SVP
SOCIETY OF VERTEBRATE PALEONTOLOGY
www.vertpaleo.org



SVP 2026

86TH ANNUAL MEETING
CLEVELAND, OHIO

MEETING PROGRAM

NOVEMBER 11–14, 2026 | CLEVELAND, OHIO, USA
HUNTINGTON CONVENTION CENTER OF CLEVELAND

VISIT VERTPALEO.ORG FOR UP-TO-DATE MEETING INFORMATION

NOVEMBER 2026 ABSTRACTS OF PAPERS

HOST COMMITTEE
Darin Croft, Chair; Caitlin Colleary, Vice-Chair; Robert Carr, Waymon Holloway, DJ Morgan, Brenna Roy

EXECUTIVE COMMITTEE
Stuart Sumida, President; Margaret Lewis, Past President;
Kristi Curry Rogers, Vice-President; Darin Croft, Secretary; Ted Vlamis, Treasurer;
Paul Koch, Member-at-Large; Beth Townsend, Member-at-Large;
Ann Weil, Member-at-Large; Lindsay Zanno Member-at-Large (Ethics)

SYMPOSIUM CONVENORS
Alyssa McGrath and Kathryn Sokolowski
Catherine Badgley and Luke Weaver
Kelsey Jenkins, Arjan Mann, and Ben Kligman
Natasha Vitek and Samantha Hopkins

PROGRAM COMMITTEE
Alistair Evans, Co-Chair; Brandon Peecook, Co-Chair; Bin Bai, Robin Beck, Juan Benito, Alessio Capobianco, Alfio Chiarenza, Brian Davis, Stephanie Drumheller, Anthony Friscia, Timothy Gaudin, Aryeh Grossman, Simone Hoffman, Juan Liu, Ingrid Lundeen, Julia McHugh, Benjamin Otoo, Felipe Pinheiro, Selina-Viktor Robson, John Scannella, Tara Smiley, Stephen Spiekman, Jack Stack, Anne Weil, Megan Whitney, Cary Woodruff

PALEONTOLOGICAL PRACTICES & AWARD LIAISONS
Matthew Brown, Christina Byrd, Kerin Claeson, Stephanie Drumheller, Lisa Herzog, Susannah Maidment, Jennifer Nestler, Ashley Poust, Kenshu Shimada, Lindsay Zanno

EDITORS
Fabian Hardy, John Hunter, Margot Nelson, Evan Vlachos, Robin Whatley

WITH SPECIAL THANKS TO…
Collections & Repository Committee, Communications Committee, Education & Outreach Committee, Ethics Committee, Government Affairs Committee, Preparators' Committee

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HUNTINGTON CONVENTION CENTER MAP

CONVENTION CENTER LEVEL





MAP LEGEND

- Registration Desk (Exhibit Level Foyer)
- Posters and Exhibits (Grand Ballroom C and Ballroom Level Foyer)
- 3 Concurrent Sessions (Grand Ballroom A, Grand Ballroom B, Room 26ABC)
- Awards Banquet (Grand Ballroom AB)
- Restroom - Women
- Restroom - Men
- Committee Meetings - Room 21, Room 22, Room 23
- Gender Neutral Bathroom - By Room 25A

HUNTINGTON CONVENTION CENTER MAP

CONVENTION CENTER - FLOOR 1

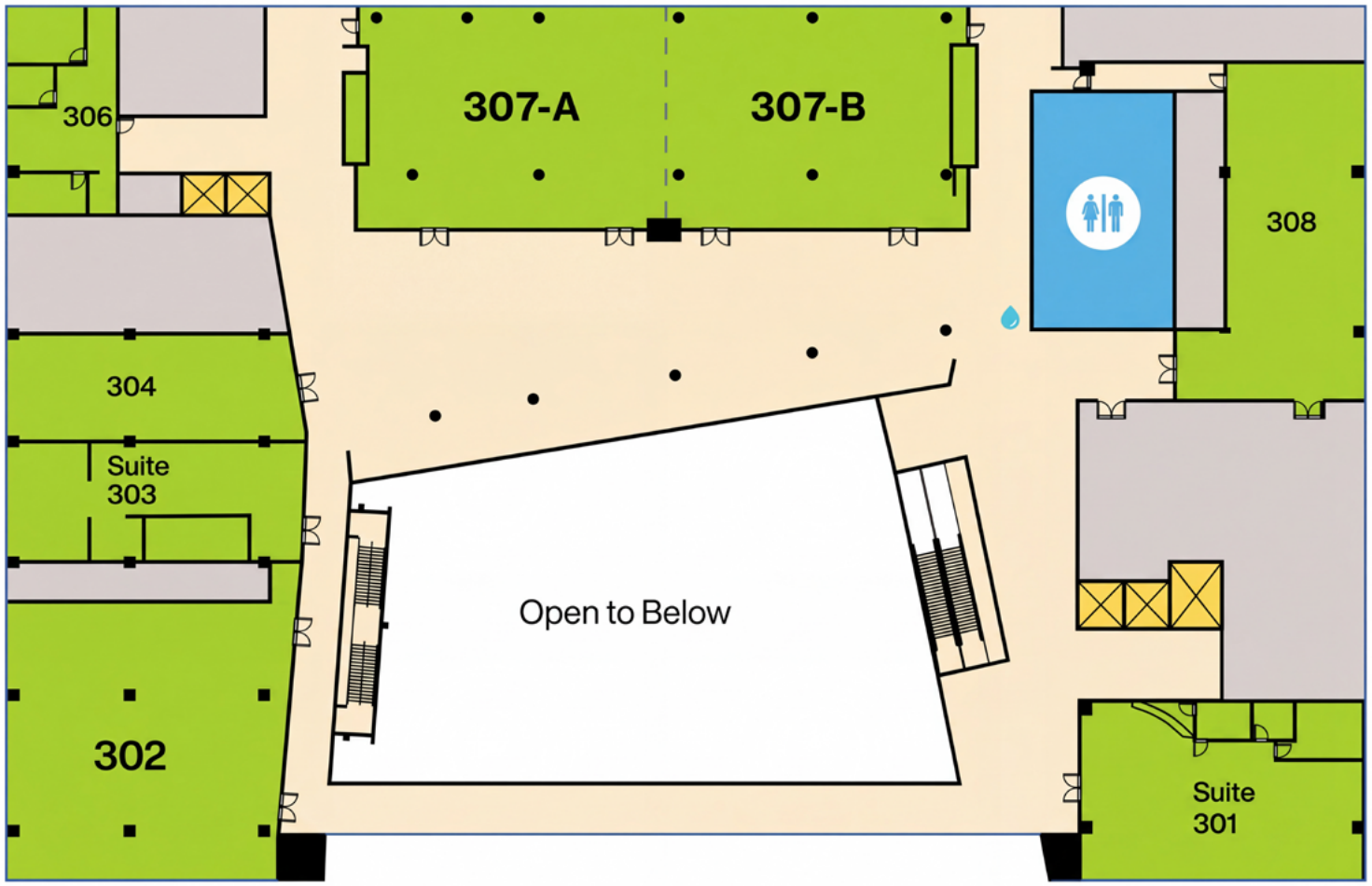


MAP LEGEND

- Auction (Atrium ABCDEF)
- Restroom - Women
- Restroom - Men
- Main Entrance (by Starbucks)
- Gender Neutral Bathroom - by Atrium Ballroom C

HUNTINGTON CONVENTION CENTER MAP

CONVENTION CENTER - FLOOR 3

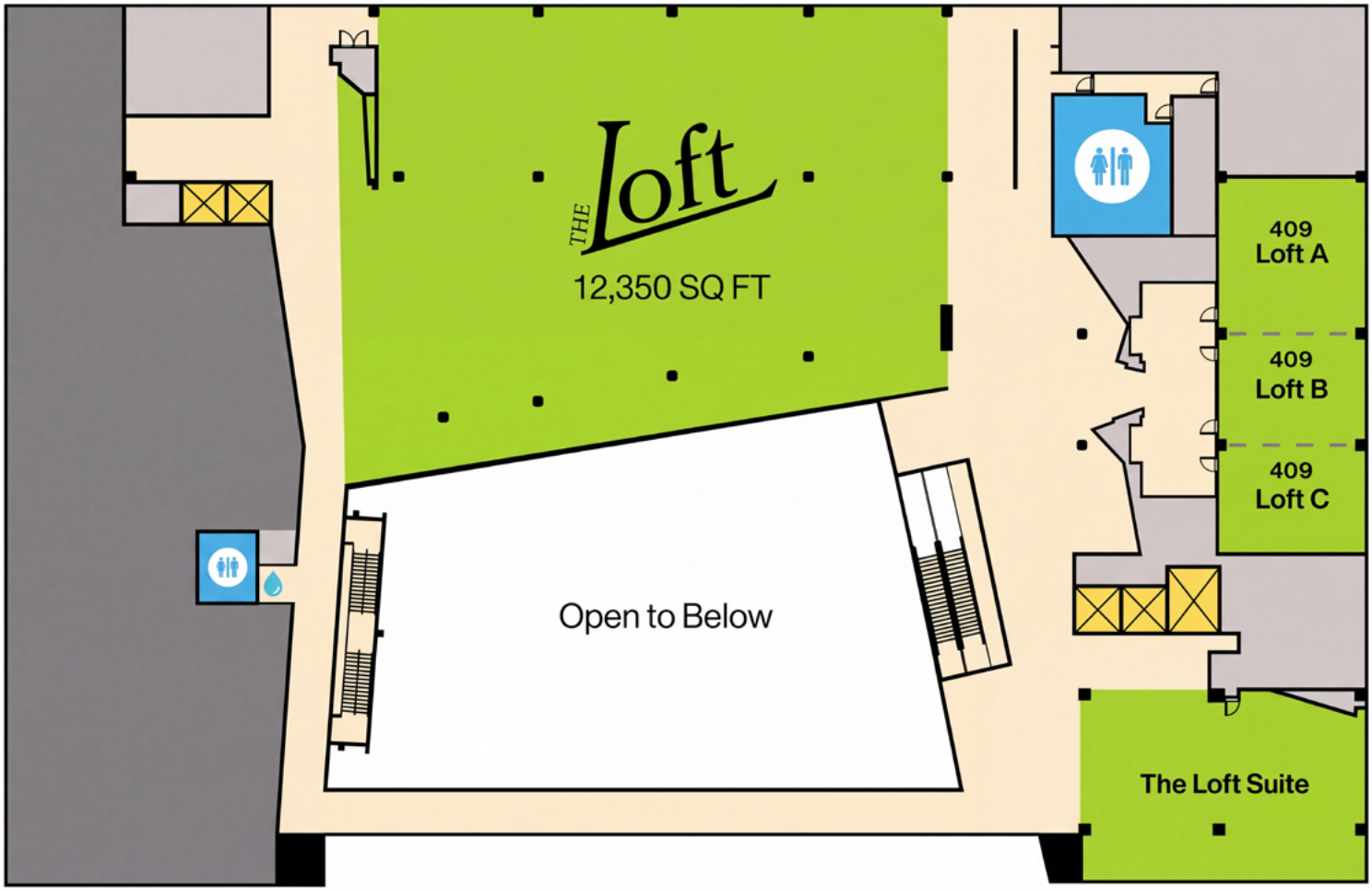


MAP LEGEND

- Student Round Table (Room 307AB)
- Restroom - Women
- Restroom - Men
- Gender Neutral Bathroom - Behind the "Open to Below" area

HUNTINGTON CONVENTION CENTER MAP

CONVENTION CENTER - FLOOR 4



MAP LEGEND

- After Party (The Loft)
- Restroom - Women
- Restroom - Men
- Gender Neutral Bathroom - Behind the "Open to Below" area

WELCOME TO CLEVELAND!

The Host Committee for the 86th Annual Meeting is excited to welcome all participants to the Society of Vertebrate Paleontology's 2026 meeting in "The Forest City", Cleveland, Ohio. The meeting will take place at the downtown Huntington Convention Center (HCC). This is the second time Cleveland has hosted the Annual Meeting. If you attended in 2008, you will be impressed by the many changes that have taken place, especially at the Cleveland Museum of Natural History!

"Forest City" may not be the moniker that comes to mind when you think of Cleveland, even though it dates back nearly 200 years. The city is still working to restore its tree canopy to what it was in the mid-19th century, but forests abound in its "Emerald Necklace", a series of 18 suburban parks that span some 21,000 acres, and in the adjacent Cuyahoga Valley National Park, which encompasses nearly 33,000 acres. You won't find any forests downtown, but if you need a break between talks, posters, and networking, head a few blocks north to Voinovich Park for a great view of Lake Erie, the Rock and Roll Hall of Fame, and downtown Cleveland - one of the best selfie spots in the city.

Those of us who live in Cleveland love the fact that it combines the amenities of a big city (it was the seventh largest in the US in 1950) with the space and affordability of a much smaller one (you can take the red line train downtown from the airport for only $2.50!). This is largely due to deindustrialization and suburbanization, which hit Cleveland hard in the 1960s and 70s. The city has undergone a resurgence in the past 20 years and is becoming a model for a modern Rust Belt city. We hope you can take advantage of the great restaurants and local food scene in Cleveland as well as the many arts and cultural organizations and events.

Paleontologists from the Cleveland Museum of Natural History (CMNH) and Case Western Reserve University (CWRU) comprise this year's Host Committee. Both institutions are in University Circle, about 5 miles (8 km) due east of downtown. University Circle is home to many other cultural attractions as well, including the impressive Cleveland Museum of Art (free to visit!), the Western Reserve Historical Society, and Severance Hall, home of the world-renowned Cleveland Orchestra. The nearby Lake View Cemetery & Arboretum is worth a visit at any time of year; its forested hills include the James A. Garfield Memorial (one of 40 US presidential burial sites), Wade Memorial Chapel (with an interior designed by Louis Comfort Tiffany), and the Eliot Ness Memorial (yes - THAT Eliot Ness!). The adjacent Little Italy neighborhood is filled with restaurants and cafes, making the area a great place to spend the day.

Among paleontologists, the CMNH is likely best known as the home of *Dunkleosteus terrelli*, the big, bad arthrodire that is the "poster child" for the Devonian Period in museums throughout the world. Other notable fossils include *Haplocanthosaurus delfsi*, the Late Jurassic sauropod represented in the museum's logo, and the Late Cretaceous theropod *Nanotyrannus lancensis*. The CMNH is well-known among paleoanthropologists for the specimen of *Australopithecus afarensis* known as "Lucy," which was discovered, collected, assembled, and described by CMNH researchers.

The CMNH completed a stunning centennial transformation late last year, which includes entirely

WELCOME TO CLEVELAND!

reimagined galleries. You will not want to miss the Welcome Reception! Several celebrated fossils are commemorated in this year's annual meeting logo and stickers, which were designed by Sofia Cina, a graduate of the Cleveland Institute of Art and CWRU's MS in Applied Anatomy program. The specimens are held by one of the Guardians of Traffic: eight colossal Art Deco figures that flank the downtown Hope Memorial Bridge. In real life, each Guardian holds a different vehicle illustrating the evolution of ground transportation from the 1800s to the 1930s. Be sure to look for them if you travel Carnegie Street to visit the West Side.

Case Western Reserve University is a private university that formed in 1967 with the merger of Western Reserve University (founded in 1826) and Case Institute of Technology (founded in 1880) - hence the long name. It is home to about 6,500 undergraduates and 5,800 graduate and professional students distributed among eight schools. CWRU is the research nexus of northeast Ohio, and PhD faculty at the CMNH, Holden Forests and Gardens, and the Cleveland Metroparks Zoo supervise undergraduate and graduate students via faculty appointments at CWRU. In addition, the School of Medicine has affiliations with four local hospitals that support research and training: University Hospitals, Cleveland Clinic, MetroHealth, and the Louis Stokes Cleveland VA Medical Center. Vertebrate paleontology at CWRU is centered in the Anatomy Department in the School of Medicine and has collaborations with the departments of Biology and Earth, Environmental, and Planetary Sciences in the College of Arts and Sciences as well as Biomedical Engineering.

A few places downtown worth checking out if you have time or if you will be traveling with family include:

- Rock and Roll Hall of Fame (the attraction speaks for itself)
- Great Lakes Science Center (many interactive exhibits for families)
- West Side Market (featuring many prepared and fresh foods)
- Playhouse Square (the largest performing arts center outside of New York City)

Slightly more distant attractions include:

- House from A Christmas Story (West Side)
- Cleveland Metroparks Zoo (West Side)
- Holden Arboretum (East of Cleveland in Kirtland, Ohio)

We hope that after attending the 86th Annual Meeting, you will agree that Cleveland Rocks!

Darin Croft,
SVP 86th Annual Meeting Host Committee Chair

Caitlin Colleary,
SVP 86th Annuam Meeting Host Committee Vice-Chair

PRESENTATION POLICIES

SVP Abstracts are reviewed by the Program Committee and members of the Collections & Repository, Education & Outreach, Ethics, Government Affairs, Preparators', and Romer Prize and Colbert Prize Committees, as appropriate. Authors are responsible for the technical content of their articles.

Unless specified otherwise, coverage of abstracts presented orally at the Annual Meeting is strictly prohibited until the start time of the presentation, and coverage of poster presentations is prohibited until the relevant poster session opens for viewing. As defined here, "coverage" includes all types of electronic and print media; this includes blogging, tweeting, advanced online publication, and other intent to communicate or disseminate results or discussion presented at the SVP Annual Meeting.

Still photography, video and/or audio taping, or any other electronic recording at the SVP Annual Meeting is strictly prohibited, with the exception of the designated SVP press event. The SVP reserves the right to engage professional photographers or audio/videotape professionals to archive sections of the Meeting for the Society's use.

Editorial policies for unpublished work: If you are planning to submit, or have submitted, your work to a journal that has embargo policies, be sure you are familiar with any restrictions they may impose on disseminating it before publication.

Please address any questions about program practices to the Program Committee or to the Executive Committee.

Citing an Abstract in the 2026 SVP Program and Abstracts Book
This Program and Abstracts Book is an official supplement to the online version of the *Journal of Vertebrate Paleontology*. The citation format for an abstract printed in this book is:
Journal of Vertebrate Paleontology, Program and Abstracts, 2026, <insert page number here>.

SVP CODE OF CONDUCT

The Society of Vertebrate Paleontology Code of Conduct

The Society of Vertebrate Paleontology (SVP) is committed to providing a courteous, professional, and harassment-free environment for all participants at our events. Attendees are expected to act with respect, integrity, and professionalism, whether in person or online.

This Code of Conduct applies to all SVP-sponsored activities, including meetings, field trips, and virtual events.

Key Principles

- **Treat others with dignity and respect:** This applies regardless of background or professional status. Respect all roles and acknowledge the contributions of professional scientists, students, technicians, volunteers, artists, and collaborators.
- **Communicate with Civility:** Engage in professional discourse.
- **Mentor Responsibly:** Encourage students in a manner that is inclusive and recognizes education as fundamental to professional development.
- **Prioritize Safety:** Adhere to rules and policies of affiliate societies, meeting venues, collections, research facilities, and field sites.
- **Honesty and Scientific Integrity.** Members will not attempt to injure the reputation or professional opportunities of others through false and/or biased claims. Members must represent research accurately when engaging with the press. Members will not intentionally reveal the results of embargoed research to colleagues or the public while an embargo is active, nor will they reveal the unpublished work of others without the explicit permission of the author(s) and/or principal investigator(s).

Unacceptable Behavior

The following actions are strictly prohibited:

- **Harassment:** Any form of harassment, including sexual harassment, bullying, denigrating language, stereotyping, or a recurring pattern of microaggressions.
- **Abuse and Intimidation:** Physical, verbal, or written abuse or intimidation. This includes threats of physical, emotional, professional, or financial harm, as well as any disregard for another's physical safety.
- **Discriminatory Conduct:** Harmful comments or conduct related to race, color, national/ethnic origin, immigration status, religion, age, marital/parental status, sex, sexual orientation, gender identity/expression, socioeconomic background, education, disability, or veteran status.
- **Violation of Boundaries:** Persisting in behaviors after boundaries have been communicated (verbally or nonverbally), or violating boundaries based on personal preferences of another individual.
- **Unwanted Contact and Stalking:** Intentional, unwelcomed behaviors including stalking, unwanted physical contact, and aggressive body language.
- **Unauthorized Recording:** Photographing, recording, or filming others, or distributing such material, without express consent.
- **Inappropriate Content:** Displaying or distributing images or media depicting bigotry, nudity, sexual activity, or physical violence.
- **Hostile Environment:** Any other behavior reasonably assumed to create, contribute to, or maintain an environment that is hostile, offensive, or damaging to a person or group.

SVP CODE OF CONDUCT CONTINUED

Reporting a Violation

If you witness or experience prohibited behavior, you are strongly encouraged to submit a report via the NAVEX Platform». Only non-anonymous reports will be considered, and reports will be returned in they lack sufficient detail.

All reports must include:

1. Your name and affiliation
2. Name(s) or identifying information of the individual(s) involved.
3. Name(s) of the victim(s), if known.
4. Description of the incident(s), including date, location, and nature of the behavior.
5. Names of witnesses, if any.
6. Any relevant documentation or supporting material.
7. Disclosure of any potential conflicts of interest among those involved or overseeing the report.

If You Need Immediate Help.

- If there is an immediate threat to safety, call emergency services (e.g., 911 in the U.S.).
- If you need help during an SVP event but it's not an emergency, contact:
  - The event leader (e.g., field trip or session organizer)
  - A member of the SVP Executive or Ethics Committee
  - Anyone wearing a "Safe SVP" button

Then, submit a formal written report as soon as possible on Navex.

Required Reporters

All SVP members in leadership roles - including elected, appointed, or temporary (e.g., session or field trip leaders) - are required to report any observed or reported violations. These reports must include a description of the incident, actions taken, and be submitted to the Ethics Committee for review.

SOCIAL MEDIA GUIDELINES

Please Read Before You Tweet (or Blog, or Facebook, or Instagram…)

The Society of Vertebrate Paleontology encourages open discussion on social media and other outlets at our Annual Meeting. In order to find a balance between embracing social media and protecting authors' work, we set forth the following guidelines:

- SVP has an embargo in place on discussing presentations until the beginning of the talk or poster session. Please do not discuss presentations until this time if you do not have the authors' permission to do so.
- This embargo exists to protect the authors. As an author, you have permission to break your own embargo or permit someone else to do the same. This includes discussing your own presentation online, posting slides or posters, etc. However, to protect yourself, make sure you are aware of any potential future publisher's policies about early dissemination of work.
- Do not photograph or videotape a talk or poster without the authors' express permission. Never post any images or video without the authors' permission.
- While the default assumption is to allow open discussion of SVP presentations on social media, please respect any request by an author to not disseminate the contents of their talk. The following icons may be downloaded from the SVP website for inclusion on slides or posters to clearly express when an author does not want their results posted:



We want to thank everyone for following these basic guidelines for online posts of all kinds. As a reminder, the official hashtag of the meeting is #2026SVP. We look forward to seeing your thoughts and discussion online!

2026 SVP FIELD TRIPS

*For Pre-registered Attendees

Day/Time	Trip
FRIDAY, November 13, 12:30 PM – 5:30 PM	Classic Cleveland Shale Fossil-Fish Localities
SUNDAY, November 15, 7:30 AM – 7:30 PM	Classic Devonian Fish Localities and Historic Newberry Collections in Ohio

2026 SVP WORKSHOPS

*For Pre-registered Attendees

Day/Time	Title	Location
TUESDAY, November 10 8:00 AM – 3:00 PM	**Using the Neotoma Paleoecology Database to Explore Quaternary Vertebrate Data**	Huntington Convention Center
TUESDAY, November 10 10:00 AM – 2:00 PM	**Improved Research Data and Printed Output with Integrated Multispectral Focus Stacked Photogrammetry**	Cleveland Museum of Natural History (1 Wade Oval Dr, Cleveland, OH 44106); Imaging Lab
TUESDAY, November 10 11:00 AM – 3:00 PM	**Techniques for Fossil Replica Painting**	Cleveland Museum of Natural History (1 Wade Oval Dr, Cleveland, OH 44106)
TUESDAY, November 10 1:00 PM – 5:00 PM	**3D Musculoskeletal Modelling and Biomechanical Analysis Using Open-Source Software**	Huntington Convention Center

For field trip and workshop pickup and drop-off location and time, please check with your workshop or field trip leader or check the mobile app.

2026 SVP SCHEDULE OF EVENTS

*All events are held at the Huntington Convention Center unless noted with ***

TUESDAY, NOVEMBER 10		
Time	**Event**	**Location**
2:00 PM – 7:00 PM	**Registration Open**	Ballroom Level Foyer
7:00 PM – 8:00 PM	**Special Lecture by Alaskan artist, Ray Troll: *"Fostering Fossil Fascination"*** –an 'epoch' journey through Troll's life and paleo inspired work depicting the deep history of the Earth	Room 26ABC

WEDNESDAY, NOVEMBER 11		
Time	**Event**	**Location**
7:00 AM – 6:00 PM	**Registration Open**	Ballroom Level Foyer
8:00 AM – 12:15 PM	**Symposium: Long Continental Records of Vertebrate Faunal Change** **Technical Session I: Ungulates** **Technical Session II: Permian Period**	Grand Ballroom A Grand Ballroom B Room 26ABC
9:30 AM – 6:30 PM	**Exhibit and Poster Viewing Hours** **Colbert Prize Competition Posters** (C1-C26) **Poster Session 1** (W28-W107)	Grand Ballroom C and Ballroom Level Foyer
1:45 PM – 4:15 PM	**Technical Session III: Squamata** **Technical Session IV: Dinosauria I: Big Theropods** **Technical Session V: Vertebrate Assemblages**	Grand Ballroom A Grand Ballroom B Room 26ABC
4:30 PM - 6:30 PM	**Exhibits/Poster Mixer** **Authors will be Present at the Following Posters:** **Colbert Prize Competition Posters** (C1-C26) **Poster Session 1** (W28-W107)	Grand Ballroom C and Ballroom Level Foyer
7:00 PM – 10:00 PM	**Welcome Reception**	Cleveland Museum of Natural History**

2026 SCHEDULE OF EVENTS

THURSDAY, NOVEMBER 12		
Time	**Event**	**Location**
7:30 AM – 6:00 PM	**Registration Open**	Ballroom Level Foyer
8:00 AM – 12:15 PM	**Romer Prize Session** **Technical Session VI: Dinosauria II: a 'Bird-Hipped' Bonanza** **Technical Session VII: Mammal-mania**	Grand Ballroom A Grand Ballroom B Room 26ABC
9:30 AM – 6:30 PM	**Exhibit and Poster Viewing Hours** **Colbert Prize Competition Posters** (C1-C26) **Poster Session 2** (Th27-Th102)	Grand Ballroom C and Ballroom Level Foyer
12:00 PM - 2:00 PM	**Ask Me Anything (AMA) Live Session**	Online
12:30 PM – 1:30 PM	**Paleo Nerds Podcast**	Grand Ballroom A
1:45 PM – 4:15 PM	**Symposium: Local & Global Drivers of Late Quaternary Extinctions** **Technical Session VIII: Fishes** **Technical Session IX: Archosaur Paleobiology & Pterosaurs**	Grand Ballroom A Grand Ballroom B Room 26ABC
4:30 PM - 6:30 PM	**Exhibits/Poster Mixer** **Authors will be Present at the Following Posters:** **Colbert Prize Competition Posters** (C1-C26) **Poster Session 2** (Th27-Th102)	Grand Ballroom C and Ballroom Level Foyer
7:30 PM – 11:30 PM	**Student and Postdoc Liaison Committee Roundtable Forum**	Room 307AB

2026 SCHEDULE OF EVENTS

FRIDAY, NOVEMBER 13		
Time	**Event**	**Location**
7:30 AM – 5:00 PM	**Registration Open**	Ballroom Level Foyer
8:00 AM – 12:15 PM	**Technical Session X: Dinosauria III** **Technical Session XI: Paleogene Period** **Symposium: Signal, Noise, and Eco-Evolutionary Opportunity: Intraspecific Variation in the Vertebrate Record**	Grand Ballroom B Room 26ABC Grand Ballroom A
9:30 AM – 6:30 PM	**Exhibit and Poster Viewing Hours** **Colbert Prize Competition Posters** (C1-C26) **Poster Session 3** (F27-F104)	Grand Ballroom C and Ballroom Level Foyer
12:30 PM – 1:30 PM	**Fossil Trails – Interview with Vince Santucci, former National Park Service Lead Paleontologist**	Grand Ballroom A
1:45 PM – 4:15 PM	**Technical Session XII: Organismal Paleobiology** **Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics** **Technical Session XIV: Return of Reptile'O'Rama: Triassic Time**	Grand Ballroom A Grand Ballroom B Room 26ABC
4:30 PM - 6:30 PM	**Exhibits/Poster Mixer** **Authors will be Present at the Following Posters:** **Poster Session 3** (F27-F104)	Grand Ballroom C and Ballroom Level Foyer
6:30 PM – 11:30 PM	**Annual Benefit Auction and Social**	Atrium ABCDEF

2026 SCHEDULE OF EVENTS

SATURDAY, NOVEMBER 14		
Time	**Event**	**Location**
7:30 AM – 2:00 PM	**Registration Open**	Ballroom Level Foyer
8:00 AM – 12:15 PM	**Technical Session XV: Dinosauria IV: A Mostly 'Bird-Hipped' Bonanza** **Symposium: Major Advances in Late Paleozoic and Early Mesozoic Tetrapod Paleontology: In Memory of Hans-Dieter Sues** **Technical Session XVI: Crocodylians & Marine Reptiles +** **Paleontological Practices: Preparation & Scientific Methods**	Grand Ballroom A Grand Ballroom B Room 26ABC
9:30 AM – 6:30 PM	**Exhibit and Poster Viewing Hours** **Colbert Prize Competition Posters** (C1-C26) **Poster Session 4** (S27-S106)	Grand Ballroom C and Ballroom Level Foyer
1:45 PM – 4:15 PM	**Technical Session XVII: Mesozoic Mammals** **Technical Session XVIII: Paleontological Practices: Education & Outreach** **Technical Session XIX: Carnivora**	Grand Ballroom A Grand Ballroom B Room 26ABC
4:30 PM - 6:30 PM	**Poster Mixer** **Authors will be Present at the Following Posters:** **Poster Session 4** (S27-S106)	Grand Ballroom C and Ballroom Level Foyer
7:30 PM – 10:00 PM	**Awards Banquet** *Annual Meeting badge is required for admittance*	Grand Ballroom AB
10:30 PM – 1:00 AM	**After Hours Party**	The Loft

2026 SVP TALK SCHEDULE

WEDNESDAY, NOVEMBER 11

TIME	GRAND BALLROOM A SYMPOSIUM LONG CONTINENTAL RECORDS OF VERTEBRATE FAUNAL CHANGE	GRAND BALLROOM B TECHNICAL SESSION I: UNGULATES	ROOM 26 ABC TECHNICAL SESSION II: PERMIAN PERIOD
8:00 AM	LUCAS WEAVER	MARK CLEMENTZ	DAVID MARJANOVIĆ
8:15 AM	JONATHAN BLOCH	ROBERT BOESSENECKER	ENELE TWALA
8:30 AM	MITCHELL RIEGLER	REBECCA STRAUCH	AJA CARTER
8:45 AM	BRANDON PEECOOK	SOPHIA DAMICO	TEA MAHO
9:00 AM	PIA VIGLIETTI	MARANDA STRICKLIN	
9:15 AM	RAYMOND ROGERS	MARK UHEN	CODY SCHULTE
9:30 AM	GREGORY WILSON MANTILLA	PIERO GIUFFRA	KEEGAN MELSTROM
9:45 AM	JASON HEAD	FABIAN HARDY	ADRIAN OSTERLING ARIAS
10:00 AM	**COFFEE**		
10:15 AM	ISAAC CASANOVAS VILAR	GARRETT WILLIAMSON	JORDAN YOUNG
10:30 AM	DARIN CROFT	KARA MIA EHLER	JACK STACK
10:45 AM	TARA SMILEY	DONALD PROTHERO	YUEN TING TSE
11:00 AM	BENJAMIN CARTER	EVAN UNRUH-FRIESEN	BRENLEE SHIPPS
11:15 AM	ANNA BEHRENSMEYER	SYDNEY BECKER	FILIP NOVAK
11:30 AM	SHAY RICE	TIMOTHY CLELAND	ANNA BRANT
11:45 AM	JOHN MORETTI	DANIELLE FRASER	MEGAN WHITNEY
12:00 PM	CATHERINE BADGLEY	KUMIKO MATSUI	SAVANNAH OLROYD
12:15 – 1:30PM	**LUNCH**		
TIME	**GRAND BALLROOM A** TECHNICAL SESSION III: SQUAMATA	**GRAND BALLROOM B** TECHNICAL SESSION IV: DINOSAURIA I: BIG THEROPODS	**ROOM 26 ABC** TECHNICAL SESSION V: VERTEBRATE ASSEMBLAGES
1:45 PM	JOHN JACISIN	JOHN FORTNER	SUYUAN YAO
2:00 PM	MICHELLE LAWING	DANIEL VIDAL	NISSA STUPAKOFF
2:15 PM	GEORGIOS GEORGALIS	THOMAS CARR	ISAAC PUGH
2:30 PM	ALFRED LEMIERRE	ALEXANDRIA POLICH	EMILY CROSS
2:45 PM	DALTON MEYER	THOMAS LABARGE	KYLEIGH PODJUBAN
3:00 PM	MEGHAN FORCELLATI	MICHAEL FRUNZI	BENJAMIN GOODE
3:15 PM	TORI PRAUSE	ZACHARY MORRIS	IAN HUTCHINSON
3:30 PM	DAVID DEMAR	JEREMIAH ROBINSON	RUBY MCCUNE
3:45 PM	AARON STEELE	SPENSER MEHEW	HOLGER PETERMANN
4:00 PM	BRUNO MURAD	ZHONGQIU JI	JASON MOORE

**SVP will not use closed captioning for talks during this meeting. However, we encourage all speakers to add concise text to slides in talks to help people of all abilities get more from your talk.*

2026 SVP TALK SCHEDULE

THURSDAY, NOVEMBER 12

TIME	GRAND BALLROOM A ROMER ROMER PRIZE SESSION	GRAND BALLROOM B TECHNICAL SESSION VI: DINOSAURIA II: A 'BIRD-HIPPED' BONANZA	ROOM 26 ABC TECHNICAL SESSION VII: MAMMAL-MANIA
8:00 AM	MEGAN WYATT	ASHLEY POUST	MAXWELL PEARSON
8:15 AM	PASHA VAN BIJLERT	KAIKI KOBAYASHI	
8:30 AM	RILEY SOMBATHY	ZAKARIA HANNEBAUM	KATHARINE WALLS
8:45 AM	ALEXANDER RUEBENSTAHL	TYLER LUCKAU	JENNY MCGUIRE
9:00 AM	BENJAMIN RODWELL	JOHN HUNTER	PAUL KOCH
9:15 AM	NANAKO OKABE	TESS GALLAGHER	RYAN HAUPT
9:30 AM	KEVIN MULCAHY	EMERALD BENDER	DAVA BUTLER
9:45 AM	STEPHANIE KILLINGSWORTH	ALI NABAVIZADEH	ANTHONY FIORILLO
10:00 AM	**COFFEE**		
10:15 AM	JONATHAN KELLER	SEISHIRO TADA	SABRINA CURRAN
10:30 AM	KATHLEEN GARLAND	J. LOGAN KING	MEYRICK TABLIZO
10:45 AM	WILLIAM FREIMUTH	KYLE OBUSZEWSKI	OWEN GOODCHILD
11:00 AM	RUSSELL ENGELMAN	PETER MAKOVICKY	KYSA MARSKE
11:15 AM	THOMAS DUDGEON	KARI MYHRAN	ADVAIT JUKAR
11:30 AM	MICHAEL CHIAPPONE	SETH GALE	TOMAS BEDANE
11:45 AM	PAUL BYRNE	BRANDON THEURER	DAVID FOX
12:00 PM	CAROLINE ABBOTT	JENNIFER BRENNAN	MATT CARTMILL
12:15 – 1:30PM	**LUNCH**		
TIME	**GRAND BALLROOM A** SYMPOSIUM LOCAL & GLOBAL DRIVERS OF LATE QUATERNARY EXTINCTIONS	**GRAND BALLROOM B** TECHNICAL SESSION VIII: FISHES	**ROOM 26 ABC** TECHNICAL SESSION IX: ARCHOSAUR PALEOBIOLOGY & PTEROSAURS
1:45 PM	JOSH MILLER	JAMES ANDREWS	LISA FREISEM
2:00 PM	AMAYA GARCIA	JUAN LIU	MARIANA HAASE
2:15 PM	CHEYENNE MUNSON	RYUSUKE KIMITSUKI	STEPHANIE BAUMGART
2:30 PM	JUSTIN YEAKEL	XINDONG CUI	KATHRYN KAVANAGH
2:45 PM	KATHRYN SOKOLOWSKI	FRANKLIN DUFFY	ROBERT SMYTH
3:00 PM	LARISA DESANTIS	ZACH LYONS-WEILER	LUCAS CANEJO
3:15 PM	QUENTIN SMITH	BENJAMIN OTOO	
3:30 PM	FELISA SMITH	MAOKUN LI	EMILY THOMAS
3:45 PM	KADE HENSLEY	TUO QIAO	SKYE MCDAVID
4:00 PM	DANIEL DALMAS	TETSUTO MIYASHITA	

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2026 SVP TALK SCHEDULE

FRIDAY, NOVEMBER 13

TIME	GRAND BALLROOM A TECHNICAL SESSION X: DINOSAURIA III	GRAND BALLROOM B TECHNICAL SESSION XI: PALEOGENE PERIOD	ROOM 26 ABC SYMPOSIUM SIGNAL, NOISE, AND ECO-EVOLUTIONARY OPPORTUNITY: INTRASPECIFIC VARIATION IN THE VERTEBRATE RECORD
8:00 AM	CHRISTOPHER GRIFFIN	JORDAN CROWELL	NATASHA VITEK
8:15 AM	GLEN KUBAN	ATHENA VOHS	P. DAVID POLLY
8:30 AM	DAKOTA CAMARENA	K. CHRISTOPHER BEARD	JAMES NAPOLI
8:45 AM	JONATHAN MITCHELL	STEPHANIE DRUMHELLER	JAMES PINTO
9:00 AM	TAIA WYENBERG-HENZLER	BRYNN WOOTEN	ELIAS WARSHAW
9:15 AM	PAUL SERENO	NAAVA SCHOTTENSTEIN	MINYOUNG SON
9:30 AM	KAREN CHIN		JOHN KANIPE
9:45 AM	DANIELA BARRERA GUEVARA	ADAM COSSETTE	CHRISTOPHER BELL
10:00 AM	**COFFEE**		
10:15 AM	MATTHEW CARRANO	MATTHEW JONES	SAMANTHA HOPKINS
10:30 AM	JOHN WHITLOCK	GEOFFREY FLORA	DANA REUTER
10:45 AM	KENT STEVENS	JACOB FREWIN	STACIE SKWARCAN
11:00 AM	BRIAN CURTICE	MELISSA WOOD	ANDREW SCHWARTZ
11:15 AM	ANTHONY ROMILIO	PATRICIA HOLROYD	KATHERINE SLENKER
11:30 AM	KOHEI YAMAGUCHI	JULIA STONE	ROBERT BURROUGHS
11:45 AM	JEFFREY WILSON MANTILLA	MATTISON SHREERO	MARGARET LEWIS
12:00 PM	KRISTI CURRY ROGERS	ELENA CATHERINE DE SANTO	SELINA-VIKTOR ROBSON
12:15 – 1:30PM	**LUNCH**		
TIME	**GRAND BALLROOM A** **TECHNICAL SESSION XII:** **ORGANISMAL PALEOBIOLOGY**	**GRAND BALLROOM B** **TECHNICAL SESSION XIII:** **PALEONTOLOGICAL PRACTICES: COLLECTIONS & CURATION, MANAGEMENT, AND ETHICS**	**ROOM 26 ABC** **TECHNICAL SESSION XIV:** **RETURN OF REPTILE'O'RAMA: TRIASSIC TIME**
1:45 PM	YOHAN POCHAT-COTTILLOUX	VANESSA RHUE	DA-YONG JIANG
2:00 PM	STEPHANIE LECHKI	LOREN BABCOCK	
2:15 PM	MARIA VALLEJO-PAREJA	KRAIG DERSTLER	
2:30 PM	SAMIR CANCEL MATOS	IAN BROWNE	NICHOLAS COUNTS
2:45 PM	KAELYN GAMEL	JOSEPH GROENKE	CARMEN URBAN
3:00 PM	EVAN ALGER-MEYER	CHRISTINA RYDER	HANK WOOLLEY
3:15 PM	JUSTIN ANDELL	VINCENT SANTUCCI	SULAGNA SEN
3:30 PM	SHOHAM BARAK	ALLISON VITKUS	BRYNDEN PERKINS
3:45 PM	MEGAN MILLER	LARKIN MCCORMACK	ELLIOTT ARMOUR SMITH
4:00 PM	DAWID SURMIK	ERIC SCOTT	RYAN PRICE

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2026 SVP TALK SCHEDULE

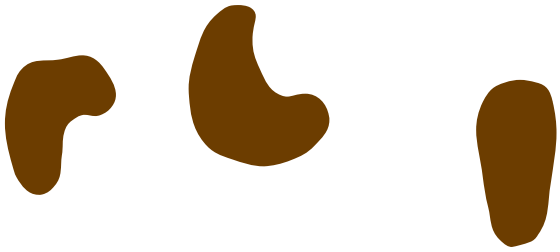
SATURDAY, NOVEMBER 14

TIME	GRAND BALLROOM A TECHNICAL SESSSION XV: DINOSAURIA IV: A MOSTLY 'BIRD-HIPPED' BONANZA	GRAND BALLROOM B SYMPOSIUM MAJOR ADVANCES IN LATE PALEOZOIC AND EARLY MESOZOIC TETRAPOD PALEONTOLOGY: IN MEMORY OF HANS-DIETER SUES	ROOM 26 ABC TECHNICAL SESSION XVI: CROCODYLIANS & MARINE REPTILES + PALEONTOLOGICAL PRACTICES: PREPARATION & SCIENTIFIC METHODS
8:00 AM	BRUNO BULAK	ABIGAIL CARON	TYLER KEILLOR
8:15 AM	DECLAN ROURKE	CAL SO	HARRISON ALLEN
8:30 AM	JOHN-PAUL HODNETT	ARJAN MANN	DANIEL LEAPHART
8:45 AM	MICHAEL D'EMIC	JASON PARDO	DAI-AN LI
9:00 AM	DAVID SMITH	ADAM HUTTENLOCKER	MADDIE TURALA
9:15 AM	YUI CHI FAN	KELSEY JENKINS	DANIEL DRISCOLL
9:30 AM	LAUREN WILSON	CHRISTIAN SIDOR	MICHAEL POLCYN
9:45 AM	CASEY HOLLIDAY	XAVIER JENKINS	ANNA PERELLA
10:00 AM	**COFFEE**		
10:15 AM	SAKETH SUNDARARAJAN	KENNETH ANGIELCZYK	KENNETH BADER
10:30 AM	MEIG DICKSON	STERLING NESBITT	MARTIN KIRINYA
10:45 AM	DONALD CERIO	BEN KLIGMAN	MADISON WESTFALL
11:00 AM	TODD GREEN	MICHELLE STOCKER	MICHAEL JONES
11:15 AM	KLARA WIDRIG	ADAM PRITCHARD	J. CHRIS SAGEBIEL
11:30 AM	KIERSTEN FORMOSO	JONATHAN WEINBAUM	ANNE SCHLUP
11:45 AM	FRANCIS KIRERA	ADAM MARSH	
12:00 PM	ISAIAH MCKINNEY	JOSEF STIEGLER	
12:15 – 1:30PM	**LUNCH**		
TIME	**GRAND BALLROOM A** TECHNICAL SESSION XVII: MESOZOIC MAMMALS	**GRAND BALLROOM B** TECHNICAL SESSION XVIII: PALEONTOLOGICAL PRACTICES: EDUCATION & OUTREACH	**ROOM 26 ABC** TECHNICAL SESSION XIX: CARNIVORA
1:45 PM	ZOE KULIK	AMELIA ZIETLOW	JOHN GALLUCCI
2:00 PM	ANDRE ROWE	SILVIA PINEDA MUNOZ	ARIN BERGER
2:15 PM	SIMONE HOFFMANN	SIERRA BORNHEIM	POLINA NIKOLSKAIA
2:30 PM	KRISTIN WATMORE	JESSICA HOLM	
2:45 PM	BRIGID CONNELLY	MATTHEW MILLER	KARI PRASSACK
3:00 PM	CONNOR DUMAS	BROOKE HAIAR	MISTY HAJI-SHEIKH
3:15 PM	HENRY FULGHUM	JANET CANAMAR	FRANK O'KEEFE
3:30 PM	DAVID GROSSNICKLE	ALEXANDRA APGAR	REBECCA HUNT-FOSTER
3:45 PM	ALYSON BRINK		YURI KIMURA
4:00 PM	RORY SWEEDLER		BLAINE SCHUBERT

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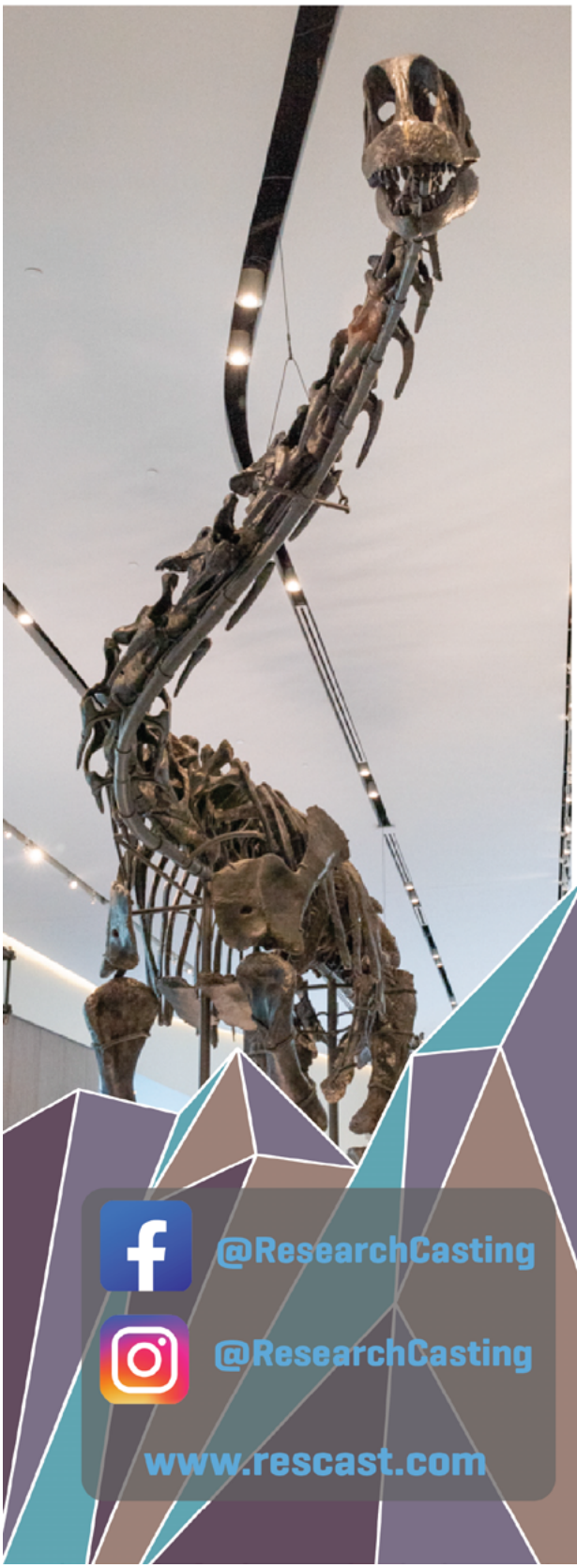
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List of Authors and Abstract Titles in Chronological Session Order

Wednesday Morning, November 11, 2026
Symposium: Long Continental Records of Vertebrate Faunal Change
Meeting Room Grand Ballroom A
Moderators: Catherine Badgely and Luke Weaver

8:00 **L.N. Weaver**, **T.S. Tobin**, **H.Z. Fulghum**, **R.E. Sweedler**, **V.A. Korasidis**, **H. Cheong**, **C.J. Sprain**, **O. Neilson**, **K. Loughney**, **A.A. Farke** After all these years, why can't we stay away? The Bighorn Basin as an archetypal 'long record'

8:15 **J.I. Bloch**, **N.S. Vitek**, **A. Porto**, **C.M. Gordon**, **S. Wing**, **P.E. Morse** Big data from the Bighorn Basin: high-resolution fossil records and novel AI workflows to clarify the effects of climate change on mammalian functional diversity across the Paleocene–Eocene Thermal Maximum

8:30 **M.S. Riegler**, **E.L. Stanley**, **K. Wolcott**, **R.E. Narducci**, **N.S. Vitek**, **J.I. Bloch** Fossorial lizards (Squamata, Amphisbaenia) respond to climate change across the Paleocene-Eocene Thermal Maximum in the Bighorn Basin, Wyoming

8:45 **B. Peecook**, **K. Angielczyk**, **J. Museba**, **C.A. Sidor**, **S. Tolan**, **M. Whitney** Growing insights from the long continental Permo-Triassic record of Zambia: dinocephalians to dinosauriforms

9:00 **P.A. Viglietti**, **J.L. Crowley**, **M. Wang**, **C. Browning**, **J. Botha**, **A.K. Huttenlocker**, **R.M. Smith**, **K. Angielczyk** Integrated Bayesian age–depth modeling constrains the Permo–Triassic boundary and vertebrate turnover in the Karoo Basin

9:15 **R. Rogers**, **J. Ramezani**, **E. Roberts**, **D. Varricchio** Calibrating the Campanian (Late Cretaceous) terrestrial fossil record of the Western Interior Basin: Insights and updates from the Two Medicine and Judith River formations of Montana

9:30 **G.P. Wilson Mantilla**, **D.G. DeMar**, **P. Roopnarine**, **C.J. Sprain**, **T.S. Tobin**, **P. Renne**, **A. Tholt**, **B.T. Hovatter**, **J.P. Silviria**, **H. Cheong** The Hell Creek Project: A long-term, multi-disciplinary investigation of the mass extinction and biotic recovery across the K/Pg boundary in eastern Montana, USA

9:45 **J. Head** Of scales and timescales: reptiles of the Miocene Siwalik Group of Pakistan reveal the applications and limitations of a long continental fossil record for examining faunal responses to environmental change through deep time

10:00 Coffee Break

10:15 **I. Casanovas Vilar**, **S.G. Arranz**, **O.c. Cirilli**, **J.c. Gamarra**, **À.H. Luján**, **L. Pandolfi**, **S.c. Siarabi**, **A.c. Villa**, **J.c. Árias-Martorell**, **D.M. Alba** Times of change: vertebrate paleobiodiversity dynamics in the Vallès-Penedès Basin (Catalonia) throughout the late Middle to early Late Miocene (12.5-9.0 Ma)

10:30 **D.A. Croft**, **F. Anaya**, **E. Madill**, **B. Saylor** The Central Andes: an archive of neotropical faunal and paleoenvironmental change during the Miocene

10:45 **T. Smiley**, **C. Badgley**, **F.C. Hardy**, **A.E. Kort**, **K. Loughney**, **M. Wyatt** Long-term eco-evolutionary dynamics of mammals in relation to landscape, climate and environmental change: a view from the Mojave Region of southwestern North America

11:00 **B.E. Carter**, **T. Smiley**, **J. Alroy**, **R. Feng**, **C. Badgley** Diversity and energy use of mammalian faunas through Miocene warming and cooling

11:15 **A.K. Behrensmeyer**, **R. Bobe**, **A. Du** African Cenozoic faunal change and human evolution in the Turkana Basin, Kenya

11:30 **S. Rice**, **A.M. Jukar** A regional comparison of large herbivore turnover and extinction selectivity in response to late Neogene cooling and aridification in North America

11:45 **J.A. Moretti**, **S. Skwarcan**, **C.J. Bell** Glimpses of faunal change across the glacial-interglacial cycle during the Late Pleistocene from renewed studies of cave sites on the Edwards Plateau of central Texas.

12:00 **C. Badgley**, **J.C. Barry**, **A.K. Behrensmeyer**, **T.E. Cerling**, **L.J. Flynn**, **M.E. Morgan**, **D. Pilbeam** The Siwalik record of Pakistan: an integrative approach to ecosystem dynamics in a long fossil record

Wednesday Morning, November 11, 2026
Technical Session I: Ungulates
Meeting Room Grand Ballroom B
Moderators: Kara Ehler and Piero Giuffra

8:00 **M.T. Clementz**, **B. Carrapa**, **P. Martinez**, **N.J. Cosentino**, **P. DiNezio**, **P. Vervoort**, **C. Gutstein**, **K. Thirumalai**, **J. Abell**, **D. Hulse** From ocean fertilization to whale giants: marine mammal responses to Late Miocene productivity and climate change

8:15 **R.W. Boessenecker**, **C. Tsai**, **J.H. Geisler** New fossils of the dwarf baleen whale *Nannocetus* and *Herpetocetus* (Mammalia: Cetacea) from the Miocene, Pliocene, and Pleistocene of Northern California inform the biochronology and phylogeny of Herpetocetinae

8:30 **R.J. Strauch**, **C. Tsai**, **N.D. Pyenson**, **M.D. Uhen** New toothed mysticetes (Aetiocetidae) from the Pacific Northwest indicate dental simplification independent of tooth loss in baleen whales

8:45 **S.L. Damico**, **M.D. Uhen** Evolution of maximum body mass in aquatic mammals

9:00 **M.L. Stricklin**, **M. Stocker** Localized bone expansion in a new Miocene odontocete rostrum (VMNH 220047): reassessment of paleopathological diagnoses in enigmatic rostra

9:15 **M.D. Uhen** The Bartonian origins of the Pelagiceti

9:30 **P. Giuffra**, **M.D. Uhen**, **M. Urbina**, **M. Mendieta** New array of early cetacean remains from the Eocene of Peru offers insights into the disparity of basilosaurids across time and space

9:45 **F.C. Hardy**, **C. White**, **R. Walter**, **L. Wilkinson** Expanding ecometric analysis of Miocene artiodactyls: regional differences and persistent phylogenetic signals from the Mojave and Great Plains

10:00 Coffee Break

10:15 **G. Williamson**, **D.J. Koning**, **S.D. Spaur**, **J.K. Rugenstein**, **D. Sweet** Late Hemingfordian-Barstovian NALMA biostratigraphy of the Tesuque Formation (Middle Miocene), Española Basin, north-central New Mexico

10:30 **K. Ehler**, **A. Styrczula**, **T.I. Prause**, **T.G. Kaye**, **B. Peecook**, **M. Whitney** Paleohistology of tylopods reveals a diversity of growth patterns and life history strategies during the Eocene-Oligocene Transition

10:45 **D.R. Prothero**, **E. Welsh**, **K.I. Watmore**, **D. Balassa** The evolution of North American camels: implications for paleontological databases

11:00 **E. Unruh-Friesen**, **M. Allen**, **W. Newman**, **L.N. Weaver**, **B.H. Passey** Evaluating the water balance thermo-physiology of late Miocene equids using triple oxygen isotopes of fossil tooth enamel.

11:15 **S. Becker**, **N. Michaelson**, **B. Jørgensen**, **M. Balisi** Post-cranial remains of a 30-million-year-old hornless rhinoceros from the Great Plains, Wyoming, USA

11:30 **T.P. Cleland**, **C. Colleary**, **L.J. Bergemann**, **M. Mihlbachler** Enamel paleoproteomics from *Teleoceras proterum* and *Aphelops malacorhinus* from the Miocene Mixson Bone Bed, Florida, USA

11:45 **D. Fraser**, **N. Rybczynski**, **M. Gilbert**, **M.R. Dawson** A new rhinocerotid from the High Arctic and biogeographic implications

12:00 **K. Matsui**, **M. Mitoh**, **T. Tsubamoto** A juvenile giant from Hokkaido, Japan: new insights into *Desmostylus* growth and dispersal

Wednesday Morning, November 11, 2026
Technical Session II: Permian Period
Meeting Room 26 ABC
Moderators: Yuen Ting (Athena) Tse and Cody Schulte

8:00 **D. Marjanović**, **A. Mann**, **J.D. Pardo**, **H.C. Maddin** *Asaphestera* and the origin of pan-amniotes

8:15 **E. Twala**, **J. Choiniere**, **K.N. Dollman**, **R. Benson** Comparative osteohistology reveals contrasting growth strategies in early amniotes and reptiles

8:30 **A.M. Carter**, **J. Caporale**, **B. Vegunta**, **H. Lou**, **A. Johnson** Intervertebral bending mechanics of *Eryops megacephalus*, *Diadectes sideropelicus*, and *Dimetrodon limbatus* through mutimaterial 3D printing

8:45 **T. Maho**, **J.J. Bevitt**, **R. Reisz** Histological and neutron CT evidence for distinct developmental strategies for the formation of dental batteries among captorhinid reptiles

9:00 **WITHDRAWN**

9:15 **C. Schulte**, **N. Tabor**, **J. Robbins**, **D. Winkler**, **C. Flis** Assessing early Permian vertebrate feeding behaviors and pelycosaur dentition evolution through stable isotopes at the Craddock Bone Bed in Baylor County, Texas

9:30 **K. Melstrom**, **T. Scott**, **M. Alkalani**, **J.K. Lungmus** An early Permian cave deposit records strikingly simple teeth in a terrestrial ecosystem

9:45 **A.F. Osterling Arias**, **J.J. Bevitt**, **R. Reisz** Taxonomy versus ontogeny - Variation in the snout morphology of Early Permian trematopids at Richards Spur, Oklahoma

10:00 Coffee Break

10:15 **J. Young**, **R. Reisz**, **J.J. Bevitt** Cranial Anatomy of amphibamiform dissorophoid temnospondyls from the early Permian cave system of Richards Spur, Oklahoma, revealed by neutron tomography

10:30 **J. Stack** Fossils of a large Permian ray-finned fish (Actinopterygii) from the western USA highlight multiple origins of large body size in Paleozoic actinopterygians

10:45 **Y. Tse**, **A.K. Huttenlocker** Synapsid cranial shape and correlation with topological simplification using 3D geometric morphometrics

11:00 **B. Shipps**, **C.A. Sidor**, **K. Angielczyk**, **R.M. Smith** The vertebrate fossil record of the Permian Usili Formation (Songea Group, Ruhuhu Basin): historical collections and recent advances

11:15 **F. Novak**, **C.A. Sidor** A digital bonehead braincase: CT evidence for soft-tissue displays in *Bondoceras bulborhynchus* (Biarmosuchia: Burnetiamorpha), and a review of braincase evolution in early synapsids

11:30 **A. Brant**, **C.A. Sidor** Variation in the maxillary canal morphology of Zambian gorgonopsians with preliminary implications for gorgonopsian phylogeny and ecology.

11:45 **M. Whitney**, **K. Ehler**, **B. Peecook**, **R.M. Smith**, **P.A. Viglietti**, **C.A. Sidor**, **S. Tolan**, **J. Museba**, **K. Angielczyk** A peculiar bonebed from the Lopingian upper Madumabisa Mudstone Formation of the Luangwa Basin, Zambia provides insights into neonatal growth rates in therapsid

12:00 **S.L. Olroyd**, **J.P. Anderson** 3D morphometric analysis of the angular across Therapsida

Wednesday Afternoon, November 11, 2026
Technical Session III: Squamata
Meeting Room Grand Ballroom A
Moderators: Dave DeMar and Georgios Georgalis

1:45 **J.J. Jacisin** Quaternary herpetofaunas from Wisconsin, USA, reveal non-analog small vertebrate communities at glacial and boreal boundaries

2:00 **M. Lawing**, **M.A. Hurtado-Materon**, **J. McGuire**, **J. Müller**, **F.K. Manthi**, **J. Head** Clade- and region-specific body size ecometrics recover temperature in global squamate assemblages

2:15 **G. Georgalis** Complex vertebral structures among Cenozoic European snakes — a fascinating story of convergent evolution and homoplasy

2:30 **A. Lemierre**, **I.V. Wilenzik**, **M. Orliac** Sneaking past the Grande Coupure: diversity of snakes across the Eocene–Oligocene transition (MP 19-22) from Dams (Quercy, southwestern France)

2:45 **D.L. Meyer**, **B.S. Bhullar**, **J.A. Gauthier** Cranial modification preceded a serpentiform body in the evolution of Glass Lizards

3:00 **M.R. Forcellati**, **A.T. Salis**, **R. Benson**, **C.J. Raxworthy** Re-examining osteological variation in the Chamaeleonidae (Squamata: Iguania) in light of novel phylogenomic data and revised historical biogeography

3:15 **T.I. Prause**, **B. Peecook**, **T.G. Kaye**, **M. Whitney** Lance Creek Formation microsites update the diversity of tooth replacement in Maastrichtian squamates

3:30 **D.G. DeMar**, **H. Woolley** A new armored large-bodied lizard from the latest Cretaceous of Montana highlights unexpected anguimorph taxonomic diversity and life strategies prior to the K-Pg mass extinction

3:45 **A. Steele**, **H. Avrahami**, **D. Varricchio** A new iguanian skull and cervical vertebral sequence from the Late Cretaceous Two Medicine Formation (Montana, U.S.A)

4:00 **B.C. Murad**, **R.C. da Silva**, **K. Bandeira**, **V. Gallo**, **A.W. Kellner** First anatomical description of historical mosasaur specimens from the Niobrara Formation (Kansas, USA) housed in Rio de Janeiro, Brazil

Wednesday Afternoon, November 11, 2026
Technical Session IV: Dinosauria I: Big Theropods
Meeting Room Grand Ballroom B
Moderators: Zachary Morris and John Fortner

1:45 **J.D. Fortner**, **A. Wilken**, **K. Sellers**, **J. Miles**, **C.M. Holliday** The biomechanical impact of external mandibular fenestral integument on mandibular performance in *Majungasaurus crenatissimus* (Theropoda: Abelisauridae)

2:00 **D. Vidal**, **R.M. Lindoso**, **P.E. Costa**, **A.D. Souto**, **F. Elias**, **E.C. Fitzgerald**, **I.S. Carvalho**, **M.A. Medeiros**, **P.C. Sereno** *Oxalaia quilombensis* is not *Spinosaurus*: new fossils from Laje do Coringa (Alcântara Formation, Brazil) support sister taxon status

2:15 **T.D. Carr** *Tyrannosaurus rex* postorbital horns reflect ontogeny, not taxonomy or sexual dimorphism, and cast doubt on "*Nanotyrannus lethaeus*"

2:30 **A.G. Polich**, **J. Napoli**, **L.E. Zanno** Comparing ceratobranchial and limb osteohistology in *Nanotyrannus lancensis*

2:45 **T.W. LaBarge** Tyrannosauroid paleodiet reconstruction using zinc, carbon, and oxygen isotopes: a case study of the Hell Creek Formation

3:00 **M.L. Frunzi**, **M. Bhat**, **C. Brown**, **L.E. Zanno**, **T. Cullen** Assessing niche partitioning in Late Cretaceous eutyrannosaurs using geochemical diet proxies

3:15 **Z.S. Morris**, **L.M. Chiappe**, **N.D. Smith** New tyrannosaur from the Bisti/De-Na-Zin Wilderness (Upper Campanian) of New Mexico provides insights into biogeography and palate anatomy of apex predators in southern Laramidia

3:30 **J.A. Robinson**, **D. Varricchio** Ailing tyrants: a quantitative survey of northern Laramidian tyrannosaurid pathologies

3:45 **S. Mehew**, **S. Brusatte**, **E. Warner-Cowgill**, **G. Storrs** A description of the postcranial osteology of *Daspletosaurus* based on a new specimen

4:00 **Z. Ji**, **E.W. Duan**, **F. Fang**, **E. Snively**, **S. Chen**, **T. Niu**, **X. Xu** Multiple individuals of the giant theropod *Zhuchengtyrannus magnus* from Campanian Shandong, China support Asian origin of the *Tyrannosaurus* lineage

Wednesday Afternoon, November 11, 2026
Technical Session V: Vertebrate Assemblages
Meeting Room 26 ABC
Moderators: Kyleigh Podjuban and TBD

1:45 **S. Yao**, **Z. Pan**, **S. Zhang**, **M. Zhu** Deep-time diversification dynamics of non-amniote tetrapods across Phanerozoic environmental crises: quantitative insights from the DeepBone database

2:00 **N.M. Stupakoff**, **C.A. Sidor**, **H. Woolley** Quantifying the taphonomic constraints on anatomical information in vertebrate fossils from the high paleo-latitude Lower Triassic Fremouw Formation of Antarctica

2:15 **I. Pugh**, **M. Stocker**, **A.B. Heckert**, **B.H. Lauer**, **R.L. Lauer**, **P.M. Barrett**, **S. Wills**, **L.J. Rose**, **M. Nohomovich**, **S.J. Nesbitt** The Garita Creek Gala: a diverse microvertebrate assemblage from the Upper Triassic of eastern New Mexico reinterprets correlations of the Garita Creek Formation

2:30 **E.G. Cross**, **T. Cullen**, **C. Suarez**, **E. Hyland**, **S.P. Finch**, **T. Chinzorig**, **B. Ganzorig**, **E. Monkhtor**, **R. Tucker**, **L.E. Zanno** Contrasting trophic networks in intracontinental and coastal ecosystems after the Cretaceous Thermal Maximum: case studies from the Gobi and Western Interior Basins

2:45 **K.M. Podjuban**, **D. Brinkman**, **F. Fanti**, **M. Bhat**, **M. Ryan**, **D.C. Evans**, **T. Cullen** An unusual vertebrate microfossil bonebed from the Oldman Formation preserving an early occurrence of *Habrosaurus* and environmentally-informative records of trematode-infected molluscs

3:00 **B.S. Goode**, **H.F. Smith**, **B. Adrian**, **J.M. Cooke**, **H. Brand** Marine vertebrate faunal turnover within the Campanian Cliff House Sandstone at Tsaya Canyon, New Mexico, USA

3:15 **I. Hutchinson**, **I. Brown**, **C. Redman**, **D. Varricchio**, **J. Moore** Insights into the terrestriality of microfossil assemblages from the Late Cretaceous based on a microsite from the Two Medicine Formation

3:30 **R.W. McCune**, **M. Whitney**, **B. Peecook**, **T.G. Kaye**, **V. Trinidad**, **M.R. Whalen** Analysis of local Lance Creek Formation food webs reveals network dynamics prior to the end-Cretaceous mass extinction

3:45 **H. Petermann**, **S.M. Sherman**, **B. Noonan**, **J.M. Christensen**, **T.R. Lyson** Amphibians from the Denver Formation of Colorado, USA, show extinction resilience at the end Cretaceous mass extinction

4:00 **J. Moore**, **C. Redman**, **A.D. Apgar**, **A.W. Poust**, **I. Hutchinson**, **R. Souberlich**, **C. Colman**, **Y. Jacks**, **E. Benito** Fossilisation on fans: Insights into the paleoecology and taphonomy of terrestrial fluvial settings by comparing the White River Group of Nebraska to the Pilcomayo Megafan, Paraguay

Wednesday – Saturday, November 11 – November 14, 2026
Colbert Prize Poster Session
Meeting Room Grand Ballroom C and Ballroom Level Foyer
Authors must be present from 4:30 – 6:30 p.m. on Wednesday, November 11 and Thursday, November 12

C1 **L.L. Yoakum**, **N.S. Whalen**, **P. Druckenmiller**, **G. Erickson** Direct identification of steppe bison (*Bison priscus*) diet utilizing phytolith dental inclusions

C2 **A.J. Wilson**, **D.J. den Ouden**, **M.F. Jones** Reevaluating the extinct insectivourous mammal *"Leptacodon" munusculum*: Implications for the understanding of placental mammal diversification

C3 **N.S. Whalen** Testing the utility of archosaurian enamel microstructure for making taxonomic assessments: *Alligator mississippiensis* enamel shows substantial ontogenetic variation reflecting scaling and changing biomechanical demands

C4 **A. Wampler**, **R. Souberlich**, **C. Colman**, **Y. Jacks**, **J. Moore**, **A.W. Poust**, **C. Redman** Identifying sources of bias in modern avian preservation in the Paraguayan Chaco and their implications for future fossil interpretations.

C5 **N.G. Sturr**, **W. Persons**, **H.M. Huynh**, **M. Belmaker** Ornithischian niche partitioning in the Lance Formation analyzed via dental microwear texture analysis (DMTA)

C6 **C. Shepherd**, **P. Makovicky**, **N.D. Smith** Reanalysis of *Cryolophosaurus ellioti*: Interpreting alternative phylogenetic placements

C7 **A. Rodriguez**, **L. Reyes**, **M. Zondo**, **P. O'Connor**, **D. Munyikwa**, **E. Roberts**, **L.N. Weaver** Non-mammalian vertebrate microfossils from the Lower Cretaceous Gokwe Formation of Zimbabwe

C8 **A.I. Price**, **A. Peng** Measuring mosasaur mandibles: mandibular ecomorphology of the Mosasauridae (Reptilia: Squamata) from the Smoky Hill Chalk of Kansas

C9 **H.K. Orlowski**, **D.L. Fox** Exploring the phylogeny of Equini (Perissodactyla) through combined-evidence approaches

C10 **H.C. Neeley**, **J.R. Bourque**, **A.N. Caudill**, **M.S. Riegler** Geckos (Squamata, Gekkonomorpha) from the Late Oligocene and Early Miocene of Peninsular Florida

C11 **S.J. Piersanti**, **M.F. Jones** Behavioral, ecological, and allometric drivers of chiropteran middle ear morphology and acoustics: an evolutionary framework

C13 **D. Leong**, **J. Liu** The cephalic lateral line system of Devonian tristichopterids (Sarcopterygii, Tetrapodomorpha)

C14 **S.G. Kryder**, **S.J. Nesbitt** Enamel anomaly: implications of enamel-less preservation in sauropsid teeth from the Late Triassic

C15 **D.A. Hoffman**, **T.A. Gates**, **L.E. Zanno** The Mesozoic tetrapod burrow fossil record and abiotic correlates of fossorial behavior

C16 **S. Feng**, **P. Currie** A homogenous dinosaur community during the Late Campanian–Middle Maastrichtian of Alberta, with no preference of depositional environment

C17 **N.F. Elgharbawy**, **S. El-Sayed**, **H. El-Desouky**, **J. Liu**, **A.M. Murray**, **H.M. Sallam** A remarkably complete articulated catfish from the Late Eocene of the Fayum Depression, Egypt

C18 **H. El-Saka**, **J. Head**, **B.S. Salem**, **S. El-Sayed**, **H.M. Sallam** Late Eocene agamid lizards from the Fayum Depression, Egypt

C19 **D.J. den Ouden**, **J.R. Doby**, **J.X. Samuels** Old shrews in new places: a new species of *Paranourosorex* (Soricidae, Anourosoricini) from Tennessee and its bearing on shrew paleobiogeography

C20 **K. Chou**, **Y. Pommery**, **M. Ruciński**, **J. Pardo-Pérez**, **O. Mateus**, **I. Werneburg** Intraspecific variation and combat behavior in the placodont *Henodus chelyops*

C21 **H. Burch**, **D. Foffa**, **A. Dineen**, **M. Stocker**, **M. Mims**, **A.D. Marsh**, **B. Kligman**, **S.J. Nesbitt** Trophic models incorporating microvertebrate data show stability of Late Triassic terrestrial vertebrate communities in equatorial Pangea across the Adamanian–Revueltian faunal turnover

C22 **K.P. Bohus**, **P. Ahlberg** New light on the inner ear and stapes of *Ichthyostega*

C23 **A.T. Boeye**, **K.L. Atkins-Weltman**, **A.L. Pauly**, **S.K. Todd**, **R.J. Brocklehurst** *Tyrannosaurus* ran like a bird

C24 **J. Bier**, **M. Chrpa** Beyond what meets the eye: A case study of *Messelornis cristata* using Laser Stimulated Fluorescence

C25 **J.J. Bartlinski**, **N.D. Mirabile**, **A.B. Heckert**, **I. Pugh**, **B.H. Lauer**, **R.L. Lauer** Digestive traces in Late Triassic phytosaur teeth from the Upper Triassic Homestead site (Garita Creek Formation, Revueltian) and its implications for archosaur digestive physiology

C26 **A.D. Apgar**, **J. Xing**, **H. Qiao**, **F. Machado Stredel**, **E. Saupe**, **A.T. Peterson**, **J. Soberón**, **J. Moore**, **C. Myers** Bias in basins: preservational megabias in a simulated world

Wednesday Afternoon, November 11, 2026
Regular Poster Session 1
Meeting Room Grand Ballroom C and Ballroom Level Foyer
Authors must be present from 4:30 – 6:30 p.m. on Wednesday, November 11

W28 **I.K. Lundeen**, **B. Rodwell**, **B.Z. Foreman**, **S. Reynolds** Basin margins and mountain edges: sparsely sampled high- and mid-elevation localities bordering the richly fossiliferous Bighorn Basin, Wyoming

W29 **S.P. Finch**, **E.G. Cross**, **T. Okoshi**, **T. Chinzorig**, **B. Mainbayar**, **M. Saneyoshi**, **W. Freimuth**, **R. Tucker**, **A. Chiarenza**, **L.E. Zanno** Comparative vertebrate diversity between the Mongolian Eastern Gobi Basin and North America Western Interior Basin in the aftermath of the Cretaceous Thermal Maximum

W30 **B.J. Burger**, **J. Foster** Dinosaur and plant ecology in a pre-angiosperm world: dinosaur habitat analysis of the Late Jurassic Morrison Formation

W31 **W. Worrell**, **M.T. Clementz**, **B. Carrapa**, **P. Martinez**, **C. Gutstein**, **J.G. Martinez-López**, **C. North** Upwelling as a driver for the globally unique marine mammal fauna of the Bahía Inglesa Formation, Chile

W32 **S.C. Groff**, **T.R. Holtz**, **O. Lambert** A Phylogenetic Analysis of the Recently Described Odontocete *Enigmatocetus posidoni,* from the Middle Miocene of Maryland and Virginia, USA With Comments on a Possible New Species

W33 **Y. Soda**, **N. Kohno** Semicircular canal morphology records locomotor and ecological diversification in toothed whales (Cetacea: Odontoceti)

W34 **M.S. Antar**, **A.S. Gohar**, **S.F. Al-Ashqar**, **S. El-Sayed**, **H.M. Sallam** The first innominate of *Dorudon atrox* from the Eocene of Egypt

W35 **N. Usachenko** New pathologic and taphonomic insights from basilosaurid skeletal remains preserved in Yazoo clay deposits of Yazoo County, Mississippi

W36 **M. Amin**, **A.S. Gohar**, **M.S. Antar**, **H. El-Desouky**, **S.F. Al-Ashqar**, **S. El-Sayed**, **H.M. Sallam** Axial reorganization across the land-to-sea transition in early whales

W37 **C. Baird** Multivariate association of postcranial morphology in living ungulates with quantitative environmental variables provides the basis for a new approach to paleoecological inference, and a pilot study in the hot deserts of Neogene North America

W38 **B. Brabson**, **J. Njau** The influence of faulting on the Pleistocene hominin landscape in Olduvai Gorge, Tanzania

W39 **D. Kitaygorodskiy**, **Z.T. Calamari** Investigating Pleistocene bison horn development and allometry through time using geometric morphometrics

W40 **A. Steinmetz**, **J. Miller** Establishing the sex of shed caribou antlers

W41 **M. Mamad** Small sized tragulids from the Upper Miocene to Lower Pliocene deposits of the Siwaliks of Pakistan

W42 **M. Ilyas**, **R. Rana Mehroz**, **S. Ghyour Abbas**, **M. Faiz**, **K. Aftab**, **I. Malik**, **A. Ghaffar**, **K. Samiullah** Expanding the fossil record of *Hippopotamodon* (Suidae, Artiodactyla) from the Hasnot Area, Siwalik, Pakistan

W43 **K. Travarca**, **C. Colleary** Dental wear analysis of *Platygonus compressus* from Sheriden Cave, Ohio

W44 **S. Parod**, **D.R. Prothero**, **N.A. Famoso** Late Oligocene–Late Miocene fossil camels from the John Day Basin, north-central and eastern Oregon

W45 **E.L. Froehlich**, **J.J. Eberle** Description and phylogenetic analysis of a well-preserved Miocene camelid from western Colorado

W46 **C. Oganesyan**, **D.R. Prothero**, **S. Parod** Interspecific limb allometry in Late Miocene to Early Pliocene giant camels of North America

W47 **D. Bogart**, **S. Olson**, **T.A. Deméré**, **D.R. Prothero** Fossil Camel bones from the Pliocene San Diego Formation, California, with numerous Shark tooth marks

W48 **M.C. Fridel**, **B. Peecook** Investigating the Presence of *Haringtonhippus francisci* in the American Falls Formation of the Snake River Plain, Idaho, USA

W49 **B. Pullu** Systematics of the Western and Central Anatolian three-toed horses of the Hipparionini (Mammalia, Equidae)

W50 **K.W. Moses**, **A. Peng** A heavy burden: linking body mass, locomotion, and osteopathology in Miocene rhinocerotids

W51 **S.M. Santos**, **D.R. Prothero** How did rhinoceros grow? A systematic analysis of growth pattern in North American rhinoceros

W52 **J.A. Gajewski**, **J. Ebersole**, **S. Wallace** *Metamynodon* (Mammalia, Perissodactyla) from the Oligocene of Alabama, USA, marks the easternmost record of Amynodontidae in North America

W53 **L. Holbrook**, **D.A. Croft**, **B. Beatty**, **B. Wynd** Early paleobiogeography of Pan-Perissodactyla: review of current hypotheses

W54 **L.B. Holmes** Evolutionary patterns of pedomorphism in Temnospondyli

W55 **J. Wilson**, **J.K. Lungmus** Digital segmentation of a vertebrate-rich Richards Spur fissure-fill block using micro-CT data

W56 **P.S. Rhynard**, **C. Flis**, **M. Stocker** Buried in burrows: two new assemblages from the Arroyo Formation, TX, illustrate wider morphological diversity in early Permian lysorophians

W57 **C.N. Ciampaglio**, **D. Cline**, **R. Shell**, **L. Fuelling**, **W. Steinbrunner** Chondrichthyans and osteichthyans of the Neva Limestone (Council Grove Group: Permian, Asselian) of Kansas

W58 **D. Cline**, **C.N. Ciampaglio**, **R. Shell**, **L. Fuelling**, **W. Steinbrunner** Chondrichthyans of the Red Eagle Limestone (Council Grove Group: Carboniferous - Permian) of Kansas

W59 **M.P. Sodano**, **R.B. Irmis**, **A.K. Huttenlocker** Interpreting climbing ability in Permian synapsids using autopodial proportions reveals limits of mammalian and reptilian models

W60 **A.N. Katuin**, **R.B. Irmis**, **J.T. Faith**, **K. Cole** A pathological fossil dentary of *Crotaphytus bicinctores*: potential implications for behavior

W61 **A.P. Damek**, **C.J. Bell**, **M.S. Riegler** Architecture of keel-headed amphisbaenians poses interesting challenges for phylogenetic analysis and interpretation of the evolution of amphisbaenian skulls

W62 **J.D. Lamer**, **B.W. Schubert** A large and robust legless lizard (Squamata, Anguinae) from the Gray Fossil Site in the Appalachian Highlands of Tennessee

W63 **A. Meza**, **J.A. Rivera**, **J. Zuniga-Vega**, **M. Lawing**, **E.P. Martins** Tooth morphology through time in fossil and extant *Sceloporus* lizards

W64 **M. Margulis-Ohnuma**, **B.S. Bhullar**, **W. Ryerson**, **A. Scanferla**, **A. Manafzadeh** Testing for functional regionalization in the snake vertebral column

W65 **C. Caputo**, **F.T. Tackett**, **A. Specht**, **C. Bataille** Development of a workflow to characterize diagenesis in fossil material for isotopic studies

W66 **WITHDRAWN**

W67 **T.L. Adams**, **M.J. Polcyn** Chasing Ghosts: Earliest occurrences of aff. *Prognathodon* sp. (Mosasaurinae, Globidensini) and *Latoplatecarpus* (Plioplatecarpinae, Plioplatecarpini) from Late Cretaceous (Early - Middle Santonian) Austin Chalk deposits in San Antonio, Bexar County, Texas

W68 **K.A. Smith**, **A.A. Brink** Palaeoecological and taxonomic description of new Gulf Coast mosasaur taxa from the Blue Springs fossil site (Coon Creek Member of the Maastrichtian Ripley Formation), Mississippi, U.S.A.

W69 **B.H. Lauer**, **S. McDavid**, **M.E. Jones**, **R.L. Lauer**, **V. Beccari** An enigmatic new reptile from the Jurassic Mörnsheim Formation, Solnhofen Archipelago, Germany

W70 **S. Oyama**, **T. Tsuihiji** Revisiting the inference of the axial position of the brachial plexus suggests conserved cervicodorsal axial patterning in evolution of theropod dinosaurs

W71 **E.D. Johnson-Ransom**, **P.C. Sereno**, **E. Snively** Craniocervical and hind limb measurements distinguish feeding function in spinosaurids and other archosaurs

W72 **R.M. Lindoso**, **P.C. Sereno**, **D. Vidal**, **M.A. Medeiros**, **I.S. Carvalho**, **P.E. Costa**, **A.D. Souto**, **E.C. Fitzgerald**, **F. Elias**, **F. Gascó-Lluna** A new mid-Cretaceous spinosaurine from Brazil (Maranhao State: Itapecuru Formation) provides insights on the evolution of Late Cretaceous spinosaurines

W73 **M. Ciudad Real**, **D. Vidal**, **P.C. Sereno** Neuroanatomy of *Suchomimus tenerensis* (Elrhaz Fm. Niger) and the sensory similitudes and differences between spinosaurid clades

W74 **B. Breithaupt**, **J. Deibert** New insights into F.V. Hayden's mysterious 1869 discovery of the first *Allosaurus* fossil and Colorado's first dinosaur fossil: the case of the 'curious vertebra'

W75 **M. Ozawa**, **G.S. Raun**, **P. Currie** Alioramus: The cranial morphology and txonomical interpretation of a long-snouted tyrannosaurid

W76 **R.L. Pines**, **J. Scannella**, **T.D. Carr** A large specimen of *Tyrannosaurus* from the lower unit of the Hell Creek Formation, Montana

W77 **D. Reeves Wolf**, **E.A. Warshaw**, **A. Miller Robinson**, **J.P. Wilson**, **D.W. Fowler** A curious case of a tyrannosaur toothache: feeding and mechanical implications to consider in the first described tooth abscess in a tyrannosaurine

W78 **G.A. Rogers**, **K. Loughney** A preliminary taphonomic analysis of Early Cretaceous (Aptian-Albian) Antlers Formation fossil sites

W79 **M.S. Hoy**, **J. Mitchell** A comparison of rich sites from the Mussentuchit Member of the Cedar Mountain Formation, Utah

W80 **I. Turner**, **A.B. Heckert**, **A. Hendrix**, **J.P. Crothers** An early Campanian pachycephalosaur and associated microvertebrate assemblage from the Upper Cretaceous Allison Member, Menefee Formation, eastern San Juan Basin, New Mexico

W81 **S.G. Choiniere**, **A.B. Heckert** A vertebrate assemblage from the Late Cretaceous Fruitland Formation (Judithian: Campanian) of New Mexico

W82 **A.A. Farke**, **G.A. Hamilton**, **M. Ghobrial**, **X. Zou**, **K. Bush**, **R.E. Sweedler**, **T.S. Tobin**, **L.N. Weaver** A marginal marine vertebrate assemblage from the middle part of the 'Mesaverde' Formation (Late Cretaceous, Campanian) in the eastern Bighorn Basin, Washakie County, Wyoming, USA

W83 **J.M. Cooke**, **B. Adrian**, **H.F. Smith**, **B.S. Goode**, **H. Brand** A new marine reptile assemblage from the Tsaya Canyon Campanian Cliff House Sandstone of New Mexico.

W84 **E.S. Davis**, **R.E. Sweedler**, **T.S. Tobin**, **A.A. Farke**, **H.Z. Fulghum**, **L.N. Weaver** New microvertebrate fossil assemblages from the Meeteetse Formation (late Campanian-early Maastrichtian) of the Bighorn Basin, Wyoming, USA

W85 **N.P. Kelley** Vertebrate fossil diversity and faunal composition of the Late Cretaceous Coon Creek Formation

W86 **T.R. George**, **J.M. Hodnett** A new and important reptile fauna assemblage from the Severn Formation in southern Prince George's County, Maryland, U.S.A.

W87 **R.L. Olivola**, **C. Redman**, **N.L. Atudorei**, **S. Nelson**, **R. Souberlich**, **Y. Jacks**, **C. Colman**, **A.W. Poust**, **J. Moore** Isotopic methods for assessing spatial fidelity in microvertebrate assemblages

W88 **Y. Kawatsuki**, **S. Toyoda**, **K. Chiba**, **B. Buyantegsh**, **B. Mainbayar**, **Z. Badamkhatan**, **K. Tsogtbaatar**, **M. Saneyoshi** Quartz ESR signal provinces for correlating Upper Cretaceous and Paleogene successions of the Gobi Desert, Mongolia

W89 **D. Flores**, **N.A. Famoso**, **S. Hopkins** Of rodents and rocks: reviewing biostratigraphic patterns in the Turtle Cove and Kimberly Members of the John Day Formation, Oregon, USA

W90 **S. Phan**, **M.C. Vallejo-Pareja**, **D.C. Blackburn** Fossil Anurans from the Early Miocene of Florida: Fossils from the Miller Site

W91 **J. Arroyo-Cabrales**, **I. Alarcón-D.**, **J.A. Cruz**, **C.W. Steele** Diversity of Pleistocene vertebrates at Huautla Cave System, Oaxaca, Mexico.

W92 **T. Hillard**, **S. Lyons**, **M. Craffey** Cooccurrence structure of diet guilds across Pleistocene–Holocene transition

W93 **L. Sankau**, **J. Rowan**, **K. Uno**, **D. Green**, **D.F. Su**, **C.J. Campisano** Dietary adaptations of sympatric large herbivores across the Mio-Pliocene boundary at Lothagam (West Turkana, Kenya)

W94 **T.A. Holzmann**, **A.M. Valenzuela-Toro**, **S. Gili**, **J. Higgins**, **P.L. Koch** Exploring macropredator dynamics in Miocene-Pliocene oceans using stable calcium isotopes

W95 **S.T. Lavin**, **A.K. Parker**, **P.Z. Barrett**, **J. Glöggler**, **A.M. Omuyangu**, **R.M. Muriuki**, **C. Atabo**, **N.R. Malit**, **C.C. Beck**, **T. Smiley** Updated Paleoecology of Locherangan (Early Miocene, West Turkana, Kenya)

W96 **W.L. Parsons**, **K.M. Parsons**, **S.L. Parsons**, **C.R. Parsons** Embryos and meteoric iron, footprints and feathers: Rare states of high-quality preservation found within various specimens recovered from the Early Cretaceous “Middle Dome” sites in central Montana

W97 **J. Duckworth**, **K. Loughney** Climate, taphonomy, and vertebrate community structure in the John Day Fossil Beds: a GIS-based analysis

W98 **Z.A. Menendez**, **A.W. Poust**, **C. Redman**, **C. Colman**, **Y. Jacks**, **R. Souberlich**, **A.D. Apgar**, **J. Moore** Experimentally determining the forces and sedimentary environments involved in miring crocodilians

W99 **L. Jones**, **E. Johnson** Taphonomic history of an 18th century landscape on the Southern High Plains

W100 **R. Franseth**, **R. Laker**, **A.K. Behrensmeyer**, **J. Miller** Comparing bone weathering across environments through the lens of optical profilometry

W101 **P. Martinez**, **J. Moore** Assessing the impact of ontogenetic development on the formation and variation of taphonomic signatures in vertebrate remains

W102 **L.A. Zugschwert**, **J.J. Eberle**, **R. Rogers**, **K. Curry Rogers**, **J. Foster**, **R. Hunt-Foster** Comparing feeding traces across the Upper Cretaceous coastline of the Western Interior Seaway: new insights into paleoecological interactions and taphonomic record on vertebrate microfossils from the Iles, Williams Fork, and Judith River Formations

W103 **X. Muñoz**, **K. May**, **L.N. Wilson**, **J.J. Eberle**, **G. Erickson**, **P. Druckenmiller** Theropod track assemblages from the Upper Cretaceous (Campanian) Prince Creek Formation of northern Alaska (USA)

W104 **E.P. Cerna**, **D. Peppe**, **L. Yann** Cretaceous two-steppin': New ichnological evidence for smaller theropod activity within the Upper Glen Rose Formation, Hamilton County, Central Texas, USA

W105 **G.J. Kuban**, **P. Baker**, **P. Riddle**, **J.R. Hall**, **P. Scoggins** Dinosaur tracks from Glen Rose, Texas (Lower Cretaceous) associated with unusual feeding and swimming behaviors

W106 **E.R. Przybyszewski**, **K.L. Tucker**, **J. Bijou**, **E.R. Bender**, **J.L. King** In Lockley' Footprints: A Diverse and Extensive Ichnofossil Layer from Late Triassic Chinle Formation of Colorado

W107 **D. DeBlieux**, **J.I. Kirkland**, **E. Warner-Cowgill**, **T. Thomson**, **A.R. Milner**, **V.L. Santucci**, **H. Wainer**, **A. Howell** Spectacular new vertebrate terrestrial and swim tracksites in the Moenkopi Formation of Canyonlands National Park: A reassessment of the identity of the primary swim track maker

Thursday Morning, November 12, 2026
Romer Prize Session
Meeting Room Grand Ballroom A
Moderators: Sara Burch and Advait Jukar

8:00 **M. Wyatt** Tectonic influence on heteromyid ecomorphology in the Miocene Dove Spring Formation

8:15 **P. van Bijlert** Ecological and biomechanical trade-offs in the locomotor abilities of the large theropod body plan

8:30 **R. Sombathy** Identifying drivers of variation in life history traits in extinct animals: A case study using paleohistology in the non-avian theropod dinosaur *Allosaurus*

8:45 **A.A. Ruebenstahl** The evolution of the reptile palate

9:00 **B. Rodwell** A light in the night, or just a photon in the dark? Predicting fossil primate activity pattern from relative depth of the maxilla

9:15 **N. Okabe** Population-level growth reconstruction in the Devonian jawless vertebrate *Protaspis* reveals rapid early growth

9:30 **K.D. Mulcahy** Linear morphometrics fail to support strong sexual dimorphism in *Uintatherium anceps*

9:45 **S.R. Killingsworth** From pixels to morphospace: interpretable deep learning reveals paleopopulation structure and evolutionary variation in Neogene horses (family Equidae)

10:00 Coffee Break

10:15 **J.S. Keller** Large changes for small mammals: Biodiversity loss and climate shaped rodent ecology after the terminal Pleistocene extinction

10:30 **K. Garland** Revealing the developmental and evolutionary trajectories that may govern theropod beak growth and shape

10:45 **W.J. Freimuth** Unified osteohistological framework provides insights into the life history and ecophysiology of Therizinosauria

11:00 **R. Engelman** Dental topographic metrics are not taxon- or homology-free: lessons learned from a new, large dataset of carnivorous mammals (Carnivora, Hyaenodonta, and Metatheria)

11:15 **T. Dudgeon** Testing trade-offs in the fossil record: socio-sexual vs. natural selection in the evolution of duck-billed dinosaurs (Ornithischia: Hadrosauridae)

11:30 **M. Chiappone** A Novel Quantitative Method for Estimating Transport Potential of Bones in Fluid Flow

11:45 **P.J. Byrne** Histometrics and μCT imaging reveal soft tissue correlates and illuminate the evolution of the avian cardiopulmonary system

12:00 **C. Abbott** Leveraging model systems in the fossil record: a case study of *Lystrosaurus* (Anomodontia) from the Karoo Basin, South Africa

Thursday Morning, November 12, 2026
Technical Session VI: Dinosauria II: A 'Bird-Hipped' Bonanza
Meeting Room Grand Ballroom B
Moderators: Tyler Luckau and Brandon Theurer

8:00 **A.W. Poust**, **R. Hunt-Foster**, **J. Foster**, **C. Woodruff** Preliminary glimpses into the growth and life history of the Late Jurassic dinosaur *Stegosaurus* from Dinosaur National Monument and the Colorado Plateau of the western United States

8:15 **K. Kobayashi**, **C. Sullivan** The ossified tendons and axial musculature of thescelosaurid dinosaurs (Ornithischia: Pyrodontia)

8:30 **Z. Hannebaum**, **C. Brown**, **G. Erickson**, **P. Druckenmiller** A small-bodied ornithischian fossil assemblage provides support for high latitude faunal provincialism in Laramidia during the Campanian

8:45 **T. Luckau**, **B.B. Britt**, **J.R. Frewin**, **S. Arriscoretta**, **R.R. Scheetz**, **M. Hiltunen**, **C. Christensen** Taphonomic analysis of the MayRae Quarry, Yellow Cat Member (Lower Cretaceous, Barremian), Cedar Mountain Formation, eastern Utah, USA

9:00 **J. Hunter**, **C. Janis** Tooth wear in nestling and perinatal *Maiasaura* with comments on parental care and the nidicolous reproductive strategy

9:15 **T. Gallagher**, **S. Drumheller**, **C. Boyd** Integumentary cellular anatomy in Dakota the *Edmontosaurus* mummy

9:30 **E.R. Bender** Reversal of Bergmann's rule in saurolophine hadrosaurid dinosaurs

9:45 **A. Nabavizadeh** Critical reappraisal of jaw muscle reconstruction along the coronoid process in ceratopsian and iguanodontian dinosaurs

10:00 Coffee Break

10:15 **S. Tada**, **T. Tsuihiji**, **H. Ishikawa**, **N. Wakimizu**, **S. Kawabe**, **K. Sakane** Nasal soft-tissue anatomy of *Triceratops* and other ceratopsid dinosaurs and its evolutionary sequence

10:30 **J.L. King**, **Q. Zhao**, **D.L. Dufeau**, **S. Kawabe**, **Z. Changfu**, **E.J. Rayfield**, **M. Benton** Distinguishing ontogenetic and phylogenetic neuroanatomical characteristics of Ceratopsia

10:45 **K.D. Obuszewski**, **N. McCuen**, **L.E. Zanno** Redefining the Mid-Cretaceous ceratopsian record of North America based on new Cenomanian-Santonian ceratopsoid occurrences, with implications for the origin of elaborate cranial ornamentation

11:00 **P. Makovicky**, **C. Yu**, **A. Prieto-Márquez**, **M. Son**, **Z. Badamkhatan**, **M. Norell** A new Mongolian species informs distribution patterns and modes of evolution in protoceratopsid dinosaurs

11:15 **K.D. Myhran**, **D.A. Orme**, **J. Mallon**, **R. Rogers**, **J. Scannella** A chasmosaurine (Ornithischia: Ceratopsidae) skull from the Coal Ridge Member of the Judith River Formation (Campanian) suggests convergent evolution in Chasmosaurinae

11:30 **S. Gale**, **S.G. Dalman**, **M.R. Woodcock** The *Ceratops* problem and the chasmosaur solution: from Ceratopsoidea and 'ceratopsians' to Chasmosauroidea and chasmosaurs

11:45 **B. Theurer** Body mass growth curve comparison and patterns of limb allometry in *Pachyrhinosaurus lakustai* (Dinosauria: Ceratopsidae) based on osteohistological evidence

12:00 **J.A. Brennan**, **C.A. Forster** Re-evaluating pachycephalosaurian relationships through expanded morphological character sampling

Thursday Morning, November 12, 2026
Technical Session VII: Mammal-Mania
Meeting Room 26 ABC
Moderators: David Fox and Ryan Haupt

8:00 **M.L. Pearson**, **P.L. Koch** From forests to farmhouses: Cenozoic synanthropy of the middle Mississippi River Valley

8:15 **WITHDRAWN**

8:30 **K. Walls**, **A. Locker**, **J.T. Faith**, **A.L. Norwood**, **T. Tung**, **L.R. DeSantis** Intraspecific variation in carbonate-collagen stable carbon isotope offsets in large herbivorous mammals: implications for dietary interpretations of fossil taxa in paleontological and archaeological contexts

8:45 **J. McGuire**, **C. Gibert Bret**, **Y. Wang**, **S. Pineda Munoz**, **J. Schap**, **B. Shipley** North American plants and mammals tracked climate with high fidelity, but mammals fell behind under anthropogenic pressure

9:00 **P.L. Koch**, **A.J. Martinez**, **A.K. Behrensmeyer**, **S.D. Newsome** The gut microbiome and amino acid synthesis: new insights on how large herbivores build their bodies, with implications for megafaunal extinction

9:15 **R.J. Haupt**, **H. McDonald**, **P.A. Dinterman**, **E.C. Rhenberg** First documented discovery of *Megalonyx jeffersonii* in non-karstic sediments in West Virginia, with insights into possible geologic provenance and depositional setting

9:30 **D.K. Butler** Reevaluating Waco Mammoth National Monument (Texas, USA): Demographic and pathologic signatures of environmental stress in *Mammuthus columbi* assemblages

9:45 **A.R. Fiorillo**, **S. Lucas**, **E.L. Simpson** Late Pleistocene vertebrate burrow complexes in the Jurassic Todilto Formation, White Mesa, Ojito Wilderness, north-central New Mexico

10:00 Coffee Break

10:15 **S.C. Curran**, **B. Pobiner**, **R. Croitor**, **V. Drăguşin**, **M. Pante**, **A. Popescu**, **C. Robinson**, **L. Werdelin**, **A. Petculescu**, **C.E. Terhune** Recent discoveries in the Olteț River Valley, Romania

10:30 **M.U. Tablizo**, **J. Head** Are bigger teeth more complex? Scaling relationships and integration in *Stegodon* molars

10:45 **O.A. Goodchild**, **A.M. Jukar** A spectacular new *Stegomastodon* skull and the origin of American brevirostrine gomphotheres

11:00 **K.R. Marske**, **O.A. Goodchild**, **A.M. Jukar** The identity of the gomphothere from Love Bone Bed, Alachua County, Florida

11:15 **A.M. Jukar**, **O.A. Goodchild**, **H. Zhang**, **J. Saarinen** Brevirostry in tetralophodont gomphotheres from the Siwaliks with comments on the diversity of tetralophodonts in the region

11:30 **T.G. Bedane**, **H.T. Mackaye**, **J. Boisserie**, **W.J. Sanders** The earliest mammoths? Evolutionary insights from *Mammuthus* remains at Toros-Menalla (ca. 7 Ma), Chad

11:45 **D.L. Fox**, **W.E. Lukens**, **B. Schubert**, **S. Cote**, **K.P. McNulty**, **S. Muteti**, **R. Nockerts** Isotopic evidence for non-analog ecosystems during the Early and Middle Miocene in eastern Africa

12:00 **M. Cartmill**, **M.R. Borths** Frontal inflation in durophagous carnivorans and primates

Thursday Afternoon, November 12, 2026
Symposium: Local & Global Drivers of Late Quaternary Extinctions
Meeting Room Grand Ballroom A
Moderators: Alyssa McGrath and Kathryn Sokolowski

1:45 **J. Miller**, **C. Simpson** Gaps in the fossil record provide new insights into extinction dynamics of mammoths and other Pleistocene megafauna

2:00 **A. Garcia**, **A.M. Mychajliw**, **M.I. Pardi**, **E.L. Lindsey**, **C. Widga**, **A.M. Jukar** How good is the radiocarbon record of extinct North American megafauna?

2:15 **C. Munson**, **L. Berigan**, **T. Cullen** From the Late Pleistocene to the future: modelling the spatiotemporal dynamics of large cervids in North America

2:30 **J. Yeakel**, **M. Hutchinson**, **C. Kempes**, **P.L. Koch**, **P. Ugarte**, **J. Gill**, **M. Pires** The bioenergetics of extinction and the ephemeral nature of mammalian megafauna

2:45 **K.G. Sokolowski**, **L.R. DeSantis**, **C. Tuck**, **J. Pargeter**, **D. Stynder**, **J.T. Faith** Dietary flexibility in Late Pleistocene megafauna and implications for extinctions in South Africa

3:00 **L.R. DeSantis** Where have all the browsers gone down under? Evidence for the decline of browse-dominated herbivore communities during the Quaternary in Australia

3:15 **Q. Smith**, **D. Shizuka**, **C.P. Tome**, **W. Gearty**, **F.A. Smith**, **S. Lyons** Structural changes in food web networks on the Edwards Plateau over the last 22,000 years as a result of the megafauna extinction

3:30 **F.A. Smith**, **S. Lyons**, **E.A. Elliott Smith**, **C.P. Tome**, **J. Sagebiel**, **M. Marina Casiano Ruiz**, **C.P. Hedberg**, **J.S. Keller**, **E. Restrepo Cortés** Moving beyond causation: examples of how the late Pleistocene megafauna extinction influenced mammal taxa and community structure and function in the Edwards Plateau of Texas

3:45 **K. Hensley**, **B. Crowley**, **S.B. Cooke**, **L.W. Viñola-Lopéz** New radiocarbon dates shed light on the extirpation timing of endemic echimyid rodents in southwestern Hispaniola

4:00 **D.M. Dalmas** Holocene bison diminution structured by predation pressure: modeling the selfish herd and non-extinction consequences of harvest pressure

Thursday Afternoon, November 12, 2026
Technical Session VIII: Fishes
Meeting Room Grand Ballroom B
Moderators: Tuo Qiao and James Andrews

1:45 **J.V. Andrews**, **A.M. Babut**, **M.L. Stiassny**, **J.H. Arbour**, **M. Friedman**, **H. Lopez-Fernandez** The paleontological record of cichlids (Acanthomorpha, Blenniiformes, Cichlidae) and the interrelationships of fossil and living species

2:00 **J. Liu**, **J. Zhang** A New Jianghanichthyid (Teleostei: Cypriniformes) from the Eocene Huachong Formation, with insights into the evolution of Cephalic Sensory Canals

2:15 **R. Kimitsuki**, **J. Zonneveld**, **M. Gingras** Trace fossils attributed to fish from the Mesozoic of western Canada: the often-overlooked record of fossil vertebrates

2:30 **X. Cui**, **Z. Pan**, **M. Zhu** Specimen-level data reveal the deep-time macroevolution of chondrichthyans

2:45 **F. Duffy**, **J. Batt**, **D. Snyder**, **A. Clement**, **A. Mann** A new Carboniferous rhizodont with “tetrapod-like” anatomy with implications for the decline and extinction of Rhizodontia

3:00 **Z. Lyons-Weiler**, **S. Giles**, **M. Friedman** Remarkable heterodonty in a Carboniferous ray-finned fish

3:15 **B. Otoo**, **P. Roopnarine**, **K. Angielczyk**, **O. Lebedev**, **M. Coates** Insights into the ecological effects of the end-Devonian Mass Extinction from the Famennian–Tournaisian Andreyevka localities of Russia

3:30 **M. Li**, **C. Li**, **X. Cui**, **M. Zhu**, **T. Qiao** The earliest known eudipnoan from the Lochkovian of Guangxi, China

3:45 **T. Qiao**, **X. Cui**, **M. Zhu** An Early Devonian fish from China provides new insights into the origin of sarcopterygian characteristics

4:00 **T. Miyashita** Historical contingency of early vertebrate phylogeny: what if and what now

Thursday Afternoon, November 12, 2026
Technical Session IX: Archosaur Paleobiology & Pterosaurs
Meeting Room 26 ABC
Moderators: Lisa Freisem and Lucas Canejo

1:45 **L.S. Freisem**, **D.L. Meyer**, **L.N. Wilson**, **C.T. Griffin**, **R. Shapiro**, **B.S. Bhullar** 3D imaging reveals early divergence in the developing archosaur brain

2:00 **M.V. Haase**, **J. Wiemann** Molecular convergence enabled multiple origins of eggshell mineralization in archosaurs

2:15 **S. Baumgart**, **R.E. Diaz**, **A. Pineda**, **C. Zimmerman**, **E. Schachner** Chick lung development and adult comparative anatomy reveals complications when interpreting the ornithodiran fossil record

2:30 **K.D. Kavanagh**, **B.P. Leary** Pedal phalanges proportions in archosaurs are constrained by body size and reach adult proportions in the embryo

2:45 **R.S. Smyth**, **R. Benson**, **D. Unwin** An exceptionally preserved pterosaur reveals deep homology of avian foot scales

3:00 **L.C. Canejo**, **J.L. Kaiuca**, **L.A. Marcelino**, **E.V. Araújo**, **L. Weinschütz**, **J.M. Sayão**, **A.W. Kellner** Taxonomic reassessment of the tapejarine pterosaurs from the Cretaceous of Cruzeiro do Oeste, Paraná, Brazil

3:15 **WITHDRAWN**

3:30 **E.M. Thomas**, **R.V. Pêgas**, **S. McDavid**, **L. Piazentin**, **K. Bandeira**, **L.D. Ortiz David**, **B.J. González Riga**, **H. Zaher** A new azhdarchid pterosaur from the Maastrichtian Ouled Abdoun Basin, Morocco, and the diversity of small-bodied Late Cretaceous pterosaurs

3:45 **S. McDavid**, **R.V. Pêgas**, **E.M. Thomas**, **L. Piazentin**, **K. Bandeira**, **L.D. Ortiz David**, **B.J. González Riga**, **H. Zaher** Reappraisal of the genus *Quetzalcoatlus* Lawson, 1975 (Pterodactyloidea: Azhdarchidae) and the status of *"Quetzalcoatlus" lawsone*

Thursday Afternoon, November 12, 2026
Regular Poster Session 2
Meeting Room Grand Ballroom C and Ballroom Level Foyer
Authors must be present from 4:30 – 6:30 p.m. on Thursday, November 12

Th27 **A.R. Milner**, **J.I. Kirkland**, **H.A. Carter**, **P.M. Barrett**, **A.D. Marsh** Ornithischian teeth recovered from a paleontological salvage in the lower Kayenta Formation (Lower Jurassic: Sinemurian) of southwestern Utah represent a previously unknown taxon

Th28 **C.G. Nunez-Rosa**, **A. Ben-Salahuddin**, **D.N. Hill**, **D.L. Brinkman** What an impression: giving some love and affection to a historic Yale Peabody Museum *Anomoepus* (Dinosauria: Ornithischia) trackway

Th29 **J.I. Kirkland**, **D. DeBlieux**, **E. Warner-Cowgill** A new basal Cretaceous (Berriasian) polacanthid ankylosaur from the Doelling's Bowl bonebed, lower Yellow Cat Member of the Cedar Mountain Formation of eastern Utah, U.S.A.

Th30 **C. Noble**, **D. Varricchio** A possible *Orodromeus makelai* (Dinosauria: Ornithischia) parietal from Egg Mountain (Two Medicine Formation, Montana)

Th31 **H. Avrahami**, **Z. Hannebaum** Separating orodromines from thescelosaurines: revised character evidence for Cretaceous small-bodied ornithischian clades

Th32 **K. Prehm**, **E. Garcia**, **K. Shimada**, **R. Tykoski** A putative *Tenontosaurus* (Dinosauria: Ornithopoda) jaw from the Lower Cretaceous Antlers Formation of Texas, USA

Th33 **E.T. Will**, **K. Poole** MicroCT reveals new elements of an embryonic specimen of *Camptosaurus*

Th34 **J. Russell**, **H. Avrahami**, **L. Krumenacker** A new ornithopod with possible elasmarian affinities from the late Aptian Chickabally Member of the Budden Canyon Formation represents the first dinosaur from northern California

Th35 **K. Cook**, **M. vom Lehn**, **J.L. King** A preliminary overview of small and juvenile ornithopod and hadrosaur specimens from northwestern Colorado

Th36 **I.M. Hawkey**, **B.A. McBride**, **V. Arbour** Hadrosaur tracks from a Late Cretaceous Pacific island may suggest island dwarfism

Th37 **M. Wosik**, **D.C. Evans** Osteohistological assessment of *Anatotitan* supports synonymy with mature *Edmontosaurus annectens*

Th38 **N.A. Brand**, **K. Derstler** Prey, mummy, and centerpiece: An extraordinary *Edmontosaurus* fossil from the Lance Formation and its pathologies and soft tissue preservation.

Th39 **N.A. Hornicak**, **M. Lamanna**, **E. Gorscak**, **E. Morschhauser** Paleobiogeography of South American hadrosauroid dinosaurs analyzed using tip-dating Bayesian methods

Th40 **A.M. Younk** Ancestral histological growth series identified in basal Ceratopsia

Th41 **E. Lund**, **J.J. Sertich**, **P. O'Connor** Reinterpretation and revised diagnosis of the chasmosaurine ceratopsid *Utahceratops gettyi* based on new cranial material

Th42 **G.M. Austin**, **M. Ryan**, **D.W. Fowler**, **J. Scannella** A New Nasutoceratopsin (Dinosauria: Ceratopsidae) Specimen from the Campanian Judith River Formation of Montana

Th43 **T. Campbell** *Styracosaurus albertensis* growth series recovered with cladistic methods is found to share growth changes with *Centrosaurus apertus*

Th44 **M.F. Mataija**, **M. Ryan**, **D.C. Evans** The First Record of *Coronosaurus brinkmani* (Ceratopsidae, Centrosaurinae) from the Judith River Formation of Montana

Th45 **A.D. Straley**, **J.J. Sertich**, **M.A. Loewen** First record of Centrosaurus apertus from Montana, USA expands the maximum centrosaurine geographic range

Th46 **B. Fulmer**, **J. Reizner** Seeing bone in a new light: utilizing new methods to better understand the growth of *Einiosaurus procurvicornis*

Th47 **C. Woodruff**, **H.N. Woodward**, **L. Rooney**, **J. Frederickson** The first occurrence of a probable pachycephalosaurian hyoid element

Th48 **G.A. Martinez-Ruiz**, **D.W. Fowler** The first *Foraminacephale* (Dinosauria: Pachycephalosauria) from the United States: A fine frontoparietal dome from the Campanian of Havre, Hill County, northern Montana.

Th49 **T. Tsuihiji**, **S. Tada** Skull of a young *Pachycephalosaurus wyomingensis* (Ornithischia, Marginocephalia) from the Hell Creek Formation in South Dakota, U.S.A.

Th50 **J.A. Case**, **J.T. Deckhut**, **J.R. Carr** New insights into monotreme locomotion and lifestyle based on ancient postcranial material

Th51 **J.R. Carr** Functional morphology of the macropod mandible: correlating medial masseter muscle insertion and size

Th52 **R.E. Narducci**, **R.C. Hulbert**, **R.W. Sinibaldi**, **J.R. Bourque**, **M.S. Riegler**, **H.C. Neeley**, **A.N. Caudill**, **J.L. Plummer**, **A.M. Jukar**, **J.I. Bloch** A new, remarkably complete skeleton of *Holmesina septentrionalis* (Xenarthra: Cingulata: Pampatheriidae) and associated fauna from the Pleistocene of Florida

Th53 **F.R. Costa**, **P.O. Costa**, **R. Céspedes**, **J.R. Hutchinson** A biomechanical approach to bipedalism in the glyptodont *Panochthus intermedius* (Xenarthra: Cingulata)

Th54 **M.S. Selby**, **R.K. McAfee** Variation in sacral number and identity in fossil sloths (Mammalia, Pilosa)

Th55 **R.K. McAfee**, **R.E. Narducci**, **S.M. Beery** Report of new ear ossicle elements for Caribbean sloths (Mammalia, Pilosa, Megalocnidae) from the Late Pleistocene–Holocene of Hispaniola

Th56 **K. Sykes**, **R.K. McAfee**, **B. Crowley** Exploring the foraging ecology and extinction chronology of Pleistocene–Holocene megalocnid sloths from Hispaniola

Th57 **J.W. Kube**, **L.E. Babcock** Recognition of two new skeletal features on the giant ground sloth *Megalonyx jeffersonii* (Pleistocene)

Th58 **A.S. Miller**, **C. Widga** A young *Mammut americanum* from Hollidaysburg Fissure, Blair County, Pennsylvania

Th59 **Z.A. Sinclair**, **L. Park Boush**, **J. Bradshaw** Regional variation in molar wear and occlusal morphology in *Mammut americanum*

Th60 **N.W. Vesel**, **C. Widga** Duplicated mandibular tusks in a juvenile mastodon found in Blair County, Pennsylvania

Th61 **A. Peng**, **G. Liggett** *Mammuthus columbi* from Pratt, Kansas

Th62 **V.M. Jimenez Gonzalez**, **D.R. Prothero**, **J. Hoffman** Neoteny in pygmy mammoth molars from the Pleistocene of the Channel Islands, California

Th63 **Z.A. Simmons**, **E. Shirley**, **D. Fisher**, **M. Cherney**, **A. Rountrey** Insights into mammoth reproduction from steroid hormone records and growth-rate variation in Siberian and North American tusks

Th64 **V. Rendon**, **C.J. Bell**, **A.P. Damek**, **D. Byerly**, **J. Sagebiel** An extraordinary accumulation of carpal and tarsal elements of proboscideans from Quaternary deposits in the Gulf Coast Plain of Texas

Th65 **G.A. Assance**, **A. Sevim-Erol**, **G. Güler**, **Z. Ülger**, **M. Silcox**, **D.R. Begun** Partial endocast of *Anadoluvius* from the late Miocene (8.7 Ma) of Central Anatolia: sulcal patterning and Implications for hominine brain evolution

Th66 **L. Winter**, **A. Deutsch**, **A. Hartstone-Rose** Evaluating osteological correlates of masticatory muscle architecture: a myological approach to the reconstruction of the bite force and gape of extinct primates

Th67 **K. Hirata**, **M. Takai**, **M.O. Kubo** Dental microwear texture analysis revealed intraspecific dietary variation of Japanese macaques (*Macaca fuscata*)

Th68 **R. Kumar** Siwalik murine rodents constrain the age of the Miocene ape-bearing Ramnagar Locality, India

Th69 **B. Roy**, **J.J. Flynn**, **A.R. Wyss**, **D.A. Croft** An articulated mammal postcranium from the late Early Miocene of the Chucal Formation, northern Chile

Th70 **M. Dickens**, **D.B. Patterson**, **A. Mead** Functional diversity of late Pleistocene and Holocene mammal assemblages across North America: How well do archaeological localities sample the broader mammalian community?

Th71 **N.E. Loughlin**, **D.L. Fox** Packing and unpacking: An analysis of regional North American mammal diversity in response to climate change at the end of the Pleistocene

Th72 **M. Ball**, **S. Hopkins**, **M. Cham**, **C.A. Strömberg** The small mammal fauna of Beatys Butte (Harney County, Oregon, U.S.A.)

Th73 **S.E. Smotherman**, **M.A. Hurtado-Materon**, **M. Lawing** Calcaneal gear ratios as proxies of habitat openness in Miocene Texas mammal assemblages

Th74 **E. Berkson**, **A. McGrath**, **J.T. Faith** Paleo-food web metric analysis of late Quaternary ecosystems in South Africa

Th75 **L.E. Babcock**, **H.J. Martin**, **J.W. Kube**, **A. Sever**, **C. Munson**, **H. McDonald** Human hunting of the giant ground sloth *Megalonyx* during the Pleistocene

Th76 **A.N. Paradis**, **G.I. Jofre-Rodriguez**, **M. Rivera** Shell-shocker: a case for the de-extinction of *Doedicurus clavicaudatus*

Th77 **M.I. Pardi**, **C. Ryder**, **A. Garcia**, **A.M. Jukar** Fleshing out the late Pleistocene large carnivore fossil record in North America

Th78 **A. McGrath**, **A. Du**, **W. Barr**, **J. Pargeter**, **J.T. Faith** Modeling late Quaternary large mammal extinctions in South Africa using paleo-food webs

Th79 **L.P. Furman**, **J.I. Mead**, **A.M. Bush**, **M. Friedman** Late Pleistocene fishes from the Southern Black Hills, South Dakota, including a unique sinkhole taphonomic environment

Th80 **B.M. Kirshner**, **N. Viswanathan** Comparing relative vs. absolute predicted best fit evolution models for fossil sticklebacks traits

Th81 **R.L. McKeeby**, **M.D. Gottfried** Was the Miocene Calvert Formation of Maryland a megalodon nursery ground?

Th82 **K. Shimada**, **K.A. Reichmann**, **D.J. Long** First report of the fossil crocodile shark, *Pseudocarcharias rigida* (Lamniformes, Pseudocarchariidae), from the Lower Miocene of North America

Th83 **H. Lopez-Fernandez**, **J.V. Andrews**, **A.M. Babut**, **J.H. Arbour**, **M.L. Stiassny**, **M.R. Carvalho**, **M. Friedman** Investigations of the cichlid skeletal fossil record reveal novel insights into the morphology and temporal distributions of the clade

Th84 **A.M. Srinivasan**, **M.S. Riegler** The oldest known fossil searobin (Triglidae: Prionotinae) from the late Eocene of Florida, USA confirms 35-million-year persistence of searobins on the North American Atlantic coast

Th85 **C.L. Rogoff** Re-examining chondrichthian species variation in Maastrichtian-Thanetian Hornerstown and Vincentown Formations at the Edelman Fossil Park in Mantua, New Jersey

Th86 **J.D. Wilson**, **T.R. Lyson** Articulated freshwater actinopterygian from the Late Cretaceous Hell Creek Formation of South Dakota sheds light on the early evolution of Percopsiformes

Th87 **J.N. Crouch**, **L. Albornoz**, **I. Turner**, **R. Krailler**, **J. Magura**, **A.B. Heckert** Systematics of a marine chondrichthyan and osteichthyan assemblage from the Upper Cretaceous (Maastrichtian) Peedee Formation of Greenville, North Carolina, USA

Th88 **J.P. Crothers**, **D.W. Fowler**, **E. Freedman Fowler**, **L.N. Wilson**, **J.P. Wilson**, **A.B. Heckert**, **S.R. Clawson**, **D.J. Neff**, **A. Hendrix**, **D. Reeves Wolf** A diverse fish and amphibian-dominated microvertebrate fauna from a taxonomically-rich channel lag, Dinosaur Park Formation (Campanian, Upper Cretaceous) of Montana

Th89 **E. Garcia**, **K. Shimada** A possible new plethodid bony fish (Actinopterygii: Tselfatiiformes) from the Upper Cretaceous Eagle Ford Shale of Texas, USA

Th90 **J.J. Ramirez** Descriptive and Comparative Analysis of Elasmobranch Teeth from the southwestern late Cretaceous limestone of Puerto Rico

Th91 **C. Beritiech**, **A.A. Brink** Paleoenvironmental reconstruction and comparison of the Tombigbee Sand Member and the lower beds of the Eutaw Formation in northeastern Mississippi during the Late Cretaceous

Th92 **W.M. Itano** Recovery of the type series of the Carboniferous chondrichthyan *Psephodus magnus* (Agassiz)

Th93 **R. Shell**, **D. Cline**, **C.N. Ciampaglio**, **L. Fuelling**, **W. Steinbrunner** A marine vertebrate fauna of the Indian Cave Sandstone (Carboniferous, Gzhelian) of Nebraska

Th94 **D. Snyder**, **J. Atkins**, **A. Howell** Study of the type specimen and referred specimens of ?*Gyracanthus duplicatus* establishes its definition, biostratigraphy and paleoecology

Th95 **J. Boyle**, **D. Broussard**, **N. Hayes** A new large species of Dunkleosteidae from the nearshore deposits of the Lock Haven Formation of Pennsylvania

Th96 **A.I. Eliezer**, **F. Charest**, **T. Miyashita** A survey of bite traces and pathologies in placoderms from the Upper Devonian Escuminac Formation of Miguasha National Park (Quebec, Canada)

Th97 **N. Hayes**, **D. Broussard**, **J. Boyle**, **A.I. Eliezer**, **J. Trop**, **S. Hasiotis**, **P. Zippi**, **T. Daeschler** Large-bodied arthrodire placoderms preserved in coastal paleoenvironments of the upper Famennian northern Appalachian Basin: implications for salinity tolerance and paleohabitat affinities

Th98 **A.J. Wendruff**, **L.E. Babcock**, **C.N. Ciampaglio** Lithostratigraphic and biostratigraphic distribution of Devonian fishes from Ohio limestones in the J. S. Newberry collection

Th99 **WITHDRAWN**

Th100 **J.A. Sargent**, **E.M. Thomas**, **S. McDavid** Dragons from Hell: further pterosaur material from the Lancian faunal stage (Maastrichtian) of northern Laramidia

Th101 **M.G. Mateo**, **J.M. Hodnett**, **R. Mateo**, **H. Sues**, **M.T. Carrano**, **C. DiPiazza** The first pterosaur from the Early Cretaceous (Aptian) Potomac Formation in Prince George's County, Maryland, USA

Th102 **D. Hone**, **J. Mallon**, **S.J. Rufolo** An exceptionally complete and taxonomically ambiguous *Pteranodon* skeleton (Pterosauria: Pteranodontidae)

Friday Morning, November 13, 2026
Technical Session X: Dinosauria III
Meeting Room Grand Ballroom A
Moderators: Taia Wyenberg-Hensler and Dakota Camarena

8:00 **C.T. Griffin**, **O. Regaldo Fernandez**, **E. Dunne**, **J. Marsola**, **C. Apaldetti**, **S. Srivastava**, **K. Chapelle**, **A.D. Marsh** Inferring the dispersal patterns of early dinosaurs using occurrence-based models

8:15 **G.J. Kuban**, **P. Baker**, **J.E. Meeker**, **P. Scoggins**, **P. Riddle**, **T. Dill**, **N.J. Edmonds** Unusual dinosaur trackways and problematic trace fossils from the Paluxy Riverbed (lower Cretaceous), Glen Rose, Texas

8:30 **D. Camarena**, **V. Arbour** Intra-trackway variation in the theropod ichnogenus *Irenesauripus* at the Nîsôtêw Nimisêw Waciy Tracksite, Gething Formation (Lower Cretaceous), northeastern British Columbia, Canada

8:45 **J. Mitchell** Examining prey size preferences in theropods using preserved gut contents: How much does food processing bias what gets preserved?

9:00 **T. Wyenberg-Henzler** Cretaceous leftovers: behavioral implications of theropod tooth marks on hadrosaurid cranial elements from the Upper Cretaceous of western North America

9:15 **P.C. Sereno**, **D. Vidal**, **J. Mallon**, **E. Saitta**, **D. Temple**, **P. Larson** Ceratopsid “mummies” reveal unique integument structure and scalation

9:30 **K. Chin**, **A. Tosolini**, **E. Mahon**, **V.A. Korasidis**, **C. Pfister**, **B.H. Tiffney**, **M. Casanova**, **O. Lindenmayer**, **S. Gale**, **E.M. Fitzgerald** Unusual preservation of fossilized gut contents in an articulated *Triceratops* from the Upper Cretaceous of Montana

9:45 **D. Barrera Guevara**, **E. Freedman Fowler**, **D.W. Fowler** Chronostratigraphic revision of the Cerro del Pueblo Formation (Campanian, Upper Cretaceous), Coahuila, Mexico suggests dinosaur fauna is ~1.5–2 Ma older than previously thought, with biogeographic and evolutionary implications

10:00 Coffee Break

10:15 **M.T. Carrano**, **S. Bajpai**, **A. Dave**, **A. Behlke**, **M. Jukar**, **A.M. Jukar** New remains of sauropod dinosaurs from the Middle Jurassic of Kachchh, Gujarat, western India

10:30 **J.A. Whitlock**, **J. McHugh** The first documented case of malocclusion in sauropod teeth

10:45 **K. Stevens**, **B.B. Britt**, **C. Boisvert**, **R.R. Scheetz**, **A. Claxton**, **A. Bowden** The curious case of the crooked neck—reconstruction of an apatosaurine sauropod neck.

11:00 **B. Curtice**, **M. Wedel**, **C. Colleary** 'Happy' to see you: *Haplocanthosaurus delfsi* secrets revealed

11:15 **A. Romilio**, **P.C. Murphey**, **N.A. Matthews**, **B.A. Schumacher**, **L.D. Murphey**, **M. Toscanini**, **P. Boyce**, **Z. Fitzner** Revealing sauropod turning, gauge variability, and lateralized gait at the West Gold Hill Dinosaur Tracksite, Upper Jurassic Bluff Sandstone, Colorado, USA

11:30 **K. Yamaguchi**, **T. Kubo**, **M.O. Kubo** Reconsideration of sauropodomorph wide-gauge hypothesis based on a large trackway dataset

11:45 **J.A. Wilson Mantilla**, **M.S. Malkani**, **I.S. Zalmout**, **P.D. Gingerich** The dinosaur record from the Upper Cretaceous of Pakistan: New material, synthesis, and prospectus

12:00 **K. Curry Rogers**, **R. Rogers**, **B. Rakotozafy**, **S. Swenson**, **D.W. Krause** New specimens, updated associations, and refined perspectives on the anatomy of the titanosaur *Rapetosaurus*: insights from three stacked bonebeds in locality MAD 93-18 (Upper Cretaceous Maevarano Formation, Madagascar)

Friday Morning, November 13, 2026
Technical Session XI: Paleogene Period
Meeting Room Grand Ballroom B
Moderators: Jordan Crowell and Mattison Shreero

8:00 **J.W. Crowell**, **S.G. Chester**, **T.R. Lyson** The oldest known placental mammal auditory apparatus

8:15 **A.J. Vohs**, **L.N. Weaver**, **S.G. Chester**, **T.R. Lyson** A new periptychid archaic ungulate from the lower Paleocene Denver Formation of Colorado

8:30 **K. Beard**, **G. Métais**, **F. Ocakoğlu**, **A. Licht** First Paleocene mammals from Türkiye and the origins of Pleuraspidotheriidae (Mammalia, “Condylarthra”)

8:45 **S. Drumheller**, **C. Boyd**, **A. Glass** First evidence of “death roll” behavior in a neochoristodere

9:00 **B. Wooten**, **A. Schwartz**, **L.R. DeSantis** Persistence through the PETM: Paleoecology of *Coryphodon* revealed by dental microwear texture analysis (DMTA)

9:15 **N.H. Schottenstein**, **J. Hunter** Climate phase mediates dental evolution in the Paleocene-Eocene plesiadapiform *Phenacolemur*

9:30 **WITHDRAWN**

9:45 **A.P. Cossette**, **M. Wosik**, **J.J. Person**, **C. Boyd** New cranial material of *Ahdeskatanka russlanddeutsche* clarifies osteological anatomy and small-bodied alligatorid diversity in the early Eocene

10:00 Coffee Break

10:15 **M.F. Jones**, **J. Johnson**, **A.J. Schauf** Land of giants: diversity and paleoecology of Eocene North African bats

10:30 **G.W. Flora**, **E. Newham**, **M. D'Emic** Evolution of body size and life history in uintatheres (Dinocerata)

10:45 **J.R. Frewin**, **B.B. Britt**, **A.R. Whiting**, **C.R. Hines**, **B. Jordan**, **R.R. Scheetz**, **W.W. Little**, **F.J. Gahn** Abundant and diverse three-dimensional lizard skin impressions from a volcanic ash horizon in the Eocene Green River Formation of Lake Uintah, Utah, USA

11:00 **M.C. Wood** Hiatal control on the turnover of mammalian assemblages in the middle Eocene Washakie Formation, WY

11:15 **P.A. Holroyd**, **J. Hutchison**, **S. Tomiya**, **K. Townsend** Soft-shelled turtles (Trionychidae) from the middle Eocene Washakie and Uinta Formations of western U.S.A.

11:30 **J. Stone**, **E. Seiffert**, **M.R. Borths**, **H.M. Sallam**, **D.M. Boyer** New postcranial material of *Afradapis longicristatus* (Adapiformes, Caenopithecinae) from the late Eocene Locality BQ-2 (Fayum Depression, Egypt): implications for locomotor pattern

11:45 **M. Shreero**, **A. Tumarkin-Deratzian**, **P.V. Ullmann**, **D.E. Grandstaff**, **D. Terry** Stable isotope and rare earth element signatures of fossil bone as a resource protection tool and paleoclimate proxy

12:00 **E.I. De Santo**, **A. Wampler**, **A.D. Apgar**, **C. Colman**, **Y. Jacks**, **A.W. Poust**, **C. Redman**, **R. Souberlich**, **J. Moore** Landmark-based identification of tooth indentations on microvertebrates allows for interpretation of ecologic relationships during the Eocene-Oligocene transition and in a modern Paraguayan microsite

Friday Morning, November 13, 2026
Symposium: Signal, Noise, and Eco-Evolutionary Opportunity: Intraspecific Variation in the Vertebrate Record
Meeting Room 26 ABC
Moderators: Natasha Vitek and Samantha Hopkins

8:00 **N.S. Vitek**, **J. Deng** Simulated local fossil records reflect neither the whole species nor local evolution, but something in between

8:15 **P. Polly** Geographic dynamics, body size, and genetic variability as factors in intraspecific variation

8:30 **J. Napoli** Does any species obey the rule? Investigating clade- vs. species-level allometry in living and extinct theropods

8:45 **J.L. Pinto**, **C.F. Kammerer**, **C. Rabe**, **A.K. Huttenlocker** Intraspecific variation over 10 million years shows potential effects of mass extinction and recovery on sex and age demography in the Permian stem-mammal *Diictodon feliceps*

9:00 **E.A. Warshaw**, **A. Goswami**, **R. Felice** Reconstructing ontogenies from adult variation

9:15 **M. Son**, **P. Makovicky** Size-related morphological variation and its implications in *Psittacosaurus*, the most speciose non-avian dinosaur genus

9:30 **J.D. Kanipe**, **L.E. Zanno**, **J. Napoli**, **T.A. Gates** Identification of Dimorphism in the *Tenontosaurus tilletti* Hypodigm

9:45 **C.J. Bell**, **S. Skwarcan** Framing studies of population-level morphological variation: how and why is this work done?

10:00 Coffee Break

10:15 **S. Hopkins** How does hypsodonty affect patterns of intraspecific variation? A comparison of dental trait variability between *Allomys* and *Meniscomys* from the John Day Formation of Oregon

10:30 **D. Reuter**, **S. Hopkins**, **K. Lintulaakso**, **A. Hurlbert**, **J. Nations**, **R. Guralnick**, **M. Lawing** Defining the dietary niche: from intraspecific variation to fossil inference

10:45 **S. Skwarcan**, **C.J. Bell** Variation in the molar dentition of a population of *Neotoma micropus* from La Salle County, Texas, USA, and implications for interpretation of the fossil record of woodrats

11:00 **A. Schwartz**, **J.H. Diepenbrock** A little long in the tooth: using linear morphometrics to discriminate species and molar position within the mesonychid *Dissacus*

11:15 **K. Slenker**, **J. McGuire**, **M.T. Clementz** Intraspecific variation in large herbivore oxygen isotopes reveals water use strategies and refines aridity proxies for fossil sites in North America

11:30 **R.W. Burroughs** The role of intraspecific variation in Eco-Evo-Devo

11:45 **M.E. Lewis**, **M.R. Lague** Intraspecific variation and morphological overlap in carnivoran and primate proximal femora

12:00 **S. Robson**, **A. Souron**, **B. Mennecart** Intrapopulation variability in the bony labyrinth of two wild pig (Suidae) species

Friday Afternoon, November 13, 2026
Technical Session XII: Organismal Paleobiology
Meeting Room Grand Ballroom A
Moderators: Maria Vallejo-Pareja and Yohan Pochat-Cottilloux

1:45 **Y. Pochat-Cottilloux**, **M. Górka**, **S. López-Torres**, **M. Talanda** A hidden northern route? Ecological niche models test a dispersal corridor along the shore of the north-Paratethys in Miocene Europe

2:00 **S.C. Lechki**, **L.N. Wilson**, **C.T. Griffin** Ecosystem composition influences morphological drivers of dietary resource partitioning: A Triassic case study

2:15 **M.C. Vallejo-Pareja**, **M.L. Victor**, **J.I. Bloch**, **D.G. DeMar**, **G.P. Wilson Mantilla**, **D.C. Blackburn** Anuran body size inferences: applicability to Late Cretaceous frog assemblages

2:30 **S.O. Cancel Matos**, **N.P. Kelley** What limits minimum body size in marine tetrapods? Evidence from multifactor agent-based models.

2:45 **K.M. Gamel**, **S. Pinti**, **H.C. Astley** The kinetics and kinematics of underwater walking

3:00 **E.L. Alger-Meyer**, **C. Cranor**, **A. Wilken**, **P. Gignac**, **E. Herbst**, **C.M. Holliday** The accuracy of digital 3D jaw muscle models compared to diceCT data in extant animals: Implications for fossil muscle reconstructions

3:15 **J.N. Andell**, **M. Bonnan** Exploring the Correlation Between 2D Ulna Geometry and Forelimb Posture in Non-avian Dinosaurs, Non-mammal Synapsids, and Fossil Therian Mammals

3:30 **S. Barak**, **H. Woolley**, **C.A. Sidor** Quantifying the utility of large language models in the three-dimensional digital preparation of fossil specimens using computed tomographic scans

3:45 **M.L. Miller**, **J. Wiemann** Machine-learning reveals shared downstream biochemical damage resulting from convergent mammalian- and archosaurian endothermy: A universal, time-integrative proxy

4:00 **D. Surmik**, **B. Rothschild** Neoplasia through evolutionary time: evidence, bias, and mechanisms from the fossil record

Friday Afternoon, November 13, 2026
Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics
Meeting Room Grand Ballroom B
Moderators: Larkin McCormack and Loren Babcock

1:45 **V.R. Rhue** Institutional Knowledge Exchange: a networking model for fostering collections care around the globe

2:00 **L.E. Babcock**, **A.J. Wendruff** Type Devonian, Carboniferous, and Jurassic fishes from the J. S. Newberry collection in the Orton Geological Museum

2:15 **K. Derstler**, **N.A. Brand**, **T.E. Pasour** Original dinosaur skeletons anchoring the recently-opened Elizabeth Williams Robinson Hall of Dinosaurs, Schiele Museum of Natural History, Gastonia, North Carolina

2:30 **I. Browne** One size does not fit all: parametrically designed 3D-printed storage solutions for museum collections

2:45 **J.R. Groenke**, **P. O'Connor**, **B. Rakotozafy**, **D.W. Krause** Collection and Dissemination of Digital Morphology from the Mahajanga Basin Project (Late Cretaceous, Madagascar)

3:00 **C. Ryder**, **M. Sponheimer** Non-destructive collagen prescreening using near-infrared spectroscopy and ethical destructive sampling in the late Quaternary of North America

3:15 **V.L. Santucci**, **J.S. Tweet**, **A. Bonde**, **J.M. Hodnett** Design and implementation of paleontological resource monitoring strategies to promote stewardship, science, and protection for National Park Service fossils

3:30 **A. Vitkus**, **D. Spivak** The use of GIS in fossil resource management in Alberta, Canada

3:45 **L. McCormack**, **G. Williamson**, **S. Grossart**, **M. Ford**, **B. Nguyen**, **D. Lau**, **J. Lotts**, **G. Mercier**, **M. Ballou**, **J. Broce** Powering the grid, unearthing the past: Fossil fish discoveries from paleontological monitoring in eastern Oregon

4:00 **E. Scott**, **L. Parry-Joseph**, **E. Eichenberg**, **A. Bonde**, **K. Springer**, **J.S. Pigati**, **A.D. Rincón**, **A. Fowler**, **P. Gutierrez**, **K. Scott** Closing the loop on a >90-year-old abandoned mammoth quarry in Tule Springs Fossil Beds National Monument, Mojave Desert, southern Nevada

Friday Afternoon, November 13, 2026
Technical Session XIV: Return of Reptile'O'Rama: Triassic time
Meeting Room 26 ABC
Moderators: Carmen Urban and Brynden Perkins

1:45 **D. Jiang**, **R. Motani**, **M. Zhou**, **A. Tintori**, **C. Ji**, **N.C. Fraser**, **O. Rieppel**, **M. Yao**, **Y. Wang**, **Y. Zhang** Stepwise establishment of the modern-type marine ecosystem after the end-Permian mass extinction

2:00 **WITHDRAWN**

2:15 **WITHDRAWN**

2:30 **N. Counts**, **P. Nordenhaug**, **Z. Lewis**, **W.J. Hart**, **Y. Hu**, **E. O'Callaghan**, **P.J. Byrne**, **D. Lomax**, **C. Morrsion** Ecological Functional Unit Analysis of Triassic Marine Reptile Diversity Highlights Disparity between Tethyan and Panthalassan Faunas

2:45 **C. Urban**, **G. McGaughey**, **B. Peecook** Cranial anatomy of the Early Triassic sauropterygian *Corosaurus alcovensis* revealed using micro-computed tomography

3:00 **H. Woolley**, **S. Barak**, **M. Whitney**, **C.A. Sidor** Archosauromorph micro-bonebeds from the Lower Triassic Fremouw Formation of Antarctica reveal new insight into polar reptile ecology and life history

3:15 **S. Sen**, **S. Ray**, **S. Bandyopadhyay** First report of procolophonid remains from the Middle Triassic of India

3:30 **B.W. Perkins**, **B.J. Small**, **M. Stocker**, **S.J. Nesbitt** A new, well-preserved silesaurid taxon from the Boren Quarry (Late Triassic: early Norian) of Texas highlights high variability in early dinosauriforms

3:45 **E. Armour Smith**, **C.T. Griffin**, **C.A. Sidor** Ontogeny of *Sonselasuchus cedrus* (Poposauroidea: Shuvosauridae): dinosaurian-pseudosuchian anatomical convergence does not extend to growth patterns

4:00 **R.C. Price**, **C.M. Gordon**, **C.J. Salcido**, **C. Diggins**, **A. Hungerbühler** New specimens from the Upper Triassic (Rhaetian) Redonda Formation of New Mexico support large body size and macrocarnivorous habits in *Vancleavea*

Friday Afternoon, November 13, 2026
Regular Poster Session 3
Meeting Room Grand Ballroom C and Ballroom Level Foyer
Authors must be present from 4:30 – 6:30 p.m. on Friday, November 13

F27 **N.E. Peters**, **B. Fernando**, **P. Saulsbury** Bite marks discovered on a frontoparietal dome of a Pachycephalosaurid from the Late Cretaceous Hell Creek Formation of South Dakota, United States

F28 **D. D'Amore**, **T. Wyenberg-Henzler** Paleopathological and taphonomic traces on the bone surfaces of a nodosaurid anklyosaur specimen from the Dinosaur Park Formation of southern Alberta

F29 **C.J. McClellan**, **B.B. Britt**, **R.R. Scheetz** Surpassing scratching the surface: 3D imaging of bioerosive insect traces in dinosaur bones from the Lower Cretaceous (Barremian) Yellow Cat Member of the Cedar Mountain Formation, Utah, USA

F30 **J. Buchwitz**, **H.A. Carter**, **R. Gay**, **A.R. Milner**, **P. Wilson**, **A.D. Marsh**, **A. Charobee** A new multitaxic bonebed containing dinosaurs from the Lower Jurassic Glen Canyon Group, an expanding fossil record in Glen Canyon National Recreation Area, Utah, USA

F31 **K. Base**, **S. Hussain**, **T.A. Moore-Culpeper**, **R. Stevens-Starks**, **A.A. Farke**, **C. Yu** Non-avian dinosaurs from the 'Mesaverde' Formation (Campanian, Late Cretaceous) in the northwestern Bighorn Basin, Park County, Wyoming

F32 **J.E. Helberg** New vertebrate material from the Campanian Woodbury Formation of New Jersey sheds light on Appalachian land fauna and theropod diversity.

F33 **H.Q. Wu**, **R. Tucker**, **T. Chinzorig**, **A. Chiarenza**, **L.E. Zanno** Paleoenvironmental preferences of nesting dinosaurs in the Late Cretaceous Gobi Basin, Mongolia

F34 **T.R. Holtz** Ontogenetic niche shift in Sauropsida is associated with hatchling vs. adult size and lack of extended parental care, not sympatric species richness or interspecific niche partitioning

F35 **C. Kearns** Testing for habitat partitioning in dinosaurs from the Upper Jurassic Morrison Formation of western North America using the Paleobiology Database

F36 **L.V. Damke**, **L. Kerber**, **S.J. Nesbitt**, **R.T. Müller** Inside a predator's brain: exploring the neuroanatomy of herrerasaurid dinosaurs

F37 **C. Carter**, **R. Sombathy**, **K. Melstrom**, **T. Williamson**, **M. D'Emic** Osteohistology of the Cretaceous tyrannosauroids *Appalachiosaurus montgomeriensis* and *Bistahieversor sealyi*

F38 **J. Shatz**, **A. Manning**, **S. Brusatte**, **Q. Zhang** Endocranial reconstruction of *Yizhousaurus sunae* and implications for pituitary hypertrophy in Sauropodomorpha

F39 **B. Ibarra**, **J.A. Wilson Mantilla** Preliminary insights into the regional patterning of the presacral series of sauropod dinosaurs

F40 **J.H. Diepenbrock**, **M.T. Clementz** The cervical series of the western grebe (*Aechmophorus occidentalis*) as a potential source of comparative anatomy for sauropodomorph dinosaurs

F41 **J.D. Haye**, **V. Díez Díaz**, **K.K. Voegele** Myological reconstruction of the appendicular musculature of the European titanosaurian *Lirainosaurus astibiae>*

F42 **S.L. Schmal**, **K.K. Voegele** Quantifying effects of variations in articular cartilage shape and muscle activation patterns on the elbow joint kinematics of *Dreadnoughtus schrani*

F43 **J. Organ**, **D. Pol**, **K.L. Gomez**, **L. Ranivoharimanana**, **A.R. Wyss**, **J.J. Flynn**, **S.J. Nesbitt** The oldest sauropod (Early Jurassic) from Madagascar and other associated fauna

F44 **K. Hunt**, **S. Walker**, **C. Woodruff**, **J.P. Schein** The first specimen of *Barosaurus* (Sauropoda: Diplodocidae) from Montana: the northernmost occurrence of the genus

F45 **J.J. Korf**, **A.K. Hastings** Description of a partially complete limb of *Haplocanthosaurus* sp. from the Poison Creek Quarry (Wyoming, U.S.A.)

F46 **C.D. Bartlett**, **J.M. Hodnett** New sauropod material from the Lower Cretaceous (Aptian) Potomac Formation of Prince George's County, Maryland, U.S.A.

F47 **B.S. Salem**, **P. O'Connor**, **M. Lamanna**, **S. Saber**, **W.A. Thabet**, **S. El-Sayed**, **S.F. Al-Ashqar**, **H.M. Sallam** New titanosaurian remains from the Upper Cretaceous Quseir Formation of Egypt and implications for sauropod morphology and diversity in North Africa

F48 **S.M. Pierce** Description of titanosaur specimens from the base of the Javelina Formation

F49 **T. Bayarmagnai**, **B.B. Munkh-Ochir**, **B. Minjin** New reports of isolated sauropod teeth from the Cretaceous of Mongolia

F50 **O. Conrad**, **Z. Boles**, **M. Heierbacher**, **K. Lacovara** Investigating pathologies preserved in the shell of *Euclastes wielandi*, a turtle from the Paleogene Upper Hornerstown Formation in Mantua, New Jersey

F51 **C.G. Fielitz**, **G.C. Argyros** Systematics and paleoecology of a late Paleocene (Tiffanian) herpetofauna from the Bison Basin (Saddle Locality), Fremont County, Wyoming

F52 **S.M. Sherman**, **J.W. Crowell**, **J.D. Wilson**, **H. Petermann**, **C. Conley**, **S.G. Chester**, **T.R. Lyson** Comparison of Early Paleocene microvertebrate assemblages from Denver Basin, CO, USA, shows difference in relative abundance of Puercan Fauna between mountain proximal and distal environments

F53 **S.G. Chester**, **A.T. Smith**, **J.W. Crowell**, **E.J. Sargis**, **T.R. Lyson** A remarkably complete, large innominate (Mammalia, Eutheria, ?Cimolesta) from the early Paleocene of southwestern North Dakota

F54 **B.T. Hovatter**, **I.E. Mason**, **S. Barak**, **A.L. Waller**, **C.J. Sprain**, **T.S. Tobin**, **P. Renne**, **A. Tholt**, **H. Cheong**, **G.P. Wilson Mantilla** New mammal specimens and geochronological data from the School Well Locality (early Paleocene, ?Torrejonian) from the Ludlow Member of the Fort Union Formation, eastern Montana, U.S.A.

F55 **A.L. Waller**, **B.T. Hovatter**, **G.P. Wilson Mantilla** A diversity analysis of the mammalian insectivores from the mid-Paleocene (latest Torrejonian) of southeastern Montana

F56 **A.L. Wisniewski**, **D.L. Lofgren**, **Y.H. Kan**, **C. Li**, **R. Alrachid**, **J.J. Ferrari**, **C.J. Chung**, **L.N. Weaver** Two new multituberculate skulls from the Goler Formation (California, USA) support the existence of a distinct mammalian province on the west coast of North America during the late Paleocene

F57 **P.D. Rhinehart**, **K. Beard**, **R.L. Anemone** A new genus of omomyid (Mammalia: Primates) from the Smiley Draw local fauna in the Great Divide Basin, Sweetwater County, Wyoming

F58 **K. Tietjen**, **K. Rust**, **K. Beard** Neurovascular soft tissue preservation in the Eocene primate *Tetonius homunculus*

F59 **K. Lidman**, **M. Silcox** Assessing the phylogeny of Palaechthonidae: implications for early primate relationships and biogeography

F60 **L. Stroik**, **D. Ruiter**, **J.J. Frielink**, **P.C. Murphey**, **A. Friscia**, **J. Hutchison**, **P.A. Holroyd**, **P. Higgins**, **K. Townsend** Habitat heterogeneity in the Uinta Basin, Utah (middle Eocene)

F61 **A.E. Kort**, **M.R. Borths**, **J. Stone**, **A. Harrington**, **J.I. Bloch**, **D.M. Boyer** Rebuilding the memory of the West and Gunnell localities in the Bridger Formation of southwestern Wyoming

F62 **A.B. Shaffer**, **C. Brochu** Cryptic diversity among Eocene fossil crocodylians of western North America: insights revealed by a new crocodylian from the Ypresian of Wyoming (USA)

F63 **L. Duerr**, **R. Benson**, **J. Meng** Worn teeth = old age? Testing estimates of relative age vs. absolute age in a population sample of Eocene erinaceids

F64 **S. Roberts**, **C.K. Siemann**, **K. Beard**, **M.F. Jones** If these jaws could talk: Piecing together a new nyctithere (Mammalia: Nyctitheriidae) from North America, with implications for dispersal patterns in an enigmatic group of early Cenozoic mammals

F65 **O.J. Singleton**, **A. Lemierre**, **J.J. Person**, **C. Boyd**, **S. Drumheller** The youngest occurrence of the genus *Eopelobates* in North America

F66 **C.K. Siemann**, **N.B. Simmons**, **J.R. Baez**, **N.S. Upham**, **M.F. Jones** A total-evidence approach to elucidating evolutionary relationships within Vespertilionoidea, a diverse superfamily of bats (Mammalia: Chiroptera)

F67 **J. Johnson**, **M.F. Jones**, **N.B. Simmons** A bat in marsupial clothing? Taxonomic reinterpretation of *Ghamidtherium dimaiensis* (Late Eocene, Egypt)

F68 **J.R. Baez**, **N.S. Upham**, **M.F. Jones**, **A. Feijó** The bat fossil record

F69 **E. Mitchell**, **M. Ebner**, **F. Farris**, **S. Santana**, **D.M. Grossnickle** Seasons eatings: comparing the power and utilization of 2D and 3D molar shape analyses to predict diet in bats

F70 **W.J. Sanders**, **R. Bobe**, **J. d'Oliveira Coelho** Systematics and paleoecology of extraordinary new embrithopod fossils (Mammalia, Afrotheria) from Gorongosa, Mozambique

F71 **S.M. Moran** Divergent mammalian body size trends across the Eocene-Oligocene Transition in Sioux County, Nebraska

F72 **J.L. Scharpf**, **J.A. Case** Early diversification and coexistence of macropods in the latest Oligocene, Etadunna Formation, South Australia

F73 **A.M. Schaeffer**, **T. Pascucci**, **D. Ksepka**, **I. Mir**, **M. D'Emic** Quantifying intraspecific variation in osteohistology in a large sample of an extant avian

F74 **D.N. Hill**, **J. Martz**, **J.C. Weinbaum** Exploration of intraspecific variation in leptosuchomorph phytosaur squamosals (Archosauriformes: Phytosauria) using 2D landmark-based geometric morphometrics

F75 **S. Srivastava**, **H. Burch**, **C.T. Griffin** Occlusal perforation across Vertebrata as a case in defining homology

F76 **S. Newsom**, **N.P. Kelley** Ontogeny of plicidentine in varanid lizards and implications for ichthyosaurian dental development and evolution

F77 **J.M. Shiffert**, **A. Porto**, **J. Nations**, **K. Sears**, **J. Miyamae**, **C. Thompson**, **P. Calvin**, **L.N. Weaver** Ontogenetic changes in the femoral histology of *Monodelphis domestica*: implications for inferring the life histories of fossil mammals

F78 **L. Hall**, **A. Weil**, **E. Snively** Comparing Models of Stress and Strain Distribution in Rodent Skulls with Different Types of Simulated Dental Attachment

F79 **A.D. Victorino**, **C. Organ** Co-evolution of brood size and parental care

F80 **J.R. Sundgren** Using statistical analysis to discriminate stratigraphic and population variation in Late Triassic (Carnian-Norian) Metoposaurids (Stereospondyli), with possible implications for alpha taxonomic resolution and phenotypic response to climate change

F81 **C.M. Gordon**, **A. Porto** Using phylogenetic Receiver Operating Characteristic (ROC) analysis to evaluate cryptic phenotype predictions in extinct vertebrates

F82 **J. Adams**, **C.J. Salcido**, **A. Bonde**, **C. Garcia**, **J. Nolasco**, **J. DeBusk** Novel approach to assessing and mitigating impacts to paleontological resources within landslide talus via industry-National Park Service collaboration

F83 **C.J. Byrd**, **D. Contreras**, **S.N. Davis**, **J. Hook**, **T. Karim**, **E. Krimmel**, **H. Little**, **A. Millhouse**, **J. Utrup**, **L.J. Walker** The life cycle of collections-based paleo data

F84 **B. Pobiner**, **A.K. Behrensmeyer**, **J. Hutson**, **H. Little**, **S. Maikweki**, **L.J. Walker** The International Taphonomy Reference Collection (ITRC): a new Symbiota-based online data portal

F85 **J. Blois**, **J. Arroyo-Cabrales**, **M. Balk**, **N. Cullen**, **R. Graham**, **N. Hoffman**, **M.I. Pardi**, **S. Pilaar Birch**, **V. Syverson**, **C. Widga** Community-driven efforts to advance Quaternary vertebrate paleoecological data curation, standards, and governance in the Neotoma Paleoecology Database

F86 **B.K. Burke**, **M.L. Stricklin** Hidden in plain sight: When reexamination of museum specimens reveal new discoveries, and the unexpected benefits to institutions

F87 **I. Kubacka**, **A. Peng**, **K. Link** Minium in Review: The Successful Preservation of a Miocene Mammal Collection

F88 **T.E. White** Moving a fossil collection: the challenge of reduction

F89 **M. Pinsdorf**, **D. Boudreau**, **M.T. Miller**, **H. Little**, **A. Millhouse**, **J. Nakano**, **N.D. Pyenson**, **S. White** How to move Leviathan: Transferring the type specimen of *Llanocetus denticrenatus* from New Zealand to Washington, D.C., USA

F90 **V. Naples** New perspectives improve equity and inclusiveness of processes involved in publishing research articles: a guide for students and their advisors

F91 **O.A. Zander** Quantifying the impact of the auction market on vertebrate fossils

F92 **M. Collins** Critical reflection on the evolution of career definitions and their relevance to paleontology

F93 **B.A. McBride**, **V. Arbour** First ichthyosaur from the Late Triassic of Vancouver Island, British Columbia, Canada

F94 **T. Naik**, **M. Zondo**, **C.T. Griffin** A non-dinosaurian dinosauriform tibia from the *"Syntarsus"* bonebed, Forest Sandstone, Zimbabwe

F95 **N.D. Mirabile**, **J.J. Bartlinski**, **C. Carter**, **I. Pugh**, **S.J. Hageman**, **S.J. Nesbitt**, **M. Stocker**, **B.H. Lauer**, **R.L. Lauer**, **A.B. Heckert** Preliminary quantitative analysis of isolated archosauromorph teeth from the Upper Triassic (Revueltian) Homestead site, Garita Creek Formation, east-central New Mexico, USA

F96 **E. Patellos**, **H. Woolley**, **D. Bottjer**, **N.D. Smith** Implications for osteoderms as a major component of Late Triassic fossil assemblages

F97 **E. McCluskey**, **D.N. Hill**, **J.C. Weinbaum**, **J. Martz** A preliminary taphonomic evaluation of a Late Triassic fossil quarry utilizing *Typothorax* osteoderms.

F98 **J. Slota**, **J. Zinto**, **A.W. Poust**, **A.J. Moore**, **A.B. Heckert**, **J. Stiegler** Stratigraphy and paleontology of the Orphan Mesa area, Petrified Forest Member of the Chinle Formation in the Chama Basin, northern New Mexico

F99 **J. Allan**, **J. Slota**, **M. Murray**, **A.W. Poust**, **A.J. Moore**, **A.B. Heckert**, **J. Stiegler** New information on the vertebrate fauna of the Upper Triassic Snyder Quarry locality (Revueltian: Norian) from the Petrified Forest Member of the Chinle Formation in the Chama Basin, Northern New Mexico

F100 **I. Waleed**, **C.F. Kammerer** Bone surface modification in fossils from the Late Triassic Placerias-Downs Quarries

F101 **A. Ben-Salahuddin**, **N.D. Fedorchuk**, **J.C. Weinbaum** Ch-Ch-Ch-Chinle chow down: biogeochemical reconstruction of a predator-rich Late Triassic food web in northeastern Arizona

F102 **O.M. Evilsizer**, **M. Stocker**, **M.L. Stricklin**, **S.J. Nesbitt**, **A. Cornille** Fighting Phytos: preservation of crocodylian-like facial injuries and interpretation of antagonistic behavior in Phytosauria (Archosauriformes)

F103 **P. Cunningham**, **M. Stocker**, **A.C. Pritchard**, **S.J. Nesbitt** Small amniote remains expand the faunal assemblage of the Manda Beds (Middle Triassic, Tanzania) and shed light on the Middle Triassic distribution of allokotosaurs and other groups

F104 **D.S. Velin**, **S.J. Nesbitt**, **M. Stocker**, **C.A. Sidor**, **K. Angielczyk** A large-bodied archosaur from the Middle Triassic Manda Beds of Tanzania: expanding known axial diversity in early pseudosuchians

Saturday Morning, November 14, 2026
Technical Session XV: Dinosauria IV: A Mostly 'Bird-Hipped' Bonanza
Meeting Room Grand Ballroom A
Moderators: Yui Chi Fan and Francis Kirera

8:00 **B. Bulak**, **M. Soares**, **D. Campos**, **R. Bantim**, **J.M. Sayão**, **A.W. Kellner** A new small coelurosaur (Dinosauria: Theropoda) specimen from the Romualdo Formation (Early Cretaceous, Brazil) sheds new light onto the early evolution of Ornithomimosauria in South America

8:15 **D. Rourke**, **P. Currie** A comprehensive revision of North American ornithomimid taxonomy reveals new insights Into the evolutionary relationships of Ornithomimidae and Ornithomimosauria

8:30 **J.M. Hodnett**, **R. Hunt-Foster**, **H. Sues**, **T.R. Holtz**, **M.T. Carrano**, **C. DiPiazza**, **R. Mateo**, **M.G. Mateo** A new therizinosaur (Dinosauria, Theropoda, Therizinosauria) from the Early Cretaceous (late Aptian) of Prince George' County, Maryland, U.S.A.

8:45 **M. D'Emic**, **T. Pascucci**, **A. Turner**, **G. Storrs** Life history and metabolic rate of the theropod dinosaur *Deinonychus antirrhopus* inferred from osteohistology

9:00 **D. Smith**, **J. O'Connor**, **A.D. Clark** A functional model of the forelimb of *Archaeopteryx lithographica*

9:15 **Y. Fan**, **A.R. McCombie**, **M. Grosmougin**, **M. Habib**, **M. Pittman** Reconstruction of wing muscle attachment in early paravians and its implied effects on early flight strokes

9:30 **L.N. Wilson**, **J.P. Wilson**, **J. Gardner**, **S.C. Lechki**, **B. Pickles**, **P.R. Bell**, **D.W. Fowler**, **E. Freedman Fowler**, **C. Organ**, **C. Brown** Multicontinental distribution of an enigmatic avialan clade increases known richness and ecological breadth of Late Cretaceous birds

9:45 **C.M. Holliday**, **A. Wilken**, **E.L. Alger-Meyer**, **R.E. Diaz** The last linkage: Epipterygoids, orbital processes, and palatoquadrate evolution in Mesozoic birds and the origin of avian cranial kinesis

10:00 Coffee Break

10:15 **S. Sundararajan**, **B. Chattopadhyay**, **R. Felice** Co-evolutionary dynamics of body mass and wing length in birds

10:30 **M. Dickson** Diversification of modern birds driven by early Paleogene climate patterns

10:45 **D.G. Cerio**, **C. Early**, **L.M. Witmer** Visual fields and eyeballs of extinct moa *Dinornis robustus*: evolution of neurosensory morphology and diel regime on an island

11:00 **T.L. Green**, **A. Watanabe**, **D.I. Kay**, **J. Berman**, **M. Granatosky**, **P. Gignac** Ultraviolet and species-specific morphological signals in cassowary casques: Testing visual display hypotheses in archosaurs

11:15 **K. Widrig**, **A. Starry**, **H. James** Anatomical atlas and three-dimensional musculoskeletal model of the flight apparatus in the Southern Screamer (Anseriformes, *Chauna torquata*)

11:30 **K. Formoso**, **D.B. Thomas**, **D. Ksepka** Crescent rising: humeral head morphology and the evolution of underwater flight in penguins

11:45 **F. Kirera**, **A. Grossman**, **R. Moru**, **M. Kirinya** A giant marabou stork (*Leptoptilos* sp.) from the Early Plieistocene of Koobi Fora, Kenya: evidence from cranial remains

12:00 **I. McKinney**, **A.D. Clark**, **G. Musser**, **J. O'Connor** Oldest record of jacana-like birds (Charadriiformes) from the Green River Formation and its implications for shorebirds in the Early Eocene

Saturday Morning, November 14, 2026
Symposium: Major Advances in Late Paleozoic and Early Mesozoic Tetrapod Paleontology: In Memory of Hans-Dieter Sues
Meeting Room Grand Ballroom B
Moderators: Kelsey Jenkins and Arjan Mann

8:00 **A. Caron**, **L. Schnetz**, **J.M. Hodnett**, **W.M. Itano**, **H. Sues**, **M. Coates** New observations on a Late Pennsylvanian myricanthoid holocephalan from the Atrasado Formation of New Mexico and new record of a related taxon from the Middle Mississippian St. Louis Formation of Indiana

8:15 **C. So**, **B. Goding**, **J.D. Pardo**, **J.S. Anderson**, **A. Mann**, **H. Sues** Late Carboniferous amphibian diversity in the Hamilton Quarry faunal assemblage

8:30 **A. Mann**, **F. Duffy**, **C. So**, **J.D. Pardo**, **H. Sues** New fossils and revised systematics of lysorophians reveal high levels of diversity across two major radiations across the Permo-Carboniferous.

8:45 **J.D. Pardo**, **C.A. Marsicano**, **R.M. Smith**, **K. Angielczyk**, **J. Fröbisch**, **C.F. Kammerer**, **J.C. Cisneros** The 'lepospondyl' tetrapod fauna from the early Permian Pedra de Fogo Formation of Piauí, Brazil

9:00 **A.K. Huttenlocker**, **A.C. Henrici**, **J. Heuck**, **X. Jenkins, B.J. Small, S.S. Sumida**, **C. Townsend**, **Y. Tse** Hyperspecialized dentition in a new endemic pantylid from the Carboniferous-Permian of Utah sheds light on dietary and functional diversity among recumbirostran 'microsaurs'

9:15 **K. Jenkins**, **H. Sues** The early evolution of the reptile ear revealed from the Permian stem reptile *Araeoscelis*

9:30 **C.A. Sidor**, **C.F. Kammerer** A reassessment of the age of the Moradi Formation of northern Niger: the tetrapod biostratigraphic evidence reviewed.

9:45 **X. Jenkins**, **B. Peecook**, **J. Choiniere**, **V. Buffa**, **J. Benoit**, **C. Browning**, **C. Marchant**, **G. McGaughey**, **S. Evers**, **R. Benson** The stem reptile Eunotosaurus africanus (Sauropsida: Millerettidae) and the phylogenetic origin of turtles

10:00 Coffee Break

10:15 **K. Angielczyk**, **M. Romano**, **F. Manucci**, **F. De Sario**, **M. Van den Brandt**, **P.A. Viglietti**, **C. Abbott**, **C.F. Kammerer** How big were the biggest Permian megaherbivores? Volumetric body mass estimates for the largest Permian dicynodonts

10:30 **S.J. Nesbitt**, **M. Stocker**, **C.A. Sidor**, **K. Angielczyk**, **R.M. Smith**, **D. Hoffman**, **R. Butler** The diversification of archosauromorphs through the lens of the reptile assemblage of the Manda Beds (Middle Triassic) of Tanzania

10:45 **B. Kligman**, **P. Olsen**, **D. Foffa**, **H. Sues** Forty-five years of research on tetrapod skeletal remains from the Upper Triassic Richmond Basin of Virginia: A rare window onto a Carnian tetrapod community from equatorial Pangea

11:00 **M. Stocker**, **E. Lessner**, **P. Olsen** Reassessment of phytosaurs (Archosauriformes) from the Upper Triassic Newark Supergroup and anatomy and variation of *Rutiodon*

11:15 **A.C. Pritchard**, **J. Safley**, **G. Workman**, **S.J. Nesbitt**, **M. Stocker**, **S. Spiekman**, **M. Ezcurra**, **C. Van Buren**, **P. Olsen** 3D Reconstruction of the small North American tanystropheid *Tanytrachelos ahynis* (Reptilia: Archosauromorpha) revelas morphological innovations in Tanysauria

11:30 **J.C. Weinbaum**, **B. von Baczko**, **J.B. Desojo**, **R.C. Ridgely**, **L.M. Witmer** The paleoneurology of *Postosuchus kirkpatricki*, its convergence with theropod dinosaurs and implications for crocodylomorph origins

11:45 **A. Marsh** Lewis's Legacy: increased protosuchid diversity in the Kayenta Formation of the Navajo Nation

12:00 **J. Stiegler**, **T.F. Gabor**, **X. Xu**, **S. Bi**, **J.M. Clark** A new hsisosuchid crocodyliform from the Lower Jurassic Lufeng Formation (Yunnan, China) and the evolution of the crocodyliform pterygoid

Saturday Morning, November 14, 2026
Technical Session XVI: Crocodylians & Marine Reptiles + Paleontological Practices: Preparation & Scientific Methods
Meeting Room 26 ABC
Moderators: Anna Perella and Tzu-Ruei Yang

8:00 **T. Keillor, P.C. Sereno, R. Chandran** Industrial CT scanning the huge cranium of *Sarcosuchus imperator*

8:15 **H. Allen, E. Wilberg, A. Turner** Emptying the “Atoposaurid Wastebasket”: anatomical reevaluation and phylogenetic relationships of the putative *atoposaurid Montsecosuchus depereti*

8:30 **D.R. Leaphart, S. Boerman, D.J. Morgan, J. Vellekoop, T. Smith, E. Wilberg, C. Brochu** A new description and phylogenetic relationships of "Crocodylus" *clavirostris*, a large tube-snouted crocodyliform from the Paleocene of New Jersey

8:45 **D. Li, C. Chien, M. Iijima, T. Yang** A new Pleistocene gavialid from Taiwan and its implications for East Asian longirostrine crocodylian systematics

9:00 **M. Turala, B.W. Schubert, J.X. Samuels, R. Gunnin** Expanding the body size estimation toolkit for *Alligator* and related taxa

9:15 **D. Driscoll, M. Benton** The fall, sudden rise and decline of Late Cretaceous marine reptiles: a two-phase model of biodiversity driven by the OAE2 and K/Pg marine extinction events.

9:30 **M. Marx, M.J. Polcyn, R.G. De La Garza, R. Tykoski, M. Slovacek, J. Lindgren** Remarkable taxonomic diversity of Upper Cretaceous polycotylid plesiosaurs in north Texas

9:45 **A.I. Perella, D. Brink-Roby, C. Organ, E. Lamm, P. O'Connor, F.R. O'Keefe** Evidence for seasonal impact on fetal growth and extensive gestation period in elasmosaurs from the Lopez de Bertodano Formation (Maastrichtian) on Seymour Island, Antarctica.

10:00 Coffee Break

10:15 **K. Bader, J.A. Moretti, E. Tandy, M.A. Brown** Consolidation and preparation of a mass death assemblage of bats using Polyethylene Glycol (Carbowax) and Cyclododecane for use in µCT-scanning

10:30 **M. Kirinya, W.J. Sanders, L. Leakey** Archival clamshell support systems for large and fragile Pleistocene fossils at Turkana Basin Institute, Illeret, Kenya.

10:45 **M. Westfall, L. Jones, N.A. Alton** Good acids: establishing a preparation methodology for the removal of calcium carbonate from unstable bone

11:00 **M. Jones** Investigation on how American institutions train volunteers in fossil preparation

11:15 **J. Sagebiel** The art of field notes: the need for analog records in a digital world

11:30 **A.S. Schulp, D. Bastiaans, M.J. Polcyn, H. Jacobs, A. Marques** Mosasaurus 3D: a museum encounter with *Prognathodon*

Saturday Afternoon, November 14, 2026
Technical Session XVII: Mesozoic Mammals
Meeting Room Grand Ballroom A
Moderators: Rory Sweedler and Henry Fulghum

1:45 **Z. Kulik**, **E. Newham**, **J. Botha**, **W. Harris**, **L. Mukwevho**, **F. Mao**, **J. Meng**, **K.N. Dollman**, **V. Fernandez**, **J. Choiniere** Miniaturization does not explain the origin of rapid growth in mammals

2:00 **A.J. Rowe**, **E. Newham**, **A.G. Martinelli**, **C.L. Schultz**, **M. Soares**, **N. Morales Garcia**, **J.R. Rawson**, **K.N. Dollman**, **P. Gill**, **E.J. Rayfield** Protracted dental replacement and life history across the mammaliaform transition

2:15 **S. Hoffmann**, **M. D'Emic**, **E. Newham**, **Z. Kulik**, **L.N. Weaver**, **E. Panciroli**, **T. Pham**, **D. White**, **P. Gill** Osteohistology of the early mammaliaform *Morganucodon* inferred from synchrotron tomography and thin sections

2:30 **K.I. Watmore**, **N.D. Smith**, **D. Bottjer** New body mass estimates in mammals of the Morrison Formation (Late Jurassic, North America) using extant analogues and phylogenetic comparative methods

2:45 **B. Connelly**, **G.W. Rougier**, **B. Davis** Basicranial anatomy of the highly autapomorphic mammal *Fruitafossor* from the Late Jurassic of North America

3:00 **C. Dumas**, **J. Nations**, **L.N. Weaver**, **D.M. Grossnickle** Going out on a limb: reconstructing the ancestral locomotor state of Theria

3:15 **H.Z. Fulghum**, **K.T. Stilson**, **P. Li**, **J.A. Schultz**, **D.M. Grossnickle**, **C.C. Snipes**, **S.H. Sides**, **C.F. Ross**, **Z. Luo** Masticatory reconstructions using dental microwear overestimate occlusion in a living tribosphenic mammal: uniting evidence from XROMM and Occlusal Fingerprint Analysis

3:30 **D.M. Grossnickle** Reexamining the evolution of the mandibular angular and pseudangular processes in mammals

3:45 **A.A. Brink**, **R.K. Denton** New Late Cretaceous (Santonian-Campanian) mammals from Appalachia

4:00 **R.E. Sweedler**, **L.N. Weaver** Mammals from the Hewett's Foresight local fauna (Lance Formation, Bighorn Basin, Wyoming) reveal a unique mountain-proximal ecosystem prior to the Cretaceous–Paleogene mass extinction

Saturday Afternoon, November 14, 2026
Technical Session XVIII: Paleontological Practices: Education & Outreach
Meeting Room Grand Ballroom B
Moderators: Silvia Pineda Munoz and Brooke Haiar

1:45 **A. Zietlow, E.C. Shelburne** Prehistoric Wisconsin: a New Paleontology Exhibit and its Impact on Museum Reach

2:00 **S. Pineda Munoz** The question behind the paper: what drives public engagement with paleontological research?

2:15 **S. Bornheim, D. Levering** Building a diverse talent pipeline to sustain large-scale paleontological programs for high school students

2:30 **J. Holm, E. Stallnick, J. Lingen, B. Rohde, T. McMan, N. Dzenowski, A.K. Hastings, G. DeVault, C. Early** Mesozoic Mysteries: using paleontology to practice asking questions, supporting evidence, and drawing conclusions with grades 3-5

2:45 **M.T. Miller** Criteria for improving the educational content of extinct organisms in children's print media at the Department of Paleobiology, National Museum of Natural History (NMNH), Smithsonian Institution

3:00 **B. Haiar, L. Treado, A.C. Pritchard** Intentional recruitment of underrepresented students, incorporation of research, and emphasis on transferable job skills increases participation in scientific fieldwork and geoscience course enrollment

3:15 **J.A. Canamar** Integrating Latino American culture and heritage science through educational gameplay with Paleoteria: A paleontological take on the classic game of 'La Lotería'

3:30 **A.D. Apgar, C. Chavez Reed, S. McAnulty, C. Myers, J. Moore** Clawing for conservation: combining digital and physical exhibitions for community outreach

Saturday Afternoon, November 14, 2026
Technical Session XIX: Carnivora
Meeting Room 26 ABC
Moderators: Misty Haji-Sheikh and John Gallucci

1:45 **J. Gallucci** Ecomorphology of Oligocene and early Miocene North American carnivores based on geometric morphometrics of the elbow and ankle joint

2:00 **A. Berger**, **A. Deutsch**, **L.L. Martens**, **A. Hartstone-Rose** Myologically-informed reconstruction of the masticatory muscle capabilities of South African fossil canids

2:15 **P. Nikolskaia**, **F. Rivals**, **R. Rabinovich**, **M. Sotnikova** The evolutionary traits of *Adcrocuta eximia* (Hyaenidae, Carnivora) from the upper Miocene localities of Central Asia and Eastern Europe

2:30 **WITHDRAWN**

2:45 **K.A. Prassack**, **B. Pobiner**, **J. Parkinson**, **M. Roblíčková**, **M. Lázničková**, **M. Germonpré** Who ate Rudolph? Reindeer taphonomy and dog domestication at the late Pleistocene site of Předmostí, Czech Republic

3:00 **M.S. Haji-Sheikh** Ontogenetic study of *Smilodon fatalis* and *Crocuta crocuta spelaea* using Micro Computed Tomography (μCT) data from the basioccipital-basiophenoid sutures, cementum annuli, and dental pulp cavity closure to compare to known age studies of *Vulpes vulpes*, *Phocoena phocoena*, and *Panthera leo*

3:15 **F.R. O'Keefe**, **D.S. Potts** The human footprint: *Smilodon* hypercarnivory and carnivore guild dynamics at Rancho La Brea

3:30 **R. Hunt-Foster**, **J. Foster** A Late Pleistocene red fox (*Vulpes vulpes*) from a cave in the Uinta Mountains of northeastern Utah

3:45 **Y. Kimura**, **Q. Jiangzuo** Small giant panda unexpectedly found from the Miocene of Japan

4:00 **B.W. Schubert**, **A.A. Ovando** An enigmatic tremarctine bear skeleton from Cebada Cave, Chiquibul cave system, Belize

Saturday Afternoon, November 14, 2026
Regular Poster Session 4
Meeting Room Grand Ballroom C and Ballroom Level Foyer
Authors must be present from 4:30 – 6:30 p.m. on Saturday, November 14

S27 **J.P. Blackburn**, **H.N. Woodward**, **L.E. Zanno**, **N. Ikegami**, **J. Scannella** An articulated small-bodied ornithomimosaur (Theropoda, Coelurosauria) from the uppermost Cretaceous Hell Creek Formation, Montana

S28 **V. Lowe**, **G. McNett** An evaluation of flight origin using phylogenetic mapping in Oviraptorosaurian families

S29 **H.R. Caldwell**, **L.E. Zanno** Troodontid (Dinosauria: Theropoda) Remains from the Upper Cretaceous Kaiparowits Formation of Utah

S30 **S.E. Jasinski**, **R.M. Sullivan** A unique troodontid (Theropoda: Troodontidae) from the Upper Cretaceous of the San Juan Basin, New Mexico, and its implications for troodontid systematics and Late Cretaceous theropod communities

S31 **K.A. Reichmann**, **K. Shimada**, **R. Tykoski** First non-dental dromaeosaurid dinosaur specimen from the Lower Cretaceous Antlers Formation of Texas, with recognition of tooth scoring and possible implications

S32 **C. Lou**, **B.A. Alyssa**, **A.A. Farke** Hesperornithiform bird femora from the Campanian-aged 'Mesaverde' Formation of Wyoming reveal morphological diversity in a coastal assemblage

S33 **J.T. Deckhut**, **J.A. Case** Is this truly *Vegavis* or someone else? Investigation into the identity and lifestyle of a large, mid-Maastrichtian specimen from the Antarctica Peninsula

S34 **C. Boyd**, **M. Householder**, **D. Ksepka**, **J.J. Person** A partial skeleton of a large bird from the Sentinel Butte Formation (Tiffanian: Paleocene) of North Dakota

S35 **C.R. Liedstrand**, **S. Walsh** NMS G.2014.54.2 - An insight into avian neurosensory evolution from an early Eocene bird

S36 **J. Gardner**, **K. May**, **P. Druckenmiller** The first occurrence of *Rivavipes* from the Chickaloon Formation: evidence for a large ground bird in Eocene Alaska

S37 **J. Moore**, **D. Ksepka** Modeling flight style using soft tissue preservation in Eocene Aves

S38 **C.S. Baird**, **S.H. Burch**, **M.R. Borths**, **B.S. Salem**, **S. Saber**, **H.M. Sallam** Morphological analysis of avian fossils from the Eocene Jebel Qatrani Formation, Fayum, Egypt

S39 **D.R. Schmidt**, **K.G. Manwell** A proposed fossil avian egg from the White River Group: a comparative analysis

S40 **W. Montague**, **C. Torres**, **M. van Tuinen** A reassessment of early flamingo filter feeding ecology based on new cranial material

S41 **J.A. Canamar**, **J.R. Clarke** A reassessment of fossils of proposed galliform affinities from the lower Oligocene Armissan Quarry, France

S42 **G.R. Bartunek**, **J.R. Clarke** A nearly-complete bird skeleton from the Oligocene of western Montana

S43 **F. McDiarmid**, **S.N. Davis**, **C. Torres** First avian remains from the middle Miocene Madison Valley Formation of Bozeman, Montana

S44 **J.L. Plummer**, **J.R. Bourque**, **J.I. Bloch** Fossil storks (Aves, Ciconiidae) from the Late Miocene of Florida

S45 **G.C. Argyros**, **C.G. Fielitz**, **A.L. Woodruff**, **B. Rothschild** Orbital vascular plexuses: implications for ocular thermoregulation in Neornithine raptors (Aves: Neornithes)

S46 **J. Ayala**, **W. Mason**, **E.R. Schroeter** Development of a novel protein extraction protocol on diagenetically altered bone evaluated through immunological assays and tandem mass spectrometry.

S47 **M.D. Gottfried**, **A. Jerve**, **P. Rasmussen**, **D.B. Thomas**, **D. Ksepka**, **D.A. Robinson**, **E. Roberts** First prehistoric record of penguins from the Falkland Islands

S48 **C.J. Van Beek**, **K.A. Bitikofer** A novel approach to making archival cradles using 3D modeling and digital printing software

S49 **E. Tandy**, **K. Bader** Thems the breaks: Risks of handling an overprepared *Gopherus hexagonatus* specimen and an economical stabilization solution to preserve data for future research

S50 **N. Charny**, **J. Martinez**, **W. Mones**, **A. Wang**, **T. Sato** Jacked-up jackets: preparation strategies for field jackets with structural and material failures

S51 **N.A. Alton** Material influences: a methodology for understanding the effects of field jacketing materials on bone preservation

S52 **H. Koh**, **T. Sato** Through thick and thin: mold design and casting strategies for fragile ceratopsian skulls

S53 **S.R. Clawson**, **D.J. Neff** Two new methods of multi-material fused deposition modeling offer more precise, less wasteful, and faster means of creating research-quality reproductions of vertebrate fossils

S54 **T. Sato** Brush-based matrix removal of vertebrate fossils from the Upper Cretaceous Djadokhta Formation, Mongolia

S55 **L. Kells**, **T. Sato** Don't brush your teeth! A swab-based matrix removal technique for mammalian teeth from the Eocene Washakie and Bridger Formations

S56 **R.G. De La Garza** Full-spectrum photography as a cost-effective, spectrally informed imaging tool for revealing hidden taphonomic and morphological features in fossils

S57 **E. Hackenmiller**, **C.T. Ward**, **D.L. Fox** Assessing diagenesis using portable x-ray fluorescence and Fourier transform infrared spectroscopy in modern and fossil bioapatite preservation

S58 **L.A. Santoro**, **A.B. Heckert**, **D.J. Ward** Maximizing fossil yield by minimizing concentrate: a chemical process to remove diagenetic selenite from screenwash concentrate from the Upper Triassic Downs Quarry (Adamanian) of Arizona

S59 **L.N. Wilson**, **J.P. Wilson**, **D. Ksepka**, **C. Brown**, **G. Erickson**, **D. Brinkman**, **J.J. Eberle**, **P. Druckenmiller** Non-destructive mounting techniques for imaging of microfossils

S60 **B.W. Schubert**, **R. Gunnin**, **S.W. Maden**, **A.A. Ovando** Using ultraviolet light as a tool in finding and processing cave fossils

S61 **F.C. Hardy**, **J. Livingston**, **D. Reynoso**, **B. Catlin**, **L. Wilkinson** Drone multispectral imaging for non-invasive fossil prospecting in the Las Vegas Formation, Ice Age Fossils State Park, Nevada

S62 **K.K. Voegele** Using low-angle light to enhance the recognition of osteological correlates for muscle attachment on fossil bone

S63 **S.E. Cobb**, **S. Palmer**, **J.C. Welter** DinoLino: a user-friendly software for 2D morphometrics

S64 **A. Neander** A CT segmentation workflow: Utilizing Boolean tools for challenging fossil datasets

S65 **B. Rothschild** The mechanics of plain field and computed tomographic radiography, semantics and misconceptions in their application to analyses in the paleontological record

S66 **K. TR**, **D. Kitaygorodskiy**, **Z. Kulik**, **Z.T. Calamari** Comparative antler histology of fossil and modern deer using synchrotron X-ray tomography and hard tissue thin sections

S67 **D.I. Peterson** The strange and unusual taphonomy in the fossils found in the Upper Hornerstown Formation, New Jersey

S68 **L. Henderson-Thomas**, **A.M. Mychajliw**, **J. Southon**, **R. Feranec** A belated beaver: fossil preparation history obscures the timing of giant beaver (Castoridae: *Castoroides ohioensis*) extinction in northeastern North America

S69 **N.C. Acer**, **Z. Boles**, **K. Lacovara** Blood vessels on exhibit: A new method for long-term display of ancient soft-tissue structures in museums

S70 **M.R. Schwarte**, **S.G. Choiniere**, **I. Pugh**, **A.B. Heckert** Osborn the *Velociraptor* and Zophia the *Protoceratops*. Fighting Dinosaurs life reconstructions for educating the public

S71 **B. Hadley**, **J.L. King** Two Decades of (Paleo)Biological Science in Videogames: AAA Gaming as Educational Engagement?

S72 **J.M. Christensen**, **E.B. Simpson** Turing the *Champsosaurus*: interactive paleoart utilizing augmented reality

S73 **V. Johnson** Fossil identification as a diagnostic act: adapting clinical confidence-calibration assessment to a single-session smartphone 3D fossil workshop for high school students

S74 **C.M. Gordon**, **J.I. Bloch**, **A. Porto**, **N.S. Vitek**, **P.E. Morse** Uniting vertebrate paleontology, AI, and climate change: A productive avenue for multifaceted undergraduate training and mentorship

S75 **A. Gens**, **S.R. Killingsworth**, **B. MacFadden**, **P. Antonenko**, **J. Waisome**, **V. Perez**, **B. Abramowitz**, **M.C. Vallejo-Pareja** Shark AI: Exploring fossil shark tooth classification through artificial intelligence—Insights from experiential learning in middle school classrooms.

S76 **J. Broo**, **S.R. Killingsworth**, **C. Wusylko**, **B. MacFadden** Using machine learning models to assess variation in fossilized horse teeth for species classification in education

S77 **R.O. Clark** Transforming passive learners into motivated researchers: the impact of paleontology-based undergraduate laboratory investigation

S78 **H.B. Davis**, **K. Lubbers**, **A. Berenyi-Tonesi**, **S. Vandenberg**, **C. Scarborough** The Mammoth Site internship program: a review of 24 years of impact

S79 **S. Anderson**, **L.D. White**, **D. Leong** Making it onto land and into the classroom: bringing tetrapod terrestrialization to community college students through research methods and specimen based learning

S80 **WITHDRAWN**

S81 **A.N. Caudill**, **R.E. Narducci**, **H.C. Neeley**, **J.A. Peña**, **A.L. López-Torres**, **J.I. Bloch** Florida' Fossil Horses: A Legacy Beneath the Horse Capital of the World

S82 **S. Drumheller**, **Z. Xu**, **K. Jones**, **C. Boyd**, **J. McHugh** Understanding public fossil dig participants: Demographics, expectations, and experiences compared between two long-running programs in North Dakota and Colorado

S83 **E. Boll** Depictions of paleontology in two American comic strips, an important medium for paleontology

S84 **I. Hutchinson**, **J. Moore** At the boundary of art and science: Developing paleoart as an interdisciplinary course

S85 **A.B. Heckert**, **J. Hagadorn**, **M.T. Mohr** Detrital zircon U-Pb geochronology provides a maximum depositional age of 220.06 ± 0.10 Ma for the base of the Blue Mesa Member of the Chinle Formation (Upper Triassic: Adamanian) in the Blue Hills, Arizona, USA

S86 **P. Olsen**, **S.J. Nesbitt** Out of the Arctic: The high-latitude crucible of Triassic integumentary evolution, the ornithischian crisis, and dinosaurian dominance

S87 **A. Acker**, **A. Hartstone-Rose**, **C.F. Kammerer** The cranial myology of *Cyonosaurus* and its implications for jaw function

S88 **L. Hosfield** Craniofacial ontogeny of *Thrinaxodon liorhinus* and *Galesaurus planiceps* (Therapsida, Cynodonia)

S89 **R. Stoddard**, **I. Hutchinson**, **G.P. Wilson Mantilla**, **J. Moore**, **H. Avrahami**, **D. Varricchio** Fossil mammals from Old Bean Coulee of the Two Medicine Formation in Montana, USA

S90 **T. Okoshi**, **K. Chiba**, **R. Takasaki**, **M. Natori**, **T. Kato**, **A. Takahashi**, **B. Buyantegsh**, **B. Mainbayar**, **Z. Badamkhatan**, **M. Saneyoshi** New zalambdalestid material from the Upper Cretaceous Javkhlant Formation, Gobi Desert, Mongolia

S91 **L. Reyes**, **A. Rodriguez**, **M. Zondo**, **P. O'Connor**, **D. Munyikwa**, **L.N. Weaver** The first Mesozoic mammal from Zimbabwe

S92 **A.A. Redman**, **M.S. Malkani**, **J.A. Wilson Mantilla** Reassessment of the anatomy and phylogenetic relationships of *Pabwehshi pakistanensis* (Archosauria: Crocodylomorpha) from the Late Cretaceous Vitakri Formation of Balochistan, Pakistan

S93 **A.E. House**, **D. Green**, **K. Uno**, **T. Smiley** Evidence for crocodilians as paleoenvironmental proxies using tooth enamel stable isotopes from Miocene localities in the Turkana Basin, Kenya

S94 **W. Reyes**, **C.T. Griffin** A hatching line? An intraskeletal osteohistological assessment in a neonatal *Alligator mississippiensis*

S95 **M. Levitin-Shilman**, **E. Berg**, **J.J. Sertich**, **A.A. Farke** New crocodylomorph and testudine discoveries in the 'Mesaverde' Formation (Late Cretaceous, Campanian) of the Bighorn Basin, Wyoming, U.S.A.

S96 **B. Adrian**, **H.F. Smith** A revision of the chelonian fauna of the Coniacian-Santonian Crevasse Canyon Formation in west central New Mexico, USA

S97 **A. Gentry**, **J. Ebersole** Newly described pan-chelonioid turtle specimens from the Late Cretaceous of Alabama, USA and a reassessment of the *Toxochelys moorevillensis* holotype

S98 **R.O. Clark**, **F.R. O'Keefe** A diminutive polycotylid from the fluvial to estuarine Dinosaur Park Formation (Alberta, Canada)

S99 **R.C. Benjamin** Expanded phylogenetic dataset elucidates large scale relationships within Plesiosauria

S100 **M. Castellanos** Hunting types in North American Eocene–Oligocene carnivores and implications for the 'cat gap'

S101 **S.M. Lopezalles** What, if anything, is a pursuit predator? Using 3D humerus shape to track the evolution of cursoriality and predation strategies in fossil canids

S102 **K. Erwin**, **A.M. Jukar** Local carnivore guild dynamics through the Cenozoic in North America

S103 **A.M. Pamfilie** Accessory roots present but uncommon among *Mustela* and *Neogale* lower carnassial teeth from the Quaternary of North America

S104 **J. Austin**, **J. Meachen** Resolving fox lineages at Natural Trap Cave: Pleistocene fossils and modern relevance

S105 **M.W. Bushell**, **L. Siciliano-Martina** Shifts in body mass in modern and fossil jaguar, *Panthera onca*

S106 **D.J. Ehret**, **R.W. Boessenecker**, **R.C. Wood** A pathologic Late Pleistocene Atlantic walrus (*Odobenus rosmarus*) skull from coastal New Jersey, USA

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Leveraging model systems in the fossil record: a case study of *Lystrosaurus* (Anomodontia) from the Karoo Basin, South Africa

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Lystrosaurus is the most recognizable non-mammalian therapsid and was abundant during the End Permian Mass Extinction (EPME). The rich fossil record of this genus is crucial for contextualizing the EPME, due to its biogeographical, biostratigraphic, paleoecological, and ontogenetic significance. In particular, *Lystrosaurus* is an ideal system to study mechanisms of the Lilliput effect, a pattern of size decrease during mass extinctions. However, key paleontological context is lacking in this genus and impedes our ability to leverage its fossil record. *Lystrosaurus* paleobiology is complicated by taphonomy, which blurs taxonomic and ontogenetic patterns within and between species. Current species diagnoses are vague, resulting in inconsistent identification, and volatile phylogenetic relationships in Lystrosauridae. For any paleobiological model, a comprehensive understanding of biological variation and geological context are crucial to evaluate patterns in the fossil record. To remedy this, I conducted a specimen-based, bottom-up approach to *Lystrosaurus* paleobiology and taphonomy. Using 297 crania from the Karoo Basin, I used discrete character, morphometric, and phylogenetic analyses to: 1) address the influence of taphonomy on *Lystrosaurus*, 2) revise morphospecies and their ontogeny, and 3) revise relationships within Lystrosauridae. My results show that *Lystrosaurus* diagnoses often reflect taphonomy, such as "*Lystrosaurus murrayi*" and "*Lystrosaurus declivis*" which represent "tapho-taxa" of one species. I have also resolved ontogenetic challenges, such as the misidentification of *Lystrosaurus maccaigi* juveniles as adults of *Lystrosaurus curvatus*. The data supporting these revised morphospecies provide substantial rigor to relationships within Lystrosauridae. This includes the recovery of *Madumabisa* as sister to *Lystrosaurus*, which implies paedomorphic-like morphological change in the evolution of *Lystrosaurus*. My results present a new road map for *Lystrosaurus* research in the context of the EPME. These revisions allow us to evaluate the mechanisms driving phenomena like the Lilliput effect and contextualize biostratigraphic and paleoecological change in the Karoo Basin. My approach can be applied widely across vertebrate groups. While big-picture paleoenvironmental and macroevolutionary questions are crucial to understanding the history of life, we cannot evaluate them without rigorous, specimen-based context of their geological setting and biological variation.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Blood vessels on exhibit: A new method for long-term display of ancient soft-tissue structures in museums

Neill C. Acer[1], Zachary Boles[1], Kenneth Lacovara[2]
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[2]Edelman Fossil Park and Museum of Rowan University, Mantua, NJ

Endogenous soft-tissue structures (e.g., osteocytes, vessels, and collagen matrix) isolated from fossil material are commonly imaged, analyzed, and eventually discarded after study. At the Edelman Fossil Park & Museum in Mantua, New Jersey, we designed a small permanent exhibit discussing the preservation of organic material in fossils. We wanted to allow guests to view actual recovered soft-tissues using a Wentzscope Easy-View Microscope which houses a glass slide in specially designed base. This required the creation of a method to 1) preserve soft tissues on a glass slide for long periods of time (~months), and 2) store demineralized products for future use/display. We tested various techniques and mounting techniques for this project. Both

Ethylenediamine tetra-acetic acid (EDTA) and 0.5M HCl can be used to dissolve fossil bone in six-well plates. After satisfactory demineralization, replace the EDTA or HCl with deionized water. Several rinses may be necessary to ensure any residual salts are removed from the samples, especially if using EDTA. The water can then be replaced with ethyl alcohol of increasing concentrations. For display, a droplet of solution was placed on a slide and coverslipped with the edges sealed with either epoxy or Canada balsam. The blood vessel-like structures we had on display survived for ~9 months before degrading and becoming unrecognizable. Further refinement of this method is ongoing. The effect this method may have on the analysis of these ancient organic structures (e.g., histochemical stains or immunofluorescence) is unknown at present.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

The cranial myology of *Cyonosaurus* and its implications for jaw function

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Gorgonopsians were predatory synapsids from the middle–late Permian and were among the first tetrapods to evolve “saber” teeth. Their enlarged canines posed a biomechanical dilemma, requiring the jaw to achieve a substantial gape while still producing a powerful, precise bite. This involves tradeoffs, as elongated jaws favor wider gapes but reduce mechanical advantage and muscles adapted for longer stretch typically generate less force. Gorgonopsians have been hypothesized to solve this through a double-jointed, streptostylic quadrate and expanded pterygoideus musculature; with less restraint than the single-pivot mammalian skull, the highly mobile quadrate likely enabled an exceptionally wide gape, while the pterygoideus provided the initial force required to close the jaws from extreme gape angles. However, these hypotheses have not been tested in three-dimensional space, leaving the mechanisms controlling quadrate motion and associated muscular configuration unresolved. To this end, we constructed a 3D myological reconstruction of the cranium of a small gorgonopsian, *Cyonosaurus,* in Blender. The specimen (NHCC LB1087) was retrodeformed by removing plastic distortion and restoring missing structures. Muscle attachment sites were mapped onto the skull and muscle volumes were created using the MyoGenerator add-on. Muscle topology was informed by gross dissection of extant reptilian and carnivoran analogues as well as identification of osteological correlates of muscle attachment in fossil specimens. The model was then rigged using the MuSkeMo add-on to simulate quadrate motion during feeding.

Using this model, we present a myological configuration that supports aspects of previous interpretations of the gorgonopsian feeding apparatus while providing new insights into muscle function. The depressor mandibulae plausibly posteromedially rotates the quadrate during jaw abduction. In contrast, the adductor mandibulae posterior likely rotated the bone anterolaterally and acted antagonistically during jaw adduction, similar to extant squamates. Together, these muscles provided extrinsic control of quadrate motion, enabling both extreme gape and effective occlusion during feeding. Although not direct ancestors of mammals, gorgonopsians demonstrate that early synapsids experimented with specialized quadrate mobility and incipient forms of precise occlusion prior to the evolution of multicuspid teeth and the mammalian jaw adductor complex.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Chasing Ghosts: Earliest occurrences of aff. *Prognathodon* sp. (Mosasaurinae, Globidensini) and *Latoplatecarpus* (Plioplatecarpinae, Plioplatecarpini) from Late Cretaceous (Early–Middle Santonian) Austin Chalk deposits in San Antonio, Bexar County, Texas

Thomas L. Adams[1], Michael J. Polcyn[2]

[1]Witte Museum, San Antonio, TX, *[2]Southern Methodist University, Dallas, TX*

We report here two mosasaurs recovered from Upper Cretaceous, Santonian deposits in San Antonio, Bexar County, Texas. The first specimen (WM 2025.04.001) is conservatively referred to as a large-bodied mosasaurine, aff. *Prognathodon* sp. (Mosasaurinae, Globidensini) and consists of a distal left quadrate, nearly complete right and partial left dentaries, and 8 vertebrae representing cervical, thoracic, and post-thoracic positions. The dentaries are extremely robust with dorsal and ventral margins slightly concavo-convex and are mediolaterally twice as wide as the tooth bases and would have an estimated 14 or 15 tooth positions. Preserved teeth are strongly bicarinate with no serration and fluting on both the lingual and labial surfaces. The quadrate preserves a relatively thick alar rim, a prominent anteroventral process, and the broken base of a robust infrastapedial process which, taken together, are consistent with our referral. All elements were found in close association as part of a surface collection. The second mosasaur (WM 2025.17) consists of a nearly complete skull and right mandible and can be identified as *Latoplatecarpus* cf. *L. nichollsae* (Plioplatecarpinae, Plioplatecarpini) by possession of the following suite of characters: frontal exhibiting a well-developed median dorsal keel; lateral borders of frontal anterior to frontal alae straight, running parallel with each other; pair of ventro-lateral processes on frontal diverging anteriorly; frontal involvement in the anterior border of the parietal foramen; parietal foramen large, elongate oval with length greater than 1.6 times width; postorbital process of parietal extending laterally to posterolateral corner of frontal; suprastapedial process more than two-thirds total quadrate height; and marginal teeth tall, posteromedially hooked, and strongly striated. These two mosasaur specimens were recovered from a fine-grained and slightly carbonaceous, off white to gray chalk, 4.5 kilometers apart along the same northeast-southwest trending exposure. The stratigraphic relationships of Cretaceous surface exposures across Bexar County are complex due to a series of southwesterly trending normal faults. As a result, microfossil analysis was incorporated in determining the age and paleoenvironment for these mosasaurs. Foraminifera and nannofossil from both localities indicate an age no younger than Early–Middle Santonian and outer neritic. They are important as they represent the earliest occurrence.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Novel approach to assessing and mitigating impacts to paleontological resources within landslide talus via industry–National Park Service collaboration

Jason Adams[1], Charles J. Salcido[2], Aubrey Bonde[3], Cecilio Garcia[1], Jasmyn Nolasco[1], Jess DeBusk[1]
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Santa Monica Mountains National Recreation Area contains 18 paleontologically sensitive geologic units, dating back to the late Jurassic, and has produced abundant paleontological resources documented through National Park Service (NPS) paleontological resource inventories. Within the recreation area, Southern California Edison (SCE) operates and maintains electrical transmission lines and related facilities. Emergency repairs to components of the SCE transmission system necessitate the removal of a wide section of landslide talus covering an existing access road. The landslide occurred in the Miocene Vaqueros Formation and preliminary NPS review of the landslide talus indicated the presence of numerous paleontological resources with the high potential for additional resources to be affected during repair operations. In collaboration with NPS and SCE, SWCA Environmental Consultants (SWCA) was contracted by SCE to conduct a paleontological survey of the landslide area. SWCA worked with NPS to develop a grid-based survey to most effectively assess the slide talus for paleontological resources and inform necessary mitigation. Paleontological resources derived from the Vaqueros Formation were identified in almost 200 landslide clasts and in 28 out of 33 survey grids. Fossils documented include vertebrate fragments (likely marine mammals), wood, and highly abundant and concentrated invertebrates. Data

collection methods developed by SWCA enabled the rapid, structured assessment and documentation of fossils during the survey. The systematic survey approach also resulted in stratigraphic insights into fossil distribution that may have been unrecognized otherwise. Survey results were incorporated into project-specific management strategies, including targeted fossil collection and monitoring strategies for future repair activities at this paleontologically sensitive locality. This project provides an excellent example of industry and NPS collaboration to create unique solutions to meet NPS fossil resource management and public safety requirements.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A revision of the chelonian fauna of the Coniacian–Santonian Crevasse Canyon Formation in west central New Mexico, USA

Brent Adrian[1], Heather F. Smith[2]
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The Dalton Sandstone Member of the Crevasse Canyon Formation (Fm.) in west central New Mexico preserves one of the oldest known turtle assemblages from the southern Western Interior during the Coniacian–Santonian. The formation records a humid coastal fluvial to deltaic depositional system and has yielded fragmentary remains of predominantly trionychid turtles. Only chelonian and chondrichthyan fauna have been identified beyond the family level, though indeterminate hadrosaurid and crocodyliform material has been reported. Reexamination of turtle material previously assigned to indeterminate Trionychidae suggests the presence of another softshell clade, Plastomenidae, in the Crevasse Canyon Fm. Specimen NMMNH P-42687 was originally described as a complete second costal of an indeterminate trionychid but was re-identified as an incomplete costal lacking the rib head. It lacks definitive pitted trionychid sculpturing and exhibits dense, fine reticulations more consistent with plastomenid morphology. The preserved lateral portion closely resembles costal VII of *Gilmoremys*, including extension of rib ends beyond the bony carapacial disc. Compared with *Gilmoremys gettyspherensis* and *Gilmoremys lancensis*, it is relatively large and lacks the pronounced sinusoidal carapacial ridges of the genus. If correctly identified, P-42687 represents one of the earliest known plastomenid specimens and aligns with recent phylogenetic hypotheses placing plastomenid divergence prior to the Campanian. The occurrence supports previous reports of Campanian plastomenids in the Menefee Fm. and suggests the clade may have been established in southern Laramidia earlier than previously recognized. The basal baenid *Neurankylus notos*, described as the oldest representative of the genus, is also reconsidered here after being initially mistaken for *Adocus*. Although it substantially predates other *Neurankylus*, the diagnostic differences from the Campanian *Neurankylus baueri* are minor and fall within a range of variation comparable to other congeners (i.e., *Neurankylus hutchisoni* and *Neurankylus utahensis*). Following direct examination of the holotype, we regard *N. notos* as a likely morphotype of *N. baueri*, while acknowledging that its temporal and geographic separation may ultimately warrant distinction pending additional material. These results illuminate one of the earliest turtle faunas from Late Cretaceous deposits of the southern Western Interior, providing the foundation for later turtle assemblages from the San Juan Basin.

Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

The accuracy of digital 3D jaw muscle models compared to diceCT data in extant animals: Implications for fossil muscle reconstructions

Evan L. Alger-Meyer[1], Corrine Cranor[1], Alec Wilken[1], Paul Gignac[2], Eva Herbst[3], Casey M. Holliday[1]
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Digital mesh editing tools are often used to reconstruct the musculature of extinct animals for biomechanical modeling and visualization.

However, muscle reconstructions cannot be directly validated in fossil taxa, leaving the accuracy of these 3D digital muscle models ambiguous. However, muscle reconstruction methods can be replicated in modern animals and validated against measurements of their muscles. We compared digitally segmented diceCT data of jaw muscles from eight amniote taxa (*Alligator*, *Anas*, *Coccyzus*, *Gekko*, *Nerodia*, *Anolis*, *Varanus*, and *Didelphis*) to digitally reconstructed models of these same muscles created using the Blender add-on MyoGenerator. The error of the reconstructed models was calculated using the segmented data as an approximation of the true muscle volume.

We found that the accuracy of the reconstructed models varied considerably by taxon and by muscle group. For sculpted muscle models, the median error per muscle was -14%, with 54 of the 81 sampled muscles falling within ±50% of the segmented muscle volume. Large, posteriorly wrapping muscles like the pterygoideus ventralis (mPTv) of the adult *Alligator* and the depressor mandibulae (mDM) of *Anas* were heavily underestimated, whereas muscles with well-defined boundaries such as the *Didelphis* temporalis tended to be modeled more accurately. Adductor mandibulae posterior (mAMP) was consistently the most accurately modeled homologous muscle, with all sampled mAMP models producing errors within ±20% of the segmented volume.

These data provide insight into sources of error and potential inaccuracies in 3D muscle reconstructions of extinct animal. For example, less confined muscles like mPTv and mDM are likely to produce greater errors than muscles like mAMP, and taxonomic variation in accuracy suggests that multiple modern reference points should be used when assessing the accuracy of extinct animal muscles. By using a varied sample of extant comparisons, we share phylogenetically weighted error estimates for muscle reconstructions in key extinct taxa such as *Tyrannosaurus*, *Majungasaurus*, *Dromaeosaurus*, and *Revueltosaurus*. The boundaries defined by error estimation help to refine what inferences we can make about the anatomy of extinct organisms and, by extension, what we can say about their behaviors in life.

Funding Sources: NSF EAR 1631684, NSF IOS 1457319, and the University of Missouri Department of Pathology & Anatomical Sciences

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

New information on the vertebrate fauna of the Upper Triassic Snyder Quarry locality (Revueltian: Norian) from the Petrified Forest Member of the Chinle Formation in the Chama Basin, Northern New Mexico

Justin Allan[1], Juliet Slota[2], Matthew Murray[3], Ashley W. Poust[4], Andrew J. Moore[3], Andrew B. Heckert[5], Josef Stiegler[1]
[1]High Point University, High Point, NC, *[2]University of Kansas*, *[3]Stony Brook University, Stony Brook, NY*, *[4]University of Nebraska State Museum, Lincoln, NE*, *[5]Appalachian State University, Boone, NC*

The Chama Basin of Northern New Mexico preserves several Upper Triassic multi-taxon vertebrate bonebeds, including the Whitaker *Coelophysis* Quarry, Hayden Quarry (HQ), Canjilon Quarry, *Eucoelophysis* Quarry, and Snyder Quarry (SQ, L-3845). Our fieldwork sought to expand the SQ fauna both in terms of its taxonomic breadth and anatomical representation and to contextualize the fauna through detrital zircon dating. A sediment sample from the main bonebed (L-3845-1) was analyzed by LA-ICP-MS and indicates a Norian maximum depositional age similar to that reported for the HQ. We have been successful separating detrital zircons from new samples (n > 300/10 kg) from L-3845-1 and from an underlying pond deposit that produces holostean fish (L-3845-0). The SQ fauna closely resembles that of the nearby and stratigraphically similar HQ. Tanysauria and Silesauridae can be added to the fauna based on isolated elements. Non-neotheropod dinosaurs are known from a dentary, an associated postcranial skeleton, and other isolated elements. Shuvosauridae is represented by an associated femur and tibia, as well as an isolated humerus, metatarsals, and

isolated femora. The shuvosaurid femora lack the "lateral bulge" present in the recently described *Labrujasuchus* from HQ, but if they are referrable to the taxon they provide well-preserved anatomy of the distal femur and proximal tibia lacking in reported *Labrujasuchus* specimens from HQ.

Among the most abundant taxa in the SQ are coelophysoid theropods. It is hypothesized that these represent a single species, and recent collections have expanded its anatomical representation. A semi-articulated juvenile specimen is the most complete individual yet known, and remains from at least one additional vertebrate are associated with its gastralia and area of the cloaca; these may represent gut contents and/or a cololite. Seven articulated or associated juvenile skeletons of similar size (femur length ~155 mm) are known from approximately 10 meters of length along the paleocurrent direction of the most productive paleochannel, indicating similar population structure to *Coelophysis bauri*.

Though many of our early results were expected, further establishment of faunal similarities between Chama Basin mass death assemblages suggest relative stability of vertebrate faunal components throughout the Norian–Rhaetian succession of the basin despite frequent wildfires and increasing greenhouse conditions.

Funding Sources: Stony Brook University OVPR Seed Grant

Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Emptying the "Atoposaurid Wastebasket": anatomical reevaluation and phylogenetic relationships of the putative atoposaurid *Montsecosuchus depereti*

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Atoposauridae, a family of diminutive neosuchians from the Jurassic and Cretaceous of Laurasia, holds a long history within the primary literature. Although many taxa have been described and attributed to this family over nearly two centuries, the phylogenetic relationships and membership of Atoposauridae remain unclear. This is largely due to the lack of adequate anatomical descriptions of many atoposaurids within a modern phylogenetic context. Therefore, anatomical reevaluation of purported members of Atoposauridae is required to elucidate the membership of this poorly understood clade. One putative atoposaurid of interest is *Montsecosuchus depereti,* known from a tiny, nearly complete skeleton from the lithographic limestone quarries of the La Pedrera de Rubies Formation within the Sierra del Montsec of Spain. Although *Montsecosuchus* does share some general morphological features with atoposaurids, its affinities with this group are questionable, and it has rarely been included in modern phylogenetic analyses with adequate sampling of relevant neosuchian taxa and characters to test this relationship. To more confidently assess the phylogenetic position of *Montsecosuchus*, we reevaluate its morphology and incorporate it into a new phylogenetic analysis with a broader sampling of neosuchians and relevant anatomical characters. *Montsecosuchus* lacks many characteristic atoposaurid features, such as an orbitonasal sulcus or hypertrophied, caniniform maxillary teeth, demonstrating little morphological support for the attribution of this taxon to Atoposauridae. A preliminary phylogenetic analysis recovered *Montsecosuchus* instead within the neosuchian family Hylaeochampsidae, though the interrelationships of the clade were unresolved. The attribution of *Montsecosuchus* to Hylaeochampsidae is not unexpected, as it shares several features with members of this group, including a maxilla extending to the posterior margin of the postorbital bar, and pterygoid flanges that do not extend laterally beyond the medial quadrate condyles. The attribution of *Montsecosuchus* to Hylaeochampsidae sheds light on the poorly understood postcranial anatomy of this family, expands the currently sparse sample of Early Cretaceous hylaeochampsids, and improves our understanding of the taxonomic content and characteristic morphology of Atoposauridae.

Funding Sources: NSF DEB – 2452976

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Material influences: a methodology for understanding the effects of field jacketing materials on bone preservation

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The process of jacketing field-excavated materials has been used by paleontologists since the late 1800s. Jackets are not meant to be long-term storage; rather, they serve as a mechanism to transfer unstable material into a more stable environment, like a laboratory, for more precise and detailed excavation in a controlled space. Due to time and staffing constraints, however, field jackets often sit for decades before they are prepared, resulting in an ever-increasing backlog of unprepared jackets within long-term storage facilities.

The question arises as to whether past materials used to preserve bone affect the bone that is housed in the jackets. When first utilized in the field, concerns over the conservation quality of the materials used during the creation of jackets are not considered. Using the five oldest jackets currently housed at the Museum at Texas Tech University, a methodology for the examination of the environments of field jackets for long-term preservation of bone has been tested. These five jackets come from the 1940s and vary slightly in construction. To address the question, the methodology begins with testing the buffering material and sediment within the jacket for pH using a digital pH meter. Second, the use of a modified mirrorless camera (used for UV and infrared spectroscopy) is used to photograph the sediment and bone to look for evidence of the bone fluorescing under UV light. Next, the bone condition is recorded, looking for such things as weathering. Lastly, the correlation between the pH of the buffering material and sediment and its effects is postulated as it relates to bone preservation. The jackets that contained sediment have been found to have had basic sediment and had neutral to slightly acidic buffering material used in their creation. Jacket number 1-18-43, when photographed using the camera, has a centimeter of sediment that fluoresced where the sediment was closest to the buffering material. The sediment stops fluorescing the further away from the buffering material. The bone that was touching the buffering material also fluoresces, while the bone covered with sediment does not. The bone and sediment exhibiting fluorescence under UV light only near the acidic buffering material may indicate that a chemical change in the bone and sediment has occurred. This methodology has proved effective in elucidating the preservation quality of the environments in which the bone resides while in these old field jackets.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Axial reorganization across the land-to-sea transition in early whales

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The transition of cetaceans from land to sea profoundly reshaped the mammalian body plan, with reorganization of the vertebral column becoming central as the backbone assumed the primary role in aquatic propulsion. This transformation involved not only changes in vertebral number and regional differentiation, but also major proportional shifts in centrum dimensions along the column. Here, we compare centrum length, width, and height across cervical, thoracic, lumbar, sacral, and caudal vertebrae in major archaeocete groups using corrected log ratio differences. Our results show that archaeocete vertebral evolution was not a simple pattern of uniform axial enlargement, but a stepwise reorganization of the vertebral column. Comparisons between remingtonocetids and protocetids reveal a regionally localized pattern of enlargement, especially increased width and height in the posterior thoracic and sacral regions, suggesting enhanced posterior-trunk force transmission before the fully aquatic stage. Within Protocetidae, georgiacetines exceeded

protocetines most strongly in the lumbar, sacral, and caudal regions, consistent with greater functional emphasis on the lumbar region and tail and reduced reliance on hindlimb support. Compared with protocetids, basilosaurids show the greatest transformation in our results, with marked elongation of the posterior thoracic, lumbar, and sacral centra, but only modest caudal lengthening despite pronounced widening and deepening of the caudal series. Dorudontines express this pattern most clearly; relative to protocetids, caudal length differs little, but caudal width and height more than double. Fully aquatic archaeocetes, therefore, did not simply elongate the body or tail. Instead, the vertebral column was reorganized into differentiated axial modules: an elongate posterior trunk transmitting undulatory forces and a structurally expanded tail increasingly specialized for propulsion. These results show that the archaeocete backbone records a shift from limb-based and limb-assisted locomotion to an integrated trunk-and-tail system underlying the fully aquatic swimming.

Funding Sources: Mansoura University; Science and Technology and Development Fund (STDF), grant 38284

Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

Exploring the correlation between 2D ulna geometry and forelimb posture in non-avian dinosaurs, non-mammal Synapsids, and fossil Therian mammals

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The elbow joint plays a significant role in forelimb posture and range of motion in tetrapods. However, the elbow postures of fossil quadrupedal tetrapods, such as dinosaurs, have been difficult to reconstruct due to the challenges of missing soft tissue data. Moreover, the acquisition of three-dimensional data remains challenging for many fossils in terms of accessibility and expense. Given these difficulties, we explored whether a simple, two-dimensional analysis of bone shape could reliably predict elbow posture and relative range of motion in fossil tetrapods. We chose to explore the shape of the proximal end of the ulna using 2D geometric morphometrics because this element is frequently preserved in fossils, it forms a significant portion of the elbow joint with the humerus, and its olecranon process receives the forearm extensor M. triceps brachii. We tested the hypothesis that two-dimensional proximal ulna shape would correlate with five forelimb posture categories in extant mammals and non-avian reptiles: non-parasagittal, high-walk non-parasagittal, and parasagittal crouched, erect, and fully erect. We then explored proximal ulna shape in quadrupedal non-avian dinosaurs, non-mammal synapsids, and fossil mammals. Our data strongly suggest that the proximal ulna shape of therian mammals and extant non-avian reptiles is correlated with elbow posture and phylogenetic history. We found that proximal ulna shape is a strong predictor of elbow posture (e.g., non-parasagittal v. parasagittal crouched) and that narrower articular surfaces correspond to reduced relative range of motion at the elbow joint. Our fossil data show similar functional and phylogenetic signals. As with previous studies, predicted postures and relative range of movement for non-mammal synapsids vary (e.g., non-parasagittal, parasagittal crouched, erect), whereas fossil therian mammals consistently show erect postures. Predicted quadrupedal non-avian dinosaur forelimb posture varied greatly from non-parasagittal to parasagittal, with a greater relative range of motion (thyreophorans, hadrosauroids, and ceratopsians) to parasagittal with a reduced relative range of motion (sauropods). Whereas our approach to analyzing ulna shape cannot account for all variables, its simplicity improves the inclusion of more fossil data.

Funding Sources: Stockton University: REU Student Travel Fund grant REU:STF:110005

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Making it onto land and into the classroom: bringing tetrapod terrestrialization to community college students through research methods- and specimen-based learning

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The University of California Museum of Paleontology (UCMP) provides a program titled "Advancing Community College Education and Student Success" (ACCESS) that introduces paleontological concepts through specimen-based lab modules to community college students. In the last academic year (2024–2025), UCMP graduate students who are a part of ACCESS created three new modules based on paleobotany, invertebrate paleontology, and vertebrate paleontology. During SVP 2025, the vertebrate paleontology lesson was presented, which was based on Pleistocene canids from Rancho La Brea and the McKittrick tar seeps in southern California and was taught in collaboration with Merced Community College and Diablo Valley College. Data collected from administering the La Brea Pleistocene canid lab to two different community college audiences is being used to guide the development of this new tetrapod lab. With the overwhelming success of this vertebrate-focused ACCESS lab, a new module is being created to focus on and highlight the water-land transition of tetrapods. This lab will use novel approaches by utilizing easily accessible data resources and authentic scientific methods researchers use for anatomical and morphological analyses, emphasizing model- and specimen-based learning in community college classrooms. By implementing a range of paleobiological and evolutionary concepts, this module will focus on many methods, such as comparative anatomy, character matrices, creating phylogenies, and using associated anatomical and morphological data to understand the paleoecology of early tetrapods. Our main goals for ACCESS are to continue engagement in paleontology, biology, and geology through hands-on experiences that are not usually accessible and to inspire students to continue on this path. The impact of ACCESS modules has been directly observed, especially with the incorporation of specimen-based learning, through tracking student engagement and feedback from the community college instructors. With this new lab, we aim to continue assessing and observing these positive impacts at the community college level, testing and actively contributing to the scientific and education community through providing fun and exciting new experiences to students who might otherwise not have the opportunity to do so.

Funding Sources: Packard Foundation grant, #2023-75218

Technical Session VIII: Fishes (Thursday, November 12, 2026, 1:45 PM)

The paleontological record of cichlids (Acanthomorpha, Blenniiformes, Cichlidae) and the interrelationships of fossil and living species

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Extant cichlids show exceptional taxonomic richness and ecomorphological disparity that make them an important study system in understanding how adaptive radiations proceed at varying timescales, spatial scales, and ecological regimes. Despite this significance, there is little consensus on when the crown group, and its constituent subclades, originated. Furthermore, nearly all fossil cichlids lack an analytically inferred phylogenetic position. Instead, the overwhelming majority of current hypotheses rely upon phenetic similarities and verbal argumentation. This incomplete understanding of their evolutionary history persists despite a relatively rich fossil record of articulated skeletons, especially for a group inhabiting tropical freshwater settings. Many age estimates draw on a small number of fossil cichlids as calibration points, failing to incorporate the numerous additional fossil forms into analytical frameworks that directly incorporate fossil tips. Because past studies have failed to incorporate the breadth of fossil cichlids, they may not accurately reconstruct trait evolution and biogeographic patterns. In our ongoing work, we are reassessing the cichlid skeletal fossil record. Using micro-computed tomography and extant osteological preparations, we are generating a family-wide fossilized birth-death phylogeny of cichlids with over 260 species in 170 genera, including over 15 body fossil genera. We

summarize the cichlid body fossil record and review the crown group in totality, refining age constraints using available geological data. We find that a majority of fossil cichlid genera lack clear temporal constraints in the paleontological literature, despite there being detailed information on geological provenance. Preliminary phylogenetic analyses reveal novel placements of fossil cichlids, sometimes challenging past hypotheses in surprising ways.

Funding Sources: National Science Foundation (Awards DEB 2341834, 2341835, 2341836)

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

How big were the biggest Permian megaherbivores? Volumetric body mass estimates for the largest Permian dicynodonts

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The evolution of herbivory in tetrapods was a watershed event in the history of terrestrial ecosystems, and appears to have been a key step in unlocking the clade's potential to reach very large body sizes. By the time of the Cisuralian–Guadalupian boundary, volumetric mass estimates indicate that large caseid synapsids could achieve masses of more than 500 kg, and late Guadalupian dinocephalians and pareisaurs attained estimated masses of close to a ton. The end-Guadalupian extinction strongly affected megaherbivores; dinocephalians disappeared, and pareiasaur species with estimated masses more than a ton became rare. Dicynodont therapsids radiated during the Lopingian, becoming the most diverse and abundant tetrapod herbivores in many communities, but mass estimates for the largest Permian dicynodonts are lacking. Masses predicted from stylopod dimensions for large dicynodont specimens exceed a ton (e.g., ~1200 kg for the mounted skeleton FMNH UC 1532 and the large, isolated humerus NMT RB1411). Scaling these estimates up to the size of the largest known Permian dicynodont skulls (e.g., SAM-PK-1226; basal length 585 mm) results in predicted masses of 3.0 to 3.2 tons, comparable to the largest extant white rhinos. However, it is known that limb scaling equations based on modern tetrapods consistently overestimate the body mass of large Paleozoic tetrapods with abducted limb postures compared to volumetric methods, in some cases by as much as a factor of three. Here we use volumetric reconstructions based on mounted skeletons of "*Aulacephalodon*", *Kannemeyeria*, and *Stahleckeria* to predict the body masses of the largest Permian dicynodonts. Preliminary results indicate masses in the range of 1.2 to 1.5 tons are more plausible than higher estimates derived from limb dimensions. These values are comparable to those of large contemporary pareiasaurs such as *Scutosaurus*. Given that dicynodonts and other megaherbivores attain much larger sizes in the Triassic (e.g., preferred estimate of ~5.9 tons for *Lisowicia* as an extreme for Triassic dicynodonts), it is uncertain whether the apparent upper size of limit of about 1.5 tons for multiple groups of Permian megaherbivores is simply a coincidence or indicative of a fundamental constraint on Permian ecosystems that was only released following the Permo–Triassic mass extinction.

Funding Sources: NSF-2325380, GENUS (DSI-NRF Centre of Excellence in Palaeosciences, UID 86073), Millennium Trust

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

The first innominate of *Dorudon atrox* from the Eocene of Egypt

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Cetaceans transformed the mammalian pelvis and hindlimb into reduced, non-weight-bearing structures during their secondary adaptation to aquatic life, yet fossil pelvic elements are rarely preserved, limiting direct evidence for this transition. This gap is especially important in fully aquatic basilosaurids, which document the final stages of the transition from limb-supported locomotion to axial propulsion. Although *Dorudon atrox* is among the best-known Eocene whales, its pelvic anatomy has remained undocumented. Here, we describe a complete right innominate (MUVP 851) associated with a complete skeleton of *D. atrox* from the Birket Qarun Formation of the Wadi El-Hitan World Heritage Site, Fayum, Egypt. The innominate is 154.7 mm long and preserves an exceptionally reduced iliac process, a well-defined circular acetabulum, a tiny oval obturator foramen (9.6 × 5.5 mm), and an elongate pubic/symphyseal axis. The ilium extends only 7.4 mm anterior to the acetabulum, which measures 18.7 mm in diameter. The innominate resembles other basilosaurids in retaining a recognizable hip socket and obturator region but differs strongly from protocetids in lacking a weight-bearing pelvic architecture. Compared with *Chrysocetus*, the *D. atrox* innominate is longer, yet the acetabulum is nearly the same size, indicating a proportionally smaller hip joint and a more elongate pubic/symphyseal region. Compared with *Basilosaurus, Perucetus*, and *Pachycetus*, it is smaller, more gracile, and more reduced in the iliac, acetabular, and obturator regions. This innominate provides the first direct evidence of pelvic morphology in *Dorudon atrox*, documenting a key stage in hindlimb reorganization near the origin of fully aquatic whale locomotion.

Funding Sources: Mansoura University; Egyptian Environmental Affairs Agency (EEAA)

Technical Session XVIII: Paleontological Practices: Education & Outreach (Saturday, November 14, 2026, 1:45 PM)

Clawing for conservation: combining digital and physical exhibitions for community outreach

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The current biodiversity crisis, caused by a multitude of anthropogenic impacts, is a vital concern of the scientific community. Dissemination of knowledge to the public on how endangered species can be aided by both individual and community efforts is imperative in order to truly make an impact. However, successful communication of this information can be challenging, as individuals may feel discouraged about the effect their singular efforts can impart. Many organizations and previous studies, therefore, suggest adopting a communication style that enacts positive emotional experiences and empowers individuals to support transformative change.

The “Clawing for Conservation” exhibit is an arcade-style claw machine developed at the University of New Mexico in order to provide an engaging, positive emotional experience for players by allowing them to “win” both extinct and currently endangered species and learn about of ongoing conservation efforts to aid said species. To increase the range and accessibility of the game, we designed physical and digital claw machine experiences, with both including 54 unique fact sheets as prizes. Each fact sheet includes information about an extinct species (with particular focus on fossil taxa) paired with information for a currently endangered species that is either related to the extinct species (e.g., birds for dinosaurs) or morphologically similar to the extinct species (e.g., pterosaurs for bats). The living species’ fact sheets explain why the species is endangered (making connections to the extinct species’ fact sheets) and contain a QR code leading to a conservation effort fighting to save that species from extinction. Additionally, the physical

version of “Clawing for Conservation” includes a small plushie of either the extinct or endangered species ($1 used to re-purchase plushies), while the digital version is free. All exhibit/prize text is available in English and Spanish to best serve members of the Albuquerque community and additionally highlights several endangered species native to the American Southwest. Preliminary survey results indicate that the exhibit is successful in reaching learning objectives and eliciting positive feelings crosscutting age groups and demographics. By curating an uplifting, individualized experience, “Clawing for Conservation” distills the biodiversity crisis such that players feel encouraged to help save their endangered species and feel confident in their ability to do so.

Funding Sources: Skype A Scientist, Science IRL Grant University of New Mexico, Lovejoy Fund

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Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Bias in basins: preservational megabias in a simulated world

Alexandra D. Apgar[1], Jiahua Xing[2], Huijie Qiao[2], Fernando Machado Stredel[1], Erin Saupe[3], A. T. Peterson[4], Jorge Soberón[4], Jason Moore[1], Corinne Myers[1]
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Our interpretation of the terrestrial fossil record is clouded by several megabiases, including that only terrestrial organisms that exist within a net-depositional sedimentary basin may potentially preserve for geologically long periods of time (hereafter, the basin-only megabias, or BOM). It is therefore imperative that we gain an understanding of how greatly this bias can impact our ability to accurately represent species traits, phylogenetic relationships, and ecosystem structures. To address this, we adapted an existing virtual world model simulating global conditions (including fluctuating precipitation and temperature patterns) across the past 120,000 years that was originally developed to delineate macroevolutionary patterns of organisms over time. Virtual species within this model were seeded into 7,774 km^2 grid cells across the planet and were capable of extinction, speciation, and/or expansion of geographic range based on assigned values relating to dispersal ability and niche breadth. To understand the impact and extent of the BOM on phylogenetic relationships and species diversity within terrestrial settings, we added the real-world position of all sedimentary basins containing at least one fluvial megafan network active within the past 120,000 years post-hoc to simulation results and pruned all lineages not within a basin. We then compared our biased diversities and phylogenies to their “real” record. We also examined whether any relationship existed between these “preserved” species and additional traits (e.g., niche breadth, dispersal ability, basin size). Finally, we reran our analyses with basin positions randomized, to investigate the impact of basin position and orientation. Preliminary results demonstrate that while the BOM does result in overall record reduction regardless of virtual species’ traits, basin position, or basin size, additional potential paleoecological biases may exist—especially regarding species’ niche breadth and basin connectivity—which have implications for, for example, the dinosaurian ecosystems of eastern Laramidia in the Cretaceous. If such biases are confirmed within the terrestrial fossil record, we could be required to alter our interpretations of prehistoric ecosystems across much of deep time.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Orbital vascular plexuses: implications for ocular thermoregulation in Neornithine raptors (Aves: Neornithes)

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Neornithine raptors (Accipitriformes, Falconiformes, and Strigiformes) possess large, metabolically active eyes that function within

narrow thermal limits, making thermoregulation essential for maintaining ocular and neurological performance. Birds commonly employ countercurrent heat-exchange systems in which closely associated arteries and veins facilitate heat transfer. In raptors, the orbital rete ophthalmicum plays a key thermoregulatory role, with its effectiveness increasing with size. Cranial surface features described as pits, pores, or porotic structures have often been assigned physiological significance, although their origins remain largely unverified. Some may represent vascular channels that serve as osteological correlates of vascular plexuses. These microscopically detectable structures have been identified as components of a thermoregulatory system involved in countercurrent heat exchange.

The orbital roofs of bird skulls were examined using surface microscopy (100–200X). To date, more than 1,950 species of Neornithine birds have been surveyed, including 256 raptor species representing three orders and seven families. Osseous correlates were identified in 55% of all raptors examined, with similar prevalence in diurnal (55%) and nocturnal (54%) taxa. Considerable variation was observed both within and among families.

The orbital plexus likely modulates peri-orbital temperatures, protecting and potentially optimizing ocular function. Although these osseous correlates are associated with both heating and cooling mechanisms, their greater prevalence in taxa from warmer climates suggests a primary role in vascular cooling or the formation of a cranial thermal window. Their occurrence appears to be influenced more by biogeography, climate, and ecological or behavioral factors than by species identity, and may therefore vary regionally within wide-ranging taxa.

Ultimately, the skeleton serves as a plastic record of phylogeny and environmental adaptation. Rather than reflecting only taxonomic identity, it preserves evidence of the ecological and climatic pressures shaping an organism's biology. Expanding this study to Cretaceous Neornithines, Enantiornithines, Ichthyornithines, Hesperornithines, and additional non-avian theropods would further clarify the roles of phylogeny, biogeography, and climate in the evolutionary development (Evo-Devo) of these thermoregulatory mechanisms and associated structures.

Technical Session XIV: Return of Reptile'O'Rama: Triassic time (Friday, November 13, 2026, 1:45 PM)

Ontogeny of *Sonselasuchus cedrus* (Poposauroidea: Shuvosauridae): dinosaurian-pseudosuchian anatomical convergence does not extend to growth patterns

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Dinosaurs and their close relatives have been shown to possess remarkably high levels of ontogenetic variation during the Middle and Late Triassic. One hypothesis attributes this ontogenetic variation to developmental plasticity and implies developmental plasticity may have conferred a selective advantage via adaptability or evolvability to dinosaurs during the climatically unstable Late Triassic and the ecological perturbation of the end-Triassic mass extinction. To investigate how widespread ontogenetic variability was among Triassic archosaurs, a pseudosuchian dataset is needed. Here, we present a comparable dataset from an ontogenetically variable assemblage of the Late Triassic shuvosaurid, *Sonselasuchus cedrus,* a pseudosuchian known from the Sonsela Member of the Chinle Formation. We assembled a dataset of 43 femora of *Sonselasuchus* scored for eight ontogenetically variable characters along with a histological growth series for 11 of the 43 femora. We then subjected this dataset to ontogenetic sequence analysis (OSA) to quantify the amount of sequence polymorphism in the acquisition of the femoral characters. Size and maturity score (both observed and reconstructed) were found to be moderately congruent, although femoral length was not a statistically significant predictor of OSA maturity score. In addition, we found there was little congruence between the total length of the femur and skeletal maturity inferred from bone microstructure. The absence of concentric growth

marks in the outer cortex of the largest femur in the dataset, which also had the highest reconstructed maturity score, suggests that the largest individuals of the *Sonselasuchus* assemblage were still growing when they died, and had not reached skeletal maturity. Interestingly, the reticulation pattern of ontogenetic sequences for *Sonselasuchus* is markedly different from that of the dinosauriform *Asilisaurus* and the theropod dinosaur *Coelophysis*: *Sonselasuchus* shows low variation early in its ontogeny and experiences the greatest amount of variation later in ontogeny. Therefore, the divergent ontogenies of *Sonselasuchus* and dinosauriformes suggest that the convergent evolution between them is limited to specific anatomical characteristics and is not matched by similar ontogenetic histories.

Funding Sources: Washington Research Foundation-Benjamin Hall Fellowship

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Diversity of Pleistocene vertebrates at Huautla Cave System, Oaxaca, Mexico.

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Huautla de Jiménez Cave System, in Oaxaca, Mexico, currently has more than 100 km of mapped branches and a recorded depth exceeding 1560 m. Its exploration has highlighted the importance of paleontological studies in this area. The vertebrate findings in this system could be explained in several ways, related to the paleoecology of the species and the taphonomy of the materials. Their study began with reports and their subsequent attention from personnel of the National Institute of Anthropology and History (INAH). Once verified, some of the available specimens were recovered in a detailed way since they are embedded in calcite rock; remains were located at depths between 30 and 50 m. The specimens were carefully packaged with polyurethane foam for protection and brought to the lab for cleaning, stabilization, and conservation. The removed sediment, as well as other sediments collected near the specimens, were analyzed for small vertebrate bones. Identification was done using specialized literature. The preliminary record of Pleistocene vertebrates shows an association of large herbivores with a rich fauna of small mammals, birds, and herpetofauna. Presently, some megafauna species have been identified, including the sloth *Meizonyx salvadorensis*, which possibly used the caves as a refuge (dated by AMS radiocarbon at 12,562 ± 130 calibrated years), and the musk sheep *Euceratherium collinum*, whose remains appear to have been deposited after the collapse of part of the cave roof. Other elements have been preliminarily identified as the Pleistocene deer *Navahoceros fricki*. Several small vertebrates have also been identified, represented by the rodent genera *Baiomys, Neotoma*, *Peromyscus*, *Microtus*, *Orthogeomys*, opossum *Didelphis*, shrew *Cryptotis*, and bats *Myotis* and *Sturnira*. The birds are represented by roadrunner *Geococcyx* and the swallow *Hirundo*. Reptiles and amphibians include the Mexican burrowing toad *Rhinophrynus dorsalis,* salamander *Bolitoglossa*, coral snake *Micrurus*, and coffee snake *Ninia*. Those findings increase the biogeographic knowledge of some of the megafauna in southern North America and underscore the value of microvertebrates as paleoenvironmental indicators, indicating a warm and wet environment, maybe similar to the current one, and highlighting the importance of protecting this vast cave system. The specimens are on deposit at the public collections of the INAH, and the associated data will be available at the time of publication.

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Partial endocast of *Anadoluvius* from the late Miocene (8.7 Ma) of Central Anatolia: sulcal patterning and implications for hominine brain evolution

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Anadoluvius turkae is a recently described member of the Homininae (African apes, humans, and their fossil relatives) from the late Miocene (8.7 Ma) of Central Anatolia in Türkiye. Cladistic analysis suggests that *Anadoluvius* represents a stage in hominine evolution prior to the dispersal of the taxon into Africa between 7 to 9 Ma. The paratype cranium (CO-2100/2800) of *Anadoluvius turkae* is remarkably well-preserved and is only the fourth hominoid (gibbons, great apes, humans, and their fossil relatives) cranium from the Miocene with an adequately preserved endocranial surface for comparative sulcal analysis. Here, we describe the partial endocast of *Anadoluvius* and its sulcal pattern for the first time. Since the *Anadoluvius* endocast preserves only the anterior-most region of the superior frontal lobe, sulcal impressions in *Anadoluvius* were compared only with sulci in that region for a large sample of extant hominoid endocasts and published descriptions of extant hominoid sulcal patterns. Sulci were identified based on similarities in spatial proximity and sulcus shape between impressions in *Anadoluvius* and the sulcal patterns of extant hominoids. We find the sulcal pattern of *Anadoluvius* to be broadly similar to that of great apes (African apes, Asian apes, humans, and their fossil relatives), and more convoluted than the relatively simple hylobatid frontal lobe in the region preserved. The sulcus rectus in *Anadoluvius* appears to lack the superior-inferior positioning of the sulcus often observed in adult *Pongo*, aligning the *Anadoluvius* sulcal pattern with that observed in hominines. Further, the *Anadoluvius* endocast shares several similarities with *Gorilla*, including a rostrally positioned anterior terminus of the superior frontal sulcus and a longitudinally oriented posterior section of the sulcus rectus, implying a longitudinal orientation of the latter sulcus, both of which are previously noted hominine affinities. These results are consistent with prior preliminary observations made regarding the *Anadoluvius* sulcal pattern and further support the hypothesis that hominine-like frontal lobe organization evolved at least by the late Miocene. Further, if the *Gorilla* affinities in the endocast of *Anadoluvius* and other Miocene hominines are indeed synapomorphies, our findings lend additional support for the Eurasian origin and diversification of Homininae prior to their expansion into Africa in the late Miocene.

Funding Sources: We would like to acknowledge the generous funding provided by Beausoleil First Nation, OGS, NSERC, and the Ministry of Culture and Tourism of Türkiye

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Resolving fox lineages at Natural Trap Cave: Pleistocene fossils and modern relevance

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Natural Trap Cave (NTC), Wyoming, informs the paleoecology of the semiarid late Pleistocene as one of the few sites that preserves semiarid mammal fossils in North America (NA). Thus far, published works from NTC focus on megafauna, apex predators, and recently rodents and rabbits, encompassing top-down and bottom-up trophic perspectives, but excluding small-to-medium carnivores (mesocarnivores). This project seeks to resolve the taxonomic identities of NTC foxes, an important mesocarnivore today and in the Pleistocene. Foxes thrive via generalist traits and as post-disturbance generalists and are among the most widely distributed carnivores in Laurasia. Preliminary comparisons of NTC skeletal material indicate multiple species present. We have identified patterns in cranial and limb morphology that exemplify species partitioning. To distinguish species, we collected linear morphometric data from modern specimens for comparison with published datasets, using PCA and ANOVA. Cluster and discriminant analyses were then applied to the combined modern and fossil

datasets to distinguish between the unknown fossil species. Red fox crania and gray fox limb bones have been identified. Unidentified bones will continue to be analyzed through June of 2026. Other candidate species data have been deduced through historical regional relevance to NTC, including swift, kit, and arctic foxes. Resolving the taxonomic identities of these species contributes to the conservation of semiarid NA environments; it informs our understanding of the ecological, habitat, and community structures that shaped these ecosystems. The presence of gray foxes at NTC indicates proximity to dense understory and other arboreal habitat features.

Funding Sources: Funding through the David B. Jones Foundation

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A new Nasutoceratopsin (Dinosauria: Ceratopsidae) specimen from the Campanian Judith River Formation of Montana

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The Campanian Upper Cretaceous Judith River Formation (JRF) of Montana has yielded abundant non-avian dinosaur fossils, including the albertaceratopsin centrosaurine ceratopsids. *Albertaceratops*, *Medusaceratops*, and *Lokiceratops* from the McClelland Ferry Member (MCM) / lower Oldman Formation equivalent, and the nasutoceratopsins *Furcatoceratops* and cf. *Avaceratops* (MOR 692) from the upper Coal Ridge Member (CRM). In 1993, the partial skull MOR 2947 was collected from what is mapped as JRF in Hill County, Montana, from strata approximately equivalent to those producing *Furcatoceratops* and cf. *Avaceratops*.

MOR 2947 comprises an elongate supraorbital horncore (~23 cm preserved length), a maxilla–jugal complex, a nasal, several fragmentary elements, and a dorsoventrally deep premaxilla with an ovoid external naris, permitting referral to Centrosaurinae. Although it lacks the diagnostic parietosquamosal frill, the robust supraorbital horncore and the nasal, with its low, elongate dorsal ornamentation, suggest affinities with Nasutoceratopsini, a conclusion supported by a preliminary phylogenetic analysis.

Within Hill County, Montana, the JRF adjacent to the new site is broadly time-equivalent to the Dinosaur Park Formation (DPF) at Dinosaur Provincial Park, central Alberta. The MOR 2947 site occurs within the uppermost part of the *Centrosaurus apertus* zone, correlating with the upper Oldman Formation (OF) of southern Alberta, equivalent in age to the lower DPF of central Alberta.

Despite some similarity in nasal morphology, MOR 2947 is unlikely to represent *Albertaceratops*, which is unequivocally known only from the lowermost OF—strata equivalent to the lowermost MCM, which produced *Lokiceratops* and *Medusaceratops*. Given the substantial temporal separation and the rapid morphologic change of Campanian centrosaurs, referral of MOR 2947 to any of these taxa is unlikely. However, the occurrence of an indeterminate nasutoceratopsin in the upper OF of southern Alberta supports the inferred nasutoceratopsin affinity of MOR 2947.

Thus, MOR 2947 has the potential to clarify key aspects of centrosaurine evolution within the Campanian Judith River–Belly River wedge, a critical biostratigraphic interval spanning the Canada–US border.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Separating orodromines from thescelosaurines: revised character evidence for Cretaceous small-bodied ornithischian clades

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Orodrominae and Thescelosaurinae are among the most consistently recovered clades of Cretaceous small-bodied early-diverging ornithischians. Orodromines appear entirely endemic to North America, whereas thescelosaurines are Asian–North American. Although morphological characters have been proposed to support this separation, many are vulnerable to subjectivity, inconsistently defined, or contradicted by observation. Here, we reassess diagnostic character validity using firsthand examination, direct comparisons, and high-resolution 3D models. We construct new phylogenetically informative conditions and reconsider historically cited features to generate robust sets of diagnostic synapomorphies. The clearest diagnostic trait of Orodrominae is the presence of a jugal horn. This condition has sometimes been conflated with the laterally rugose jugal surface present in some thescelosaurids, but these features are not equivalent and should be scored independently. Orodromines possess ventrally oriented basipterygoid processes, contrasting with the more rostroventrally oriented condition in thescelosaurines. Orodromines show dorsal neural spines positioned cranially or centrally over the centra, whereas thescelosaurine dorsal neural spines are more caudally positioned. Thescelosaurines possess a subtle medial tubercle on the scapular neck that is absent in orodromines, whereas orodromines generally retain a straighter scapular outline relative to the more ventrally downturned scapulae of thescelosaurines. The pubes of orodromines showcase a prepubic process with distal dorsoventral expansion, forming a subtle spade- or paddle-shaped tip which may bear prominent striations when well preserved. Thescelosaurines generally have either an unexpanded rod-like or mediolaterally compressed prepubic process.

Several proposed distinctions should be rejected or treated cautiously. The traits in question include: midshaft fibular cross section; shape of the dorsal and ventral margins of the rostral process of the jugal; angle separating the tibial and fibular facets of the calcaneum; foramen magnum size; and a sharp scapular spine. The newly validated synapomorphies provide substantial support for the monophyly of Orodrominae and Thescelosaurinae, despite the elimination of invalid historical characters.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Development of a novel protein extraction protocol on diagenetically altered bone evaluated through immunological assays and tandem mass spectrometry.

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Over the last two decades, different protein extraction protocols have been used to characterize proteins preserved in fossilized bones, including collagen, myosin, and histones. Protein extraction protocols differ in demineralizing and solubilizing reagents, resulting in diverse protein affinities. The disparity in proteins detected across protocols incentivizes the modification or development of novel protein extraction protocols to widen the range of recoverable proteins and more effectively target proteins of interest. Here, the “extractome” of a novel protocol is assessed on extant and diagenetically altered bone using enzyme-linked immunosorbent assay (ELISA) and tandem mass spectrometry (MS/MS). Bone powder from extant organisms (chicken and alligator) and an approximately 1,000-year-old moa (Dinornithiformes) were processed using two two-phase extraction protocols. The first method solubilized bone powder in a non-demineralizing buffer (400 mM ammonium phosphate diabasic, 200 mM ammonium bicarbonate, and 4M guanidine HCl; 400/200/4), followed by 8 M urea in 100 mM ammonium bicarbonate (UABC). The second method demineralized bone powder in 0.6 M HCl, followed by solubilization in UABC. Extraction efficiency was compared between (1) collagen, a high-abundance bone protein frequently identified in paleoproteomic studies, and (2) hemoglobin, a low-abundance protein with known extraction challenges. Their relative abundance in extraction supernatants was assessed in ELISA using antibodies against chicken collagen and ostrich hemoglobin. Samples were also prepared for MS/MS through a filter-assisted sample preparation (FASP) workflow, in

which extracts were concentrated, reduced, alkylated, and digested in a 3.5 kDa molecular weight cut-off ultrafilter, followed by centrifugal stage tipping. Preliminary immunological results indicate the recovery of collagen in all moa protein extraction fractions, and hemoglobin solely in the 400/200/4 fraction. Extant samples yielded both collagen and hemoglobin across all fractions. The UABC fraction enabled accurate protein quantification via the bicinchoninic acid assay by avoiding urea/thiourea buffer interference. Results from additional ELISA replicants and high-resolution LC-MS/MS will also be discussed. Further development and optimization of this novel extraction protocol, coupled with MS/MS, may enable recovery of low-abundance proteins from fossilized tissues and expand the breadth of extinct proteomes.

Funding Sources: North Carolina State University Biology Department Teaching Assistantship

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Human hunting of the giant ground sloth *Megalonyx* during the Pleistocene

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Human impacts, whether direct or indirect, and environmental changes precipitated by glacial recession, have been hypothesized as forcing factors related to the extinction of mammalian megafauna in North America during the latest Pleistocene to Early Holocene. Whereas some taxa, including the proboscideans *Mammuthus primigenius* and *Mammuthus columbi*, the perissodactyl cf. *Equus ferus*, the artiodactyls *Hemiauchenia macrocephala*, *Mylohyus fossilis*, and *Platygonus compressus*, and the canid *Aenocyon dirus*, among others, have stratigraphic ranges terminating in the Holocene, indicating that climate change alone was not responsible for their extinction, the range of the pilosan *Megalonyx jeffersonii* is not known with certainty above the uppermost Pleistocene. Skeletal remains of a *Megalonyx* from Millersburg, Ohio, show modifications indicative of human butchering. It is the second *M. jeffersonii* from Ohio recognized to have bone modification suggestive of butchering activity. The Millersburg specimen has been radiocarbon dated at approximately 13,100 ka. This constrains the Millersburg specimen to an age between the beginning of the Santarosean North American Land Mammal Age (NALMA), estimated to be 14 ka, and the beginning of the Holocene Epoch (11.7 ka). The primary and secondary stratigraphic markers of the Santarosean NALMA are the first appearances of *Homo sapiens* and *Canis familiaris*, respectively, below 55°N in North America. Extensive cuts to both femora of the Millersburg *Megalonyx*, evidently inflicted using flint knives or scrapers, may have been the work of people of Clovis or a pre-Clovis culture. Traces of scavenging by canids have not been observed on this skeleton. This trace fossil evidence is among the earliest well-dated information about human occupation in Ohio; it demonstrates unequivocally that humans were present in midwestern North America by at least the Late Pleistocene and provides indirect, equivocal evidence that domestic dogs were as well. Both invasive species likely had an impact on the native environment. Their role in environmental alteration, including culling of megafauna, began prior to the onset of climatic warming at the beginning of the Holocene.

Funding Sources: Battelle Engineering, Technology and Human Affairs (BETHA) Endowment, Friends of Orton Hall Fund of The Ohio State University

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Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

Type Devonian, Carboniferous, and Jurassic fishes from the J. S. Newberry collection in the Orton Geological Museum

Loren E. Babcock[1], Andrew J. Wendruff[1]
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Between 1853 and 1889, John Strong Newberry named, described, and commonly illustrated numerous Paleozoic and Mesozoic fishes from the United States. They include Devonian placoderms, sarcopterygians, and chondrichthyans from the "Corniferous" of Ohio (Devonian), the Ohio Shale (Huron–Cleveland Shale Members; Devonian) of Ohio; a sarcopterygian from the "Chemung" (Devonian) of New York; chondrichthyans and actinopterygians from the Linton, Ohio (Carboniferous); and actinopterygians from the "Triassic" (now Jurassic) of New Jersey and Massachusetts. The whereabouts of many of the type and illustrated specimens, apart from those known to have been reposited with or transferred to the American Museum of Natural History (AMNH), and some in the Orton Geological Museum at The Ohio State University (OSU), has remained uncertain for more than a century. Portions of Newberry's collection, including specimens amassed by the second Geological Survey of Ohio, were deposited with Ohio Wesleyan University (OWU), beginning in the 1850s, and OSU, beginning in 1874. Many specimens originally in these collections have been rediscovered, in part stimulated by transfer of much of the OWU collection to OSU. With the availability of key specimens, long-standing uncertainties about taxonomic standing, morphology, and stratigraphic provenance are now being resolved. For example, discovery of Newberry's *Macropetalichthys rapheidolabis* from the Devonian of Ohio (at OSU) serves to stabilize the taxonomy of this placoderm, and discovery of the types of *Agassizichthys sullivanti* (at OSU) and *Agassizichthys manni* (originally at OWU) shows both species to be junior synonyms of *M. rapheidolabis*. Discovery of the type and other examined specimens of *Onychodus sigmoides* and *Onychodus hopkinsi* (both originally at OWU) and restudy of *Onychodus ortoni* (at OSU) resolves long-standing issues pertaining to these species. Similarly, clarification of the morphology and systematics of several fishes from the Linton, Ohio, deposit (Upper Freeport Coal, Carboniferous) and the Newark Supergroup (Jurassic) of New Jersey and Massachusetts is now possible.

Funding Sources: Save America's Treasures Program, administered by the National Park Service, US Department of the Interior under Grant Number P25AP01904-00

Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Consolidation and preparation of a mass death assemblage of bats using Polyethylene Glycol (Carbowax) and Cyclododecane for use in *μ*CT-scanning

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We selected an isolated portion of the bone horizon which was exfoliating off of the underside of the limestone slab. This sample was removed by adding damp toilet paper to the bone surface and covering it with Gypsona plaster bandages before carving into the limestone and separating it from the slab. In the lab, limestone fragments were removed from the surface of the bone layer and the entire sample was hardened with Paraloid B-72. A sheet of crushed Tyvek was placed over the sample and polyethylene glycol (Carbowax) was brushed over the surface to create a separator between the bone layer and a new Gypsona bandage plaster cradle. The specimen was flipped to expose the underside for research. Unfortunately, some Carbowax leaked through the Tyvek into the bone layer and visually obscured diagnostic morphology. Due to the fragility of the fossils, only lightweight hand tools could be used on the specimen. Excess Carbowax was mechanically removed using a porcupine (Erethizon) quill and by melting with an electric filament Maxwax pen then wicking up the pooled wax onto a wooden toothpick. In preparation for *μ*CT scanning, Cyclododecane was melted and poured onto the bone surface. Once cooled, a final layer of Gypsona bandages were added to complete the second half of the clamshell cradle. The resulting clamshell was successful in protecting the sample, allowing *μ*CT scans that revealed fine morphological detail and provided

new insights into the composition and taphonomy of this unique fossil assemblage.

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

The Siwalik record of Pakistan: an integrative approach to ecosystem dynamics in a long fossil record

Catherine Badgley[1], John C. Barry[2], Anna K. Behrensmeyer[3], Thure E. Cerling[4], Lawrence J. Flynn[2], Michele E. Morgan[2], David Pilbeam[2]
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The Neogene Siwalik fossil record of South Asia is remarkable in scope and richness, with high temporal and lateral continuity—18 million years of continuous history and tens of square kilometers of exposures with high lateral continuity in northern Pakistan. This record contains a wealth of geological, climatic, and biotic information for testing hypotheses about causes of biotic change over millions of years. The sequence consists of alluvial sediments deposited in a foreland basin created by the collision of the Indian and Eurasian tectonic plates. Sediments representing large and small river channels and their associated floodplain deposits correspond to mountain-sourced, large rivers and foothill-sourced, smaller rivers. Vegetation attributes are recorded in stable carbon isotopes and biomarkers in paleosols. Molluscs, fishes, crocodilians, turtles, lizards, snakes, birds, and mammals are preserved throughout the sequence. Vertebrate fossil assemblages show consistent patterns of preservation in fluvial lithofacies of four formations spanning 18.0 to 6.0 Ma, enabling robust analyses of trends in taxonomic and ecological diversity over time and across the paleo-landscape. The species richness and ecological diversity of mammals rise and fall over 12 million years with intervals of both rapid and gradual change. Small-mammal richness peaked earlier and declined earlier than large-mammal richness did, suggesting response to different factors in each group. An astonishing number of megaherbivore species (weighing >800 kg as adults) inhabited Siwalik ecosystems. Two major environmental transitions—one middle Miocene, the other late Miocene—were accompanied by major changes in mammal richness and faunal composition. The timing and magnitude of change in mammal richness and ecological structure are consistent with environmental forcing as a significant influence on these features.

Funding Sources: Funding sources include the Smithsonian Foreign Currency Program, US National Science Foundation, and our home institutions

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

The bat fossil record

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Our understanding of the evolutionary history of bats is directionally biased, mostly employing methods designed to reconstruct their evolution by studying living species. This uni-directional framework may stem from the assumed absence of a fossil record. However, beyond the handful of taxa belonging to five of the most well-known fossil bat families (†Onychonycteridae, †Icaronycteridae, †Archaeonycteridae, †Hassianycteridae, †Palaeochiropterygidae) with well-preserved skeletons from the Messel (Germany) and Green River (North America) lagerstätten, the bat fossil record contains numerous taxa that are geographically and chronologically dispersed and are identified from dentognathic remains spanning the earliest Eocene (56 Ma) through the Holocene. The unique combination of their deep evolutionary history and high modern diversity (1500+ living species) highlights the importance of utilizing the full fossil record for bats. Despite clear limitations when using mostly fragmentary cranio-dental remains, the bat fossil record can illuminate key

mysteries, such as the origin of novel traits, the biogeographic history of major clades, the development of modern ecological diversity, and aid in constructing phylogenetic hypotheses and contextualizing the stark species asymmetry among bat families. Here we aim to summarize what is known of the bat fossil record and demonstrate the richness of information that can be gathered from it.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Multivariate association of postcranial morphology in living ungulates with quantitative environmental variables provides the basis for a new approach to paleoecological inference, and a pilot study in the hot deserts of Neogene North America

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The vertebrate fossil record is a rich source of information on the morphology of past forms of life, but direct evidence of the environments in which extinct species lived is rare. Although we cannot study the habitat of extinct species directly, we can draw correlations between morphology and ecology in modern taxa and extrapolate these relationships to model the ecology of related and analogous clades in the past. Terrestrial ungulates are an excellent study group for making environmental inferences from morphology: they are ecologically diverse with a wide geographic distribution and variety of morphological types. Many studies of paleoecological inference from morphology in ungulates have focused on dentition, and although some methods for inferring paleohabitat from individual postcranial elements exist, they have been generally been restricted to predictions of coarse categories of habitat openness. The relationships between more complex (i.e., multi-element) combinations of postcranial morphology and ecology are still poorly understood. Few attempts have been made to correlate postcranial morphology with more fine-grained ecological metrics such as mean annual temperature, annual precipitation, and seasonality. Here I collected linear measurements from axial skeletal elements of complete skeletal specimens of 70 living species representing all living terrestrial ungulate families. The measurements for all elements within a species were taken from the same individual, so that not only different limb elements, which are most informative regarding locomotion and habitat use, but also all the proportions of disparate elements within an individual could be tested for association with environmental variables. I combined these data with range information and a large dataset of modern climatic variables (including average temperature and temperature variability, humidity, precipitation, vegetation coverage, seasonality, and more) to find these associations among the morphological measurements and the climate data. The most informative of these associations allow for paleoecological inference reconstructing climate in the North American hot deserts in the Neogene. Morphological measurements from ungulate taxa at Late Miocene and Early Pliocene sites in the southwestern United States were used as a pilot study to project climatic variables using this dataset of postcranial measurements.

Funding Sources: Richard Gilder Graduate School Graduate Student Fellowship Annette Kade Graduate Student Fellowship

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Morphological analysis of avian fossils from the Eocene Jebel Qatrani Formation, Fayum, Egypt

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The Fayum Depression of Egypt preserves one of the most important Paleogene vertebrate assemblages in Afro-Arabia. There are many fossiliferous sites in the Fayum, but the most fossil-

dense is Quarry L-41 from the latest Eocene section of the Jebel Qatrani Formation. The fine-grained mudstone preserves a diverse fauna that includes many delicate specimens of extinct primates and other vertebrates including a rich avifauna. Previously described Fayum birds, including one of the earliest fossil records of pelicans and the extinct wading-birds family Xenerodiopidae, underscore the importance of the region for understanding Paleogene avian evolution. This study aims to expand our understanding of late Eocene avian biodiversity and community ecology through the analysis of a previously unstudied collection of avian fossils, including assessing morphological and size diversity at the site as well as providing preliminary taxonomic identification. By investigating a collection of fossils found at L-41, we can help further our understanding of the ecology and evolution of birds in the Eocene of Egypt. The specimens examined in this study are housed at the Duke Lemur Center Museum of Natural History (DLCNMH). A total of 23 fossils representing mostly isolated postcranial elements were photographed and analyzed. Most lacked prior identifications and none had been assigned to a specific taxon. Comprehensive digital measurements were taken to quantify morphological variation, and these measurements were compared against equivalent elements in modern bird taxa so that the specimens could be classified into four size categories: giant, large, medium, and small. To move beyond preliminary sorting, a comparative database was compiled, incorporating morphological data from both extant skeletal material and previously described fossil taxa. The comparative framework links these unidentified elements to broader avian groups and provides a foundation for further taxonomic identification contributing to a better understanding of avian diversity in the Fayum.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

The small mammal fauna of Beatys Butte (Harney County, Oregon, USA)

Madeline Ball[1], Samantha Hopkins[1], Melanie Cham[2], Caroline A. Strömberg[2]

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Fossiliferous terrestrial deposits in the northwesternmost Great Basin have yielded a middle Miocene ($^{40}Ar/^{39}Ar$; 15.65 ± 0.07 Ma) mammalian assemblage known as the Beatys Butte Fauna (Barstovian NALMA; Ba1). Field crews from the California Institute of Technology and the University of Oregon (UO) collected from several localities in the area during the 1930s–1950s. Some of these collections were first described by R.E. Wallace in 1946 and included ungulates (Antilocapridae, Dromomerycidae, Camelidae, and five equids), an amphicyonid, and a few small mammals (Erinaceidae, Heteromyidae, Ochotonidae, Sciuridae, and two aplodontiids). Components of the small mammal fauna have since been described in dedicated taxonomic works, including the pika *Oreolagus wallacei*, the squirrel *Protospermophilus malheurensis*, the mylagaulid *Hesperogaulus gazini*, and the eulipotyphlans *Pseudotrimylus mawbyi* and *Scalopoides* cf. *ripafodiator*.

However, many of the small mammals from Beatys Butte retain indeterminate identifications, and subsequent collection efforts by University of California and UO field crews have recovered extensive small mammal material that has not yet been described. Examination of these collections reveals a more diverse small mammal fauna than previously recognized. Several genera known from other Barstovian-aged localities in Oregon, including *Alluvisorex*, *Balantiomys*, *Citellus*, *Copemys*, *Hypolagus*, *Lantanotherium*, *Paradomnina*, and *Tamias*, have been identified, along with a genus not previously known from the Barstovian of Oregon, *Ansomys*, a small aplodontiid rodent with a complex biogeographic history.

The small mammals of Beatys Butte show strong similarity to those recovered from nearby deposits in Malheur County, particularly the Red Basin and Skull Spring localities (Butte Creek Volcanic Sandstone), as well as Quartz Basin (Deer Butte Fm.) and Sucker Creek (Sucker Creek Fm.). The assemblage is taxonomically and ecologically diverse, which could reflect local habitat heterogeneity. Preliminary study of microscopic

plant silica (phytoliths) recovered from Beatys Butte includes both C_3 grasses and forest indicators, which may suggest the area hosted a mixed flora. The reevaluation of other small mammal assemblages in the northwestern United States and expanded phytolith sampling may help illuminate how the profound landscape and climatic changes of the Miocene impacted small mammal faunas in the region.

Funding Sources: National Science Foundation Award Number 2322803

Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

Quantifying the utility of large language models in the three-dimensional digital preparation of fossil specimens using computed tomographic scans

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Advances in 3D imaging and segmentation have transformed the world of paleontological research. Through digital segmentation of computed tomography (CT) scans and computer-generated 3D models, we are able to obtain detailed visualization and analysis of fossil specimens without destructive sampling. However, extracting meaningful data in this manner remains time-intensive and requires extensive oversight and anatomical expertise. This project evaluates whether automated, semi-supervised segmentation tools, specifically the Segmentation Wizard tool in Dragonfly 3D World software, can independently produce detailed, scientifically robust results when compared to preexisting workflows such as manual segmentation performed in Avizo software. We also aim to see if these methods are truly reliable and possibly aid in significantly reducing manual labor times spent by paleontologists, with the ultimate goal being the use of large language models (LLMs) to digitally prepare fossil data. We use a CT scan of a microvertebrate bonebed containing hundreds of disarticulated skeletal elements from at least five individuals referrable to the archosauromorph genus *Prolacerta* from the Lower Triassic Fremouw Formation of Antarctica as our study system. Using Segmentation Wizard in Dragonfly, we trained a U Net deep learning model on several CT slices. We then allowed it to then iterate across the rest of the slices and the final output we were left with was a 3D model of all identified and segmented fossils from the bonebed. Our results indicate that the LLM we used to segment the specimen was extremely accurate at identifying fossil bone from the surrounding rock matrix, but additional validation was needed to separate individual bones from one another. This work included “eroding” each region of interest (ROI) by one pixel, separating each ROI, and then “dilating” each region of interest by one pixel once separated. Our next step was analyzing 150 segmented elements at random and employing a 1–10 ranking system to score each one, with 1 representing an extremely incomplete score and 10 being complete. Our median score for these randomly-selected elements is 4, illustrating that this postprocessing method is not strongly effective at delivering anatomically accurate data. This study demonstrates that more exploratory work is needed to better train existing models to recognize anatomical details for disarticulated skeletal remains in fossil specimens.

Funding Sources: NSF ANT-2313242

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Chronostratigraphic revision of the Cerro del Pueblo Formation (Campanian, Upper Cretaceous), Coahuila, Mexico suggests dinosaur fauna is ~1.5–2 Ma older than previously thought, with biogeographic and evolutionary implications

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Since the late 2000s there has been a surge in Mexican dinosaur research, predominantly based on partial to relatively complete remains from the Late Cretaceous Cerro del Pueblo Formation

(CdP) of northeastern Mexico. As the southernmost unit in Laramidia with abundant dinosaur remains, the CdP has potential for testing latitudinal biogeographic hypotheses, which depend on accurate chronostratigraphic correlation. Although no radiometric dates have been recovered from the CdP, historical work using other methods suggest a latest Campanian age (72.3–71.3 ± 0.5 Ma, biostratigraphy; 72.5 Ma, magnetostratigraphy; 73 ± 1 Ma, strontium isotope analysis). However, these prior methods were indirectly based on Ar/Ar dates calibrated to previous standards, resulting in ages ~0.5–1 Ma younger than would be produced by current standards. The morphology of dinosaurs within the CdP has been noted to be unexpected given the purported age of the unit, resembling older taxa from the southern United States. Various hypotheses have been proposed to explain this, such as higher origination rates and lower extinction rates in the south, where primitive taxa survive and go extinct later in the south compared to that of northern dinosaur assemblages.

Revised invertebrate biostratigraphy and sedimentological geometry indicates that the CdP represents the lower part of a west–east clastic wedge. Significantly, hitherto overlooked ostreid biostratigraphy indicates west–east diachroneity, with the older *Exogyra ponderosa* only occurring in the lower section of the western CdP, being overlain by *Exogyra costata,* whereas only *E. costata* occurs at the central and eastern sections. This is particularly significant as the boundary between *E. ponderosa* and *E. costata* correlates with the base of the *Baculites compressus* ammonite zone (~74.21 Ma/~73.79 ± 0.38 Ma), ~1.5–2 Ma older than the previously suggested age of the CdP. This stratigraphic reassessment is important as most dinosaurs from the CdP have been recovered from the western section of this unit, suggesting that these taxa may be ~1.5–2 Ma older than previously regarded, perhaps equivalent to the Fruitland or Kirtland Formations of New Mexico or the Kaiparowits Formation of Utah. The revised chronostratigraphy presented here introduces an alternative to the biogeographic refugium hypotheses, as various taxa from the CdP closely resemble and might be synonymous with that of other of Campanian units of the southern United States.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

New sauropod material from the Lower Cretaceous (Aptian) Potomac Formation of Prince George's County, Maryland, USA

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In 1858, African American ironworkers discovered the first sauropod fossils from the Early Cretaceous Potomac Formation in Prince George's County, Maryland, USA. In 1865, Leidy formally described two sauropod teeth, naming *Astrodon johnstoni*, although it was not recognized as a sauropod at the time. In 1887, Hatcher recovered more fossils from the Maryland iron mines, during which they recovered additional sauropod cranial and post-cranial material. In 1888, Marsh described this sauropod material and named two species of *Pleurocoelus*, initiating a taxonomic debate that continues to this day. Very little sauropod material was recovered from Maryland over the following century, until the discovery of a partial femur in 1991. Since then, discoveries were particularly driven by the establishment of the M-NCPPC Dinosaur Park in 2009, with public programming and excavations yielding several isolated teeth as well as five caudal vertebrae, a metacarpal, and two unguals.

New sauropod material from Maryland closely resembles *Abydosaurus* from the Ruby Ranch Member of the Cedar Mountain Formation in Utah. The teeth include specimens from different ontogenetic stages and are distinctive from both the spatulate teeth seen in *Camarasaurus* and the rod-like teeth seen in *Diplodocus*. Rather, they are consistent with the narrow semi-spatulate morphology of *Abydosaurus*. Sauropod caudal vertebrae from Maryland include five isolated specimens from the middle to distal series. Three are amphyplatyan, similar to brachiosaurids and other historic sauropod caudal vertebrae from Maryland. However, two distal caudal vertebrae are procoelous, similar to the morphology

observed in titanosaurs, some non-neosauropod eusauropods, and a couple macronarians. New sauropod appendicular elements from Maryland consist of a complete right first metacarpal as well as two unguals. The right metacarpal is the first adult metacarpal found in Maryland. It resembles the juvenile material referred to as Astrodon (sensu *Pleurocoelus nanus*) and exhibits similarities with *Abydosaurus*, including a mediolaterally curved shaft, as well as a palmar expansion of the proximal articular surface. The right partial femur from Maryland shows similar proportions to femora referred to *Abydosaurus* regarding the mid-shaft and distal condyles. Collectively, the sauropod material from Dinosaur Park suggests the Maryland sauropod may have a close relationship with *Abydosaurus.*

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Digestive traces in Late Triassic phytosaur teeth from the Upper Triassic Homestead site (Garita Creek Formation, Revueltian) and its implications for archosaur digestive physiology

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The Homestead Site in the Upper Triassic Garita Creek Formation of New Mexico contains a high degree of diversity in its microvertebrate assemblage, including dozens of teeth attributed to phytosaurs. The teeth exhibit a variety of different forms of enamel and dentin degradation. Previous authors attributed similar degradation to digestion or erosion by weathering and transport. This study evaluated digestive processes and the patterns of digestive traces on teeth that had been ingested. There are two types of digestive processes: “acid digestion” via an animal with primarily acid activity in their digestive system, and “enzyme digestion” via an animal with both acid and enzyme activity in their digestive system. These digestive processes leave traces of damage to the tooth. Acid digestion traces are characterized by thinning and cracking of the enamel with little to no effect on the dentin. Enzyme digestion traces are characterized by pitting to the enamel surface, loss of enamel, and wrinkling and cracking of dentin. Determination of the type(s) of tooth degradation damage by gastric juices can provide clues into the physiology of the digester. Animals with a primarily acid digestion, such as modern crocodilians, are more suited to the breakdown of hard parts such as the mineral hydroxyapatite found in teeth and bones. Animals relying on enzyme digestion, such as most other extant diapsids, are better able to break down organic compounds such as proteins. Many of the teeth examined in this study have resorption pits, features that only form when the tooth is shed. This suggests the tooth was shed, and then ingested, while the animal was feeding. Thus, the animal responsible for digesting the tooth is likely the animal to which the tooth originally belonged, and features of the digestion of the tooth maker can be understood through investigation of digestive traces on fossil teeth. We find that phytosaurs relied on acid digestion, similar to modern crocodilians. This similarity could suggest acid digestion is basal to Pseudosuchia as it is seen both in phytosaurs and crocodilians, but not in extant birds, or it highlights another convergent feature between phytosaurs and crocodilians. Many of the teeth show evidence of enzyme digestion, being especially common in the fragmentary remains. This could be due to digestion by theropod dinosaurs, the only diapsids present in the assemblage large enough to ingest these teeth.

Funding Sources: Appalachian State University Undergraduate Research Assistantship, Appalachian State University Office of Student Research

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A nearly complete bird skeleton from the Oligocene of western Montana

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The transition from the Eocene into the Oligocene was marked by a period of global cooling and the recession of global forests, which coincided with faunal turnover of many lineages in North America. Several avian lineages that were once well-represented on the continent are completely absent following the beginning of the Oligocene. While the diversity of avian lineages during the Early Eocene of North America is fairly well represented, the fossil record of the Eocene-Oligocene boundary is remarkably poor. This is especially for the lineage Telluraves, also known as "perching birds," with only five known representatives known from specimens consisting of more than a single element. This lack of data severely impedes our understanding of how the diversity of avifauna changed as the climate shifted from the greenhouse conditions of the early Paleogene to the more modern-day icehouse conditions. In this paper, we describe a small bird specimen from the late Eocene to early Oligocene of Montana; the first fossil bird skeleton from the Douglas Creek beds and the second from the Renova Formation as a whole. Despite the poor preservation quality and lack of key limb elements, such as the majority of the pectoral girdle and fore limbs, its skeletal proportions and morphology clearly distinguish it from all other Paleogene birds. Although the lack of concrete morphology prevents a concrete phylogenetic placement, this specimen adds further context to our understanding of avifaunal assemblages during the Eocene–Oligocene transition.

Funding Sources: Jackson School of Geosciences

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Non-avian dinosaurs from the 'Mesaverde' Formation (Campanian, Late Cretaceous) in the northwestern Bighorn Basin, Park County, Wyoming

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The "Mesaverde" Formation in the Bighorn Basin, Wyoming, preserves an increasingly well characterized terrestrial vertebrate assemblage from the middle Campanian (~80–78 Ma). Work by the Raymond M. Alf Museum of Paleontology (RAM) in previously unexplored outcrops in Park County provides important new data on the non-avian dinosaurs of this time and place. To date, theropods are represented almost exclusively by dental remains. Dromaeosauridae indet. and *Richardoestesia gilmorei* are most common, followed by Tyrannosauridae. A single ornithomimid pedal phalanx rounds out the theropod assemblage. No Troodontidae have been recovered yet, consistent with a lack in penecontemporaneous formations in Alberta and Montana.

A single eggshell fragment (RAM 29065) from the Teapot Sandstone member of the Bighorn Basin, Wyoming, provides the first direct evidence of theropod nesting in this region. The eggshell, with a thickness of 0.7 to 0.9 mm, is identified as Elongatoolithidae based on its non-branching pore canals and ramotuberculate ornamentation.

Ceratopsids (teeth, horncore), thescelosaurids (teeth), and ankylosaurs (teeth) are rare elements of the ornithischian assemblage. Hadrosaurids dominate, with abundant but mostly isolated bones and teeth. A subadult hadrosaurid jugal from high in the section serves as the first confirmed occurrence of Brachylophosaurini in the "Mesaverde" Formation and resembles material of *Acristavus* from the Two Medicine Formation. This find is consistent with a middle or early late Campanian age for the Teapot Sandstone in the Oregon Basin. An isolated, incomplete nasal is also consistent with this clade. An isolated juvenile hadrosaurid femur (length 130 mm) matches the size of large nestlings or early juveniles for other hadrosaurs, indicating an individual around 1 m in body length. The largest femur (RAM 29075) measures 945 mm long (est. body length 8.5 m), with intermediate sized specimens also known.

Although few specimens are diagnostic beyond the broad clade level, the overall hadrosaurid-

dominated assemblage is similar to other mid-Campanian formations in Laramidia. Theropod eggshell and small juvenile hadrosaurid bones show that multiple clades reproduced in this area.

Funding Sources: David B. Jones Foundation, Mary Stuart Rogers Foundation

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Technical Session IX: Archosaur paleobiology & pterosaurs (Thursday, November 12, 2026, 1:45 PM)

Chick lung development and adult comparative anatomy reveals complications when interpreting the ornithodiran fossil record

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Phylogenetically, pterosaurs and non-avian dinosaurs sit between crocodylians with lungs powered by a hepatic piston and birds with extensive air sacs and skeletal pneumatization. As such, extant phylogenetic bracketing alone cannot reconstruct the lungs of these extinct ornithodirans; comprehensive study of adults and developmental series of many species is needed to capture the range of viable possibilities. Chick lung development was first described in detail a century ago by Locy and Larsell, but since then, avian lung development studies have largely been molecular, with little qualitative or quantitative morphological analysis. Here we use contrast-enhanced staining, micro-computed tomography, and three-dimensional digital modeling to evaluate development of the chick bronchial tree and air sacs from embryonic day five (E5) to E19, two days before hatching. We also demonstrate differences between these embryos and the first complete adult chicken respiratory model. Post-hatching, non-ventilatory pulmonary diverticula expand extensively and pneumatize the postcranial skeleton, traits not seen at E19. The interclavicular air sac has two components that fuse during development: a lateral interclavicular originating from the first ventrobronchus (V1) and a medial interclavicular from the third ventrobronchus (V3). Their cervical diverticula develop directly from the cervical air sac and extend cranially up the neck; however, this is not the only developmental possibility.

In adult specimens of two grackle species (*Quiscalus quiscula* and *Quiscalus major*), cervical diverticula originate from the interclavicular air sac. In an adult *Anhinga anhinga*, cervical diverticula have a dual origin: one part directly from V1 in the gas-exchanging lung and one part from the parabronchi. This result highlights the need for a developmental series of *A. anhinga* to track timing and order of this dual origin and for analysis of more taxa to determine the number of ways for cervical diverticula to develop. Regarding extinct ornithodiran lung hypotheses, presence of pneumatic foramina in fossil cervical vertebrae does not guarantee presence of a cervical air sac; cervical vertebrae can be pneumatized by the gas-exchanging lung directly or by other air sacs. Combining avian lung development with adult comparative anatomy helps us build a more complete picture of avian lung evolution and more precisely evaluate skeletal pneumatization patterns in the ornithodiran fossil record.

Funding Sources: University of Florida College of Veterinary Medicine Spring Faculty Grant (ERS), Gatorade Award Allocations (ERS)

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

New reports of isolated sauropod teeth from the Cretaceous of Mongolia

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We report three isolated sauropod teeth from the Gobi Desert of Mongolia. Two of the specimens

are from the sites of Zos Wash and Khulsan, in the Nemegt Basin, and one is from a fairly unstudied locality, Two Volcanoes, which is near the southern part of the Bayankhongor region. Tooth IGM 100/1185 was collected from the Baruungoyot formation of Khulsan. It is referred to Titanosauria and exhibits a chisel-like dental morphology. Prior to this discovery, the only sauropod reported from the Baruungoyot formation is *Quaesitosaurus* from the locality of Shar Tsav in the Eastern Gobi. IGM 100/1256 was collected from Zos Wash, located just west of the better-known Late Cretaceous locality of Ukhaa Tolgod. Based on its peg-like tooth shape, it is referred to Diplodocoidea. The neornithiscian *Haya griva* has also been reported from Zos Wash, a taxon previously known from the Javkhlant Formation. The third specimen, MAE 98/2, was recovered from the Two Volcanoes site. The age of this locality is unknown, but it has been suggested on a previously figured sauropod tooth to be Early Cretaceous. That tooth is similar in morphology to that of *Asiatosaurus mongoliensis* from the Oosh Formation. We report a second tooth from the Two Volcanoes locality that even more closely resembles the type specimen of *Asiatosaurus*. Although the information that can be gleaned from these teeth is limited, these specimens are noteworthy for their rarity and the insights they provide into a poorly known component of the Cretaceous faunas of Mongolia.

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

First Paleocene mammals from Türkiye and the origins of Pleuraspidotheriidae (Mammalia, "Condylarthra")

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Recent field and laboratory research on late early and/or middle Eocene vertebrate faunas from Türkiye has emphasized their highly endemic nature. They are characterized by unique associations of Laurasian and Gondwanan metatherians and eutherians and the absence of multiple clades (including Carnivoramorpha, Rodentia, Perissodactyla, Artiodactyla, and Hyaenodontidae) that are otherwise ubiquitous across Laurasia by the Eocene. This faunal pattern has been interpreted as evidence for insular conditions across the newly recognized biogeographic province of Balkanatolia since the late Paleocene (at least). Pleuraspidotheriids are common, if anachronistic, elements of these Eocene Balkanatolian faunas, apparently persisting there for ~13 myr after their extirpation on mainland Europe near the Paleocene–Eocene boundary. Here, we report the discovery of the first Paleocene mammal assemblage from Türkiye, which partly fills a substantial geographic gap in the fossil record of Eurasian mammals spanning from France, Belgium, and Germany in the west to Mongolia and China in the east. The new fauna has been collected from the fluvial Kızılçay Formation in the Sakarya Basin (SB) of northwestern Türkiye. The most common taxon in the SB Paleocene fauna is a relatively bunodont pleuraspidotheriid that shares many features of upper dental morphology with *Parabunodon anatolicum*, a taxon known only from its holotype crushed partial skull from the late early or early middle Eocene Çeltek Formation in the Suluova Basin, north-central Türkiye. The new SB pleuraspidotheriid is much smaller than *P. anatolicum*, but comparable aspects of their upper dentition (P4-M3) are remarkably similar. Current understanding of the age of the SB Paleocene fauna relies on planktonic forams from the underlying Taraklı deltaic sands, which can be assigned to biozones P3b and/or P4a (Selandian, ~61 Ma). Paleomagnetic results from this section have so far yielded only reversed polarity signals, which is not surprising given the brief duration of normal intervals during Chrons C26-C24. Extrapolation based on the assumption of a constant sedimentation rate of 100 m/myr places the SB Paleocene fauna close to the Selandian–Thanetian boundary (~59 Ma). Pending future geochronological constraints, the new SB pleuraspidotheriid is arguably the oldest known member of its clade. Whether pleuraspidotheriids colonized Balkanatolia from Europe or vice versa remains open to debate.

Funding Sources: US National Science Foundation grant 2141115; European Research Council grant 101043268

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

Post-cranial remains of a 30 million-year-old hornless rhinoceros from the Great Plains, Wyoming, USA

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Subhyracodon is an extinct genus of hornless rhinoceroses (Rhinocerotidae) from the Oligocene of North America. Here, we describe post-crania preserved in a *Subhyracodon* bonebed from the Brule Formation (ca. 33–30 Ma) of Niobrara County, Wyoming, now reposited at the Alf Museum of Paleontology, to better understand the taphonomy of the bonebed and the natural history of the species. The 378 specimens are pale pink, characteristic of fossils from the Scenic Member of the Brule Formation. The most abundant long bones are the humerus (Number of Identified Specimens [NISP] = 27, Minimum Number of Elements [MNE] = 20) and femur (NISP = 25, MNE = 17). Based on the left humerus, we calculate a minimum of 11 individuals; further, assessing age using epiphyseal fusion, we identify at least four juveniles based on femora and tibiae and at least nine adults based on humeri.

The resulting adult-to-juvenile ratio is ~2.25:1. This ratio differs from modern rhinoceros populations, which typically show a 1:1 ratio due to solitary adults and single-calf reproduction. We infer either cohabitation of adults with juveniles, or preferential predation or scavenging of juveniles. The latter is supported by much fewer juvenile forelimb elements than juvenile hindlimbs, consistent with differential disarticulation by predators or scavengers. The Brule Formation represents an environment where streams meandered through cool and dry grasslands and marshes: a complex ecosystem that included carnivores, like amphicyonids and nimravids, that likely preyed upon juvenile *Subhyracodon*. Preliminary body size estimations of the *Subhyracodon* assemblage show no clear evidence of size dimorphism (median ≈ 295 kg ± 132 kg; range 126–573 kg), which may indicate weak or absent sexual dimorphism or reflect non-coexistence of males and females within the sampled population. Future work will incorporate analysis of cranial material.

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

The earliest mammoths? Evolutionary insights from *Mammuthus* remains at Toros-Menalla (ca. 7 Ma), Chad

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The evolution of mammoths (*Mammuthus*) constitutes a major adaptive transition among large terrestrial mammals and offers critical insights into the interplay between environmental change and evolutionary innovation during the Late Neogene. Mammoths originated in Africa during the late Miocene, evolving from ancestral elephantids, likely related to *Primelephas*, in a period marked by increasing aridity, expanding grasslands, and significant faunal turnover. Fossil specimens from Toros-Menalla, a rich late Miocene locality dated to approximately 7 million years ago, are among the most important records for understanding mammoth origins. These remains may represent the oldest known occurrence of *Mammuthus* in Africa and potentially the earliest record of the genus globally, providing a unique opportunity to investigate the initial stages of mammoth evolution. This study investigates the evolutionary significance of the Toros-Menalla *Mammuthus* material through detailed analyses of dental morphology and paleoecological evidence. The analysis compares key dental traits, including

lamellar frequency, enamel thickness, and crown height, with those of later mammoths and ancestral elephantids to clarify the morphological transformations associated with the emergence of earliest known mammoth population, and is of critical importance to assess the ecological and environmental conditions accompanying the emergence of the genus. The findings contribute substantially to broader discussions of proboscidean evolution, adaptation, and faunal change in late Neogene Africa.

Funding Sources: IRL (PALAETHIOPS)

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

African Cenozoic faunal change and human evolution in the Turkana Basin, Kenya

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The East African Rift System (EARS) preserves many records of Cenozoic terrestrial faunas, including fossils important for understanding human evolution in Africa. In the northern part of this 3,000 km+, equator-spanning tectonic system, the Turkana Basin (TB) preserves a ~30 million-year vertebrate record and is unique in terms of its size (148,600 km²) and physiographic position (2°–5° N latitude) between uplifted regions of Ethiopia and Kenya. Faulting, sedimentation, and vulcanism resulted in complex physiography and ecology in a relatively low altitude (360 m), arid lake basin fed by perennial river flow from highlands to the north and south. Intense interest in human evolution has generated a well-studied vertebrate record and detailed understanding of environmental change over the last ~7 million years. Decades of geochronological research on volcanic deposits and magnetostratigraphy provide the essential framework for age dating and correlation. The Omo Group formations (4.5 Ma to Holocene) include stratigraphic sequences (up to 760 m each) with abundant fossils in different subregions along with evidence for paleoenvironments inhabited by hominins and associated faunas. Ecomorphology, stable isotopes, and other proxy data reveal significant environmental differences across subregions. Ecological fidelity is preserved at the scale of local habitats within these regions, and faunal variation across subregions shows differences in contemporaneous environmental settings (e.g., axial versus lateral rift setting, riverine corridors versus lake margins). A rich upper Oligocene–Miocene record occurs in more localized sites around the basin that document afrothere lineages prior to and following biogeographic connection with Laurasia beginning at ~19.5 Ma, accompanied by faunal evidence for early forested environments (e.g., Topernawi, Losidok). The wealth of cumulative knowledge and the number of past and ongoing TB research projects present challenges for synthesizing major patterns of biodiversity over time. Current research focuses on questions such as whether this basin was a “hot spot” for Cenozoic evolution in Africa (for hominins as well as diverse ungulates), i.e., a spatially complex, low altitude ecosystem where selection pressures favored early adaptations to arid conditions. Such questions are motivating efforts to organize and standardize TB faunal data as an internationally accessible resource that can be used to test such hypotheses.

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Framing studies of population-level morphological variation: how and why is this work done?

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Data on population-level variation in skeletal and dental features of vertebrates provide special insights into the minimum range of variant morphology present in a species. This is especially true when specimens from a given population are sampled in a restricted and narrow time frame, permitting assessment of the morphological states expressed in a population over short time intervals. Such studies provide important baseline data for

broader assessments of variation that sample individuals across multiple populations, or the entire geographic range of a species, but are relatively rare. We reviewed 50 papers that address patterns of morphological variation in single populations of vertebrates, and we assessed the temporal and spatial limits that various authors used to constrain a "population sample" for analysis. In our collection of papers, sample size of studied individuals in a population ranged from 13 to 526. Temporal sampling intervals for collected specimens ranged from one day to 20 years. The common motivations for collecting data on population-level variation include assessment of sexual dimorphism, documentation of ontogenetic variation, and developing a better appreciation of variation in modern populations to permit a more reliable interpretation of the fossil record. Other motivations included documentation of morphological variation prior to (or as a test of) data collection for phylogenetic or ecologic analysis and evaluation of variation specifically to the exclusion of sexual dimorphism and ontogenetic variation. Exploration of variation in the context of natural selection and development are other motivators, as was in at least one case documentation of the propensity to express variation as an emergent property of lineages. Determination of variation on different spatial scales can be an important goal in itself and may yield surprising results at localized spatial scales. Without defined minima, "larger" sample sizes yield important perspectives on expressed variation within populations, demonstrate the need to be cautious when generalizing or drawing conclusions from small sample sizes, and may result in the unpleasant or disappointing deterioration of the discriminatory power of features often used to distinguish or "diagnose" different species.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Ch-Ch-Ch-Chinle chow down: biogeochemical reconstruction of a predator-rich Late Triassic food web in northeastern Arizona

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The Late Triassic period saw the rise of modern ecosystems, both in terms of major biotic clades and their resultant trophic structures. The Chinle Formation in the southwestern United States provides a well-sampled record of terrestrial fauna from this time interval, covering roughly 20 million years. Though our collective knowledge of the formation's paleofaunal diversity is still developing, one notable observation after over a century of study is the abundance of predatory tetrapods inhabiting both terrestrial and freshwater paleoenvironments against a relative lack of primary consumers. This pattern is reflected at Jeffers Ranch, a ~213 Ma (Norian) dig site in the Sonsela Member of northeastern Arizona that has yielded a growing variety of mid- to large-bodied carnivorous taxa and only three (primarily) herbivorous species over 15+ years of excavation and study led by Southern Connecticut State University's paleontology program. This pattern, inverse to what is typically seen in modern terrestrial ecosystems and even other well sampled contemporaneous paleoenvironments, invites questions about the Chinle's trophic structures and interactions. The biopurification of various minerals and compounds can be used to assess relative trophic levels. Thus, we used wavelength dispersive X-ray fluorescence (WD-XRF) spectrometry to measure the relative abundance of strontium (Sr) to calcium (Ca) in isolated phytosaur ($n = 5$), rauisuchid ($n = 2$), and theropod ($n = 1$) teeth collected from the same bonebed (1 m^2) at Jeffers Ranch. Even accounting for diagenetic contamination, the resulting Sr/Ca ratios indicate heavily overlapping trophic levels among these carnivores, with phytosaurs encompassing both ends of the total range (-2.10 to -2.40 on a $\log_{10}$ scale). Tooth (and presumably body) size appears to inversely trend with Sr/Ca levels, though more work is needed to elucidate the true relationships (if any) between tooth size and total size in these taxa. Though preliminary, our findings are in line with other evidence of diets and trophic interactions of Chinle paleofauna, including generalist size-based diets among phytosaurs that included preying on even large (8–9 m) macrocarnivorous rauisuchids. Further tests

using other chemical proxies and datasets encompassing a wider range of taxa are planned, which we hope will robustly build out our picture of the Late Triassic Chinle paleoecosystem.

Funding Sources: Connecticut State University Faculty Research Grants AUPA09 and AUP769

Technical Session VI: Dinosauria II: a "bird-hipped" bonanza (Thursday, November 12, 2026, 8:00 AM)

Reversal of Bergmann's rule in saurolophine hadrosaurid dinosaurs

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Hadrosaurid dinosaurs achieved exceptionally large body size during the Campanian and Maastrichtian. This is especially true of saurolophine hadrosaurs, of which the largest member (*Shantungosaurus*) rivals the size of *Tyrannosaurus rex*. The tempo of this trend is well-characterized; larger size was likely achieved by evolutionary rate acceleration relative to lambeosaurines and ancestral hadrosauriforms. However, potential predictors of exceptionally large body sizes within Saurolophinae remain entirely unexamined. Here, I address this gap using phylogenetic comparative methods applied to a specimen-level dataset of body size proxies, estimated body mass, and paleolatitude in saurolophine hadrosaurs. Saurolophine hadrosaurs are abundant, well-documented, and well-preserved, allowing a near-comprehensive sample of 39 specimens representing 29 taxa. Data were analyzed using Bayesian phylogenetic regression.

Analyses revealed a significant negative relationship between absolute paleolatitude values and both estimated body mass and femur circumference in saurolophine hadrosaurs. While this pattern was statistically evaluated at the subfamily level, it can also be observed qualitatively within species. In species that occur at two substantially different geographic regions, northern specimens are smaller than southern ones (e.g., *Brachylophosaurus canadensis* specimens MOR 794 and CMN 8873). Negative covariation between body mass and latitude is a reversal of Bergmann's rule, which connects greater body size to increases in latitude. Among extant tetrapods, this reversed Bergmann's rule is most often observed in ectotherms, perhaps due to prohibitively slow heating rates in large-bodied animals. However, hadrosaurs lack an extant reptilian ecomorphological analog and may have been endothermic. Therefore, the converse Bergmann's rule in saurolophines may be better explained by a latitudinal gradient in net primary productivity. These findings contribute to the growing consilient knowledge of hadrosaur biogeography and emphasize the impact of sampling depth in comparative studies**.**

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Expanded phylogenetic dataset elucidates large scale relationships within Plesiosauria

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Plesiosaurs were an incredibly successful clade of marine reptiles, first appearing during the Late Triassic and not fully dying out until the end of the Late Cretaceous. During that time, they evolved a wide variety of shapes and sizes to fill various niches in marine and freshwater ecosystems. While phylogenetic analyses have been used in many recent publications on plesiosaurs, they tend to focus on specific subgroups of Plesiosauria, and even include additional characters not present in other analyses. This research seeks to remedy this by compiling a single, consolidated data matrix, as well as testing the effects of character weighting and ordering on the phylogenetic relationships of all plesiosaurs. The current version of this matrix is composed of 294 morphological characters, 70 of which are ordered, scored for 172 OTUs representing 167 plesiosaur taxa and 5 basal sauropterygians as outgroups, which was analyzed under both equal and implied-weights parsimony. Preliminary results find strong support for Rhomaleosauridae being the sister group to Neoplesiosauria, the clade containing Pliosauridae and Plesiosauroidea, in contrast to the traditional

model in which rhomaleosaurids are sister to pliosaurids in the clade Pliosauroidea. I also find that some species traditionally classified as rhomaleosaurs actually fall outside the group, usually as early-branching plesiosaurs, although *Lindwurmia* appears to be an early pliosaurid. *Attenborosaurus* and *Rhaeticosaurus*, initially described as basal pliosaurs, are here recovered as basal members of Plesiosauroidea, while *Brancasaurus* is recovered as a basal elasmosaurid rather than a leptocleidid. Even taxa recovered within the expected clade have interesting results, like *Thaumatodracon* within the *Rhomaleosaurus* species complex, *Hastanectes* within the *Leptocleidus* species complex, elasmosaurs from the Western Interior Seaway not forming a monophyletic group, and a clade of basal wedellonectians consisting of members from North America, South America, Africa, and Asia. The results of the phylogenetic analyses clearly demonstrate that including more taxa and characters results in more stable and well-resolved trees, and provides the opportunity to further study the taxonomy, evolution, and paleobiogeography of plesiosaurs.

Technical Session XIX: Carnivora (Saturday, November 14, 2026, 1:45 PM)

Myologically-informed reconstruction of the masticatory muscle capabilities of South African fossil canids

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The appearance of canids in the Southern African fossil record during the Pliocene coincided with major ecological transitions that reshaped the region's carnivore guilds. The evolutionary pressures caused by these changes likely drove the development of African canid ecology and evolution. Analysis of the functional capabilities of these species may provide deeper insight into how these canids competed with and predated on the animals in their communities over time. Masticatory gape and bite force are key functional variables in assessments of dietary ecology and capabilities, but the soft tissue anatomy driving these variables is not preserved in the fossil record. Thus, direct analysis of the fiber architecture of the masticatory adductors of South African fossil canids is impossible. To gain further insight into these species' masticatory capabilities, we established osteological proxies for the estimation of fascicle length (FL; related to gape) across Canidae based on 8 taxonomically diverse modern canid species. We tested origin-to-insertion as well as cranium- and mandible-only proxies that capture the size and shape of the adductors and calculated geometric means for scaling. Using the best correlated proxies (temporalis: r = 0.903; masseter: r = 0.709; medial pterygoid: r = 0.899; average adductor FL: r = 0.95), we then estimated adductor FLs in 11 fossil canids. We also applied the previously validated "dry skull" method to estimate physiological cross-sectional area (PCSA; a bite force correlate) of the adductors among the most complete specimens, including the holotype of *Eucyon khoikhoi*, though this yielded greater masseter PCSA estimates and lower temporalis estimates than expected based on the specimens' overall proportions relative to modern canids. We found that our fossil FL estimates fell within the range of modern canids but that the various lineages in our sample were optimized for different degrees of gape and bite force. *Eucyon khoikhoi* showed longer FLs, suggesting that this jackal-ancestor was capable of greater gapes but potentially weaker bite forces than their geologically younger relatives.

Funding Sources: North Carolina State University

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Paleoenvironmental reconstruction and comparison of the Tombigbee Sand Member and the lower beds of the Eutaw Formation in northeastern Mississippi during the Late Cretaceous

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The Eutaw Formation ranged from the late Coniacian to the early Santonian (86.3–83.6 Ma) and consists primarily of sands, silts, clays, and glauconitic sediments that accumulated in shallow marine and nearshore environments in the eastern part of the Mississippi Embayment. Because of this depositional environment, Luxapallila Creek, Lowndes County, Mississippi, contains vertebrate and non-vertebrate marine fauna including lamniformes: *Scapanorhynchus texanus*, *Squalicorax yangensis*, and *Ptychodus mortoni*. Teeth from these prehistoric sharks make up a vast majority of what is found at both localities which gives us insight into potential interpretations such as breeding grounds and nurseries as well as population size. Less common finds include crocodilian osteoderms, a very limited number of lungfish tooth plates, and coelacanth material. We used this material along with additional specimens to compare the fauna from the upper Tombigbee Sand Member to the lower Eutaw Formation at Luxapallila Creek to determine if this area experienced a transgressive or transgressive event and how this affected the diversity of marine fauna.

Funding Sources: The Drapeau Center for Undergraduate Research

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Paleo-food web metric analysis of late Quaternary ecosystems in South Africa

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The extinction of Earth's megafauna during the late Quaternary led to considerable biodiversity loss that dramatically altered the structure and function of terrestrial ecosystems. In South Africa, the Pleistocene–Holocene transition was characterized by the extinction of multiple large-bodied grazing species. The causes and ecological consequences of these extinctions remain debated. Food web analysis can help paleontologists understand the complex ecosystem dynamics surrounding extinction events. Here, we present a topological analysis of the pre- and post-extinction food webs at the South African archeological sites of Boomplaas Cave and Nelson Bay Cave. We ask whether the biased extinction and extirpation of large-bodied grazers influenced food web stability across the Pleistocene–Holocene transition. The food webs for each site were constructed with observed herbivores, a regional carnivore guild, and plant nodes. Carnivore-herbivore links were drawn using random forest modeling based on functional traits. We assessed metrics of compartmentalization, a measure of how linked nodes cluster; connectance, the fraction of possible links realized based on functional traits and body mass scaling; and link density, the average number of links per compartment, all of which have been linked to the stability of a food web. We found that each metric declined in the post-extinction food web as compared to the pre-extinction food web, signaling that the observed extinctions destabilized the food webs at Boomplaas and Nelson Bay caves. When the empirically observed food web metrics were compared to a null model where random extinctions were simulated, connectance was lower than the range expected by the null model, while compartmentalization and link density metrics were within the predicted range. We find that the selective loss of large-bodied grazers had a larger impact on stability than we would expect from random extinctions, meaning that this guild could have been responsible for maintaining important interactions in the food web.

Funding Sources: NSF BCS-245211

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Beyond what meets the eye: A case study of *Messelornis cristata* using laser-stimulated fluorescence

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The Messel Pit site in Hesse, Germany (47 Ma, Eocene) is a lacustrine laminated bituminous shale ("oil shale") with vertebrate fossils routinely preserving traces of soft tissue. Oil shale fossils deteriorate when exposed and must be preserved with the Transfer Technique, encasing them in

resin. Despite the fragility of the fossils over 1,400 taxa are currently known, 72 of which are birds. Of the bird fossils, the most abundant genus of bird is *Messelornis*, or Messel rail, with more than 500 specimens known. The large volume of well-preserved fossils has contributed to significant scientific discoveries about the early evolution of modern birds. Although this particular genus is abundant, most other birds from the Messel site are represented by only a few fossils, limiting the likelihood of destructive analysis due to the need to conserve fossil specimens as nonrenewable resources. Using non-destructive laser-stimulated fluorescence (LSF), these analyses use visible wavelength lasers in order to stimulate fluorescence with a response that is stronger than conventional UV lighting. LSF has been proven to identify areas of soft tissue preservation not visible to the unaided eye but has not been broadly applied to fossils preserved with the Transfer Technique. Another method of nondestructive imaging that takes advantage of the spectroscopic aspect of fluorescence is X-ray fluorescence (XRF). This study uses LSF and XRF to examine a fossil specimen of *Messelornis cristata* in detail. A previous study using one feather specimen of *M. cristata* found black iridescent coloration using scanning electron microscope (SEM) imaging; however no further reconstruction of the life coloration was inferred. Preliminary observations of the specimen indicate that using SEM may find melanosomes indicative of the bird's life coloration, however, this analysis would require destructive sampling. The combination of the LSF and XRF methods in this study will verify the identity of previously invisible fossil structures by cross-referencing imaging results and pinpoint the most promising targets for future SEM analysis while minimizing the need for destructive investigation.

Funding Sources: UD Alumni Association Academic Enrichment Award & UD Dept of Earth Sciences Excellence in Geoscience Award (both awarded to JB)

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

An articulated small-bodied ornithomimosaur (Theropoda, Coelurosauria) from the uppermost Cretaceous Hell Creek Formation, Montana

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The uppermost Cretaceous Hell Creek Formation preserves one of the last Mesozoic ecosystems, including fossils of iconic taxa like *Tyrannosaurus rex* and *Triceratops*. A lesser-known component of the Hell Creek ecosystem is the ostrich-like ornithomimosaurs. Fossils of these theropod dinosaurs are typically fragmentary and difficult to identify within the Hell Creek Formation, although some specimens have been referred to *Ornithomimus* and *Struthiomimus*. In 2019, the articulated remains of a small ornithomimosaur (Museum of the Rockies specimen 11737) were discovered in the Hell Creek Formation of Dawson County, Montana. The specimen preserves much of the skeleton, including both hind limbs sans the left femur, the right forelimb, ribs, and delicate gastralia. Although much of the specimen remains obscured by the encasing sandstone, X-ray-computed tomography further reveals vertebrae and possible skull material. With a tibia length of 216 mm, MOR 11737 is among the smallest articulated theropods thus far reported from the Hell Creek Formation. Histological examination of the tibia reveals the presence of four cyclical growth marks, with no sign the animal was slowing growth at the time of death. Comparisons with other Hell Creek Formation ornithomimosaur specimens highlight potential autapomorphies; including a lack of a supraglenoid buttress flange on the scapula, elongate pedal unguals and metatarsals which appear to exhibit a subarctometatarsalian condition. Additional morphological comparisons with other ornithomimosaur specimens from the Hell Creek Formation and phylogenetic analyses will assess whether the unique morphology of MOR 11737 is attributable to ontogenetic or intraspecific variation or is taxonomically significant and provide new data on terminal Cretaceous ecosystem dynamics.

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Big data from the Bighorn Basin: high-resolution fossil records and novel AI workflows to clarify the effects of climate change on mammalian functional diversity across the Paleocene–Eocene Thermal Maximum

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The Paleocene–Eocene Thermal Maximum (PETM) was an interval of rapid, millennial scale carbon release and global warming (~5°C) ~56 million years ago that altered terrestrial ecology and permits testing of hypotheses related to modern biotic responses to climate change. Despite intensive study of the PETM terrestrial vertebrate fossil record in North America, basic patterns such as the timing of species first and last appearances and temporal ranges are unresolved. Characterization of such fundamental faunal dynamics is limited by stratigraphic resolution and fossil sampling that is often biased toward recovery of larger taxa. Two decades of fieldwork, across tens of kilometers in the southeastern Bighorn Basin (BHB), Wyoming, has yielded >20,000 vertebrate fossils from sections spanning the PETM. Traditional surface collecting methods coupled with exhaustive screenwashing for smaller taxa from similar lithologies have reduced biases related to sampling and taphonomy. A stratigraphic framework that incorporates multi-proxy data from paleosols, fossil vertebrates and plants, and isotopes permits characterization of a shifting regional biome through the PETM across the field area. While the BHB is well known for paleontological and stratigraphic studies of the PETM, only in the past few years have fossil samples and contextual information from multiple horizons before, during, and after the PETM become complete enough to address fundamental questions about the links between climate and community assembly. Leveraging these large samples, our principal objective is to distinguish the effects of change in both climate and taxonomic composition on the functional diversity of mammalian communities. To this end, we are generating rich 3D datasets from micro-CT scans of mammalian molars, tarsal elements, and distal phalanges. A new set of AI tools is being trained on diverse pilot datasets to rapidly isolate, segment, and crop 3D surfaces of these elements for functional measurements. Measurements include molar dental topography, tarsal facet curvature, and linear measurements of distal phalanges from a stratigraphically-resolved fossil sample spanning the PETM. Measurement of functional diversity permits a taxon-free ecological characterization of the mammalian fauna. It further allows for direct tests of whether abiotic drivers such as temperature or biotic drivers such as plant community composition have a greater influence on mammalian functional diversity.

Funding Sources: NSF Grants: EAR-0720268, EAR-0717892, EAR-0718740, EAR-0719941, EAR-0640076, EAR-2422839, EAR-2422838, EAR 2422840. BLM collecting permits: PA04-WY-113, PA10-WY-185

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Community-driven efforts to advance Quaternary vertebrate paleoecological data curation, standards, and governance in the Neotoma Paleoecology Database

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Paleoecological data networks have advanced knowledge about the state and rate of past climate change, including biogeography, evolution, and ecological responses to past environmental change. One such compilation, FAUNMAP, found that mammals responded individualistically to Quaternary climate change, providing a foundation for understanding and modeling future responses. FAUNMAP was later incorporated into the Neotoma Paleoecology Database (Neotoma), a multi-proxy database arising from community-driven efforts to make Quaternary paleoecological data more open and interoperable, and to advance broad-scale research. Compiling individual site data into an open resource enables reuse in new scientific and educational contexts. Such repurposing often motivates scrutiny of the original data. Additional metadata may be needed to increase context or provenance, and decisions on data openness may be reevaluated in light of new guidance (e.g., CARE principles for Indigenous data governance). Thus, archives such as Neotoma should be actively stewarded rather than passively stored.

Here, we describe the current state of vertebrate data in Neotoma, key uses, and improved alignment with the FAIR and CARE principles. Since initial upload, the FAUNMAP constituent database has been extended (new sites, new chronologies, new specimens) and revised, and additional constituent databases have expanded geographic coverage and data types (PaVeLA, Alaskan Archeofaunas, Faunal Stable Isotopes). Our citation analysis identified 97 papers that focused on vertebrate data and mentioned either FAUNMAP or Neotoma. 86 of these papers are focused on data reuse; very few mention data uploads. Most analyses focused on either a single taxon or a site assemblage. We also audited Neotoma for aspects of site sensitivity, such as representation of human-associated data and locality precision. The audit motivated updates to mammal localities and new guidance for ethical curation and use of vertebrate data in Neotoma. Finally, we tackled key barriers to data reuse, including taxonomy, data upload, and support for specimens. Overall, our efforts increase the quality of vertebrate data in Neotoma and mobilize an invested community of ethical data stewards.

Community-driven work is not limited to 10 individuals. We thank additional co-authors Edward Davis, Deborah Espinosa-Martínez, Michael Etnier, Simon J Goring, and John W. Williams.

Funding Sources: NSF 2226368 and NSF 2410965 to JLB, NSF 2226372 to MAB, and NSF 2226370 to SPB

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

New fossils of the dwarf baleen whale *Nannocetus* and *Herpetocetus* (Mammalia: Cetacea) from the Miocene, Pliocene, and Pleistocene of Northern California inform the biochronology and phylogeny of Herpetocetinae

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The Herpetocetinae is a northern hemisphere clade of late Neogene derived dwarf mysticetes (4–6 m length) with apomorphic temporomandibular joint and limited gape. A new skull of *Nannocetus eremus* (SCNHM VMW 65) from the upper Miocene Santa Cruz Mudstone (7.7–7.0 Ma) is similar to *Herpetocetus bramblei* but possesses inflated postglenoid processes and short zygomatics. Isolated earbones (SCMNH 21228, UCMP 296829, 296832) of *Nannocetus* are also identified from the basal Purisima Formation (6.9–6.4 Ma). Newly referred specimens of *H. bramblei* include skulls (UCMP 137471, 219111), periotics (UCMP 2191101, 219113, SCMNH 9976.29), bullae (SCMNH 21230, 9990.04, 9990.06), and mandibles (UCMP 219079, 219112, 219124, 219125) from the latest Miocene and earliest Pliocene parts of the Purisima Formation (~6–5 Ma). *H. bramblei* was the largest and most robust species in this genus (bzw = 40 cm; mandible length = 120 cm). A braincase of *Herpetocetus* sp. (UCMP 77197) from the Etchegoin Formation (5.5–4.5 Ma) of the Kettleman Hills has narrow ascending maxillae,

low nuchal crests, and a narrow occipital shield, likely representing a gracile new species. Younger taxa from the Pliocene part of the Purisima Formation (5.2–3.6 Ma) include a new species of *Herpetocetus*, represented by skulls (CAS 44597, UCMP 219121) and periotic (UCMP 219115) with inflated lateral tuberosity. Other isolated periotics (UCMP 219114, 219118) are referable to *Herpetocetus morrowi*. A skull of *Herpetocetus* sp. (SCNHM VMW 64) from the Pleistocene Falor Formation (2.1–0.7 Ma) is the youngest herpetocetine worldwide. Stratigraphic occurrences indicate that *Nannocetus* is restricted to strata of late Tortonian to early Messinian (~8–6 Ma) age and does not co-occur with any *Herpetocetus* spp. *H. bramblei* occurs only in rocks of latest Messinian or earliest Zanclean age (6–5 Ma). Pliocene strata have produced 2–3 species of *Herpetocetus*, including *Herpetocetus morrowi*; the Falor specimen indicates early Pleistocene survival (2.1–0.7 Ma). Phylogenetic analysis of a large matrix (159 OTUs; 6 archaeocetes, 10 odontocetes, 143 mysticetes; 481 characters) resulted in 3 most parsimonious trees under implied weighting. A strict consensus places Cetotheriidae as sister to the Balaenopteroidea, with *Caperea* in the Balaenoidea. *Nannocetus* is recovered as sister to a *Piscobalaena* + *Herpetocetus* clade, with *H. bramblei* sister to all Pliocene forms at the base of a California clade of *Herpetocetus* spp.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

***Tyrannosaurus* ran like a bird**

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There has been a persistent fascination with—and controversy over—the locomotory style and top speed of *Tyrannosaurus* over the last century. Resolving this controversy requires a holistic integration between descriptive anatomy and biomechanics, in a modern methodological framework. We present a revised description of the lower hind limb myology of *T. rex,* based on extant phylogenetic bracketing, and find that the tibiotarsus, tarsometatarsus, and pes of *T. rex* were both more muscular overall, and more birdlike in their anatomy, than previously indicated. These muscular restorations, alongside revised body mass properties and an oscillating tail, form the basis of a series of complex spring-loaded inverted pendulum (SLIP) models. These modeled gaits produce a style of locomotion in *Tyrannosaurus* defined by compliant and rapid repositioning of the whole-body center of mass and hindlimbs, all key characteristics of avian terrestrial locomotion. We validated our modelling by creating SLIP models of extant birds, and successfully matched model predictions of key gait parameters to experimental data. Our modelling and revised myology contradict the long-standing view that birdlike running, and its underlying musculoskeletal anatomy, is exclusive to extant avians. We reveal new information about the biomechanics of an iconic dinosaur species, and our results of birdlike running in *T. rex*—a Coelurosaur—suggest a much earlier, more basal origin of this trait than previously assumed. In light of this, we critically reinterpret hypotheses of locomotor evolution across the avian lineage, particularly with regards to "ground up" hypotheses on the origin of powered flight.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Fossil Camel bones from the Pliocene San Diego Formation, California, with numerous shark tooth marks

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Fossil bones with bite marks from sharks are not common in the fossil record but have been reported in a number of cases. The Pliocene San Diego Formation in southern California, a shallow marine unit, has already yielded whale bones with bite marks attributed to the great white shark, *Carcharodon sulcidens*. In addition to other examples of shark-bitten whale bones, there are shark bite marks on a humerus and metapodial attributable to the extinct giant camel *Megatylopus* sp. (these same specimens are misidentified as *Camelops* in the literature and online) so these bones apparently came from a carcass which apparently bloated and floated out to sea. These bones bear clear grooves with shark tooth marks. On the humerus, there are a total of eight marks, with an average length of 16.375 mm, and an average orientation of 61.5° ± 0.93° with respect to the long axis of the bone, or nearly perpendicular. These marks occur on all sides of the humerus, suggesting that the bone was likely impacted by both upper and lower teeth. In addition, one mark preserves a set of fine parallel ridges and grooves indicative of damage cause by a tooth with serrated margins. This evidence suggests that the trace maker was likely *Carcharodon sulcidens*, since the only other shark known from the San Diego Formation with teeth large enough to create the observed overall pattern of bite marks is a species of mako shark, *Isurus* sp., whose teeth are not serrated.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

New light on the inner ear and stapes of *Ichthyostega*

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The late Devonian (Famennian) stem tetrapod *Ichthyostega* is one of the few well-described limbed, Devonian stem tetrapods. Despite this, its anatomy is quite enigmatic and puzzling for a putative transitional form within the water-to-land transition. Of particular interest is the braincase, known only in four Devonian stem tetrapods (*Acanthostega*, *Ventastega*, *Ichthyostega*, and *Parmastega*), which show radically different morphologies. The morphology of the stapes, which transduces vibrations into the inner ear, is known in some stem tetrapods, but its exact position and orientation are poorly known in all except *Lethiscus* and *Ichthyostega*. Previous work on *Ichthyostega* elucidated the anatomy of the stapes and its position within the otic chamber; however, that study utilized conventional computed tomography scans of moderate resolution and was unable to resolve all aspects of the anatomy. The work presented here, based on the same specimen, utilizes a propagation phase contrast synchrotron microtomography scan with 10 μm voxel size (made at ESRF, Grenoble, France) to reveal a wealth of new anatomical details. These include a greater extent of ossification of the distal expansion of the stapes and its relation with the unique "Säve-Söderberg's process," which together form a wall around the otic chamber, as well as the anatomy of the bipartite footplate of the stapes and the semicircular canals of the inner ear, which are poorly understood in almost all limbed stem tetrapods. Our new data add to the emerging picture of substantial braincase and middle ear variability among limbed stem tetrapods, while at the same time strengthening the foundation for comparative homology judgements and investigations into the functional evolution of these structures at the water-to-land transition.

Funding Sources: ERC-2020-ADG 101019613 Tetrapod Origin Knut and Alice Wallenberg Foundation Scholarship

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Depictions of paleontology in two American comic strips, an important medium for paleontology

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Newspaper comic strips represent an area of communication that is often underrepresented in both research and scientific impact. Yet occasionally a comic will be published in the right place at the right time to leave a mark on society.

The Far Side is notable for its frequent depictions of academia, scientific research, and specifically paleontology. Perhaps the most famous example of this is *The Far Side* coining the term "thagomizer" to describe the weaponized tails of *Stegosaurus*. The popularity of *The Far Side* is such that many paleontologists have cut out copies of *The Far Side* in their laboratories, on office doors, or keep collections in their personal libraries. Similarly, *Calvin and Hobbes*, an equally popular peer of *The Far Side*, would occasionally depict dinosaurs and has even directly commented on private fossil collections and museum operations. These two titles are among the most influential and popular comic strips in the world, yet an analysis of their paleontological focus has never been done before. This study seeks to change that. This study is a qualitative content analysis that examined how *The Far Side* and *Calvin and Hobbes* (1) depicted paleontologists and their work, (2) represented prehistoric species and the era they came from, and (3) any common tropes used. Theoretically speaking, this study is rooted in the framing theory of mass communication.

In total, all 3,151 *Calvin and Hobbes* strips and all 4,337 *The Far Side* strips were read and analyzed as part of this study. This study produced novel findings, such as *The Far Side* placing greater emphasis on Mammoths than on large theropods. This stands in contrast to prior literature that showed that large theropods (and more specifically *T.rex*) are the kings of media attention. *Calvin and Hobbes* certainly leaned this way with large theropods outpacing every other clade in representation. *The Far Side* tended to depict post-Mesozoic life such as mammoths, saber-toothed cats, and a variety of other Ice Age animals. *Calvin and Hobbes* also primarily depicted the post-Mesozoic context, but it did so primarily through Calvin imagining the behavior of dinosaurs in the modern day. *The Far Side* also engaged in a surprising number of early tetrapods, as the comic frequently quipped about "the first fish to walk on land." Lastly, both comic strips leaned on the "mascot" trope favoring depictions of conventionally popular species such as *T. rex, Mammuthus primigenius, Smilodon, Triceratops*, and others.

Technical Session XVIII: Paleontological Practices: Education & Outreach (Saturday, November 14, 2026, 1:45 PM)

Building a diverse talent pipeline to sustain large-scale paleontological programs for high school students

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Sustaining interest in paleontology as a long-term career pathway remains a persistent challenge, particularly for students from underrepresented backgrounds. Sternberg Museum Science Camps addresses this challenge by intentionally fostering a community-centered environment in which students can engage with paleontology across multiple years and progressively transition into leadership and staff roles. The program currently serves approximately 100 high school students per year and employs more than 30 seasonal staff annually in partnership with 6 regional museums and research institutions. We analyzed enrollment and employment data from 2022–2026 to quantify patterns of student retention, multiyear participation, and transitions from student to staff roles: 40% of students return for additional years, with no significant difference by sex assigned at birth, 33% of staff are former students, and most staff (65%) are employed for multiple summers. We also interviewed alumni who have held a staff role or are interested in applying for future summers about the factors that made them return. Results of these interviews indicated that multiyear engagement strengthens participants' identity as scientists and perceptions of themselves as confident, capable young professionals. Notably, many participants continue to engage with the program even when pursuing careers outside paleontology, contributing to the development of a broader community of scientifically literate amateur paleontologists.

Retention of seasonal staff across multiple years also contributes to organizational continuity and the preservation of institutional knowledge, allowing us to iteratively improve our operational and educational practices. This continuity aligns with consistently excellent program evaluations

from both students and parents. Program outcomes demonstrate that cultivating supportive science pre-professional communities also translates into measurable contributions to the broader paleontological community. Alumni have presented research at professional conferences, participated in internships and museum work, and developed science communication platforms with broad public reach, all during high school. We suggest that sustained investment in healthy interpersonal relationships, mentorship, and community-building are as critical to developing future scientists as academic training.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A partial skeleton of a large bird from the Sentinel Butte Formation (Tiffanian: Paleocene) of North Dakota

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Paleocene birds, especially associated skeletons, remain rare. In the summer of 2016, a survey of outcrops of the Sentinel Butte Formation (Tiffanian: Paleocene) on US Forest Service lands in Williams County, North Dakota, resulted in the discovery of several partial avian forelimb bones exposed at the top of a small butte. Examination of the adjacent rocks revealed in situ material within a fine-grained mudstone that capped the butte. The friability of the mudstone and fragility of the bones resulted in the decision to collect a large field jacket that included the maximum area that a full skeleton would occupy if present. Recent preparation of the field jacket revealed the presence of a partial avian skeleton that includes an articulated hind limb with partial pelvis, associated series of ribs, and additional forelimb elements. Though swelling clays within the mudstone fractured and shifted many of the bones given its proximity to the surface over an extended period of time, this specimen is the most complete avian fossil recovered from the Paleocene of North Dakota. Representing a large-bodied bird approximately the size of an extant Red-tailed Hawk, the preserved proximal portion of the humerus is ~30% larger than the holotype of *Dakotornis cooperi* from the underlying Bullion Creek Formation at the Wannagan Creek locality in Billings County, North Dakota. The presence of an enclosed foramen ilioischiadicum in the pelvis supports assignment to Neognathae. The coracoid exhibits a straight and elongate extremitas omalis, a deep cotyla scapularis and a small foramen nervi supracoracoidei, features that closely resemble the coracoid of extant storks (Ciconiiformes) and the enigmatic *Calcardea junnei* from the Late Paleocene Willwood Formation of Wyoming. This specimen represents a unique data point for North American avian diversity after the K/Pg extinction and preceding the Paleocene–Eocene Thermal Maximum.

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Osteological distinctions between sympatric *Notharctus* and *Smilodectes* (Primates, Adapiformes) from the early Eocene of Southern Wyoming, USA, based on a large sample of recently collected skulls and partial skeletons

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The Bridger Basin of southwest Wyoming is known for exceptional preservation of dentally associated skeletons of Eocene vertebrates, including several attributed to the adapiform primate *Notharctus*. These adapiform skeletons, first described more than 100 years ago, provide what are still some of the most complete and detailed views of Eocene primate bauplans. It has since been argued that *Notharctus* existed sympatrically with another

generically distinct adapiform: *Smilodectes*. This generic level distinction was originally supported in a 1958 publication by qualitative differences observed in a collection of six crania. Differences in morphology of certain teeth have also been cited as distinguishing the two taxa, but overall, their dentitions are very similar. In practice, many Bridger adapiform dental specimens must be diagnosed to genus on the basis of size, with specimens assigned to *Smilodectes* having substantially smaller molar teeth than those assigned to *Notharctus*. Thus, despite the relatively rich record of these taxa, more evidence for evaluating their affinities is needed. While several partial skeletons assigned to *Smilodectes* have been known for decades and mentioned in publication, no systematic and comprehensive comparisons have been made with those assigned to *Notharctus*. Collaborating teams affiliated with the Burke Museum, Duke University, Florida Museum of Natural History, and the University of Nebraska renewed the effort to document the osteology of *Smilodectes* and *Notharctus* through scanning and measurement of largely undescribed specimens, and through new fossil collecting efforts. The current assessment is based on 23 crania and 40 partial skeletons, less than half of which have been mentioned or figured in previous studies. This sample allows the first statistical assessments of cranial and postcranial shape and size differences in *Notharctus* and *Smilodectes*. Our results further strengthen the view of distinct cranial morphologies, establish qualitative mandibular traits that distinguish the genera in Bridger B (based on their associations with molar size differences), show that postcranial dimensions from across the skeleton are largely overlapping (suggesting similar body sizes), and reveal differences in a number of postcranial traits suggesting modest to substantial differences in locomotor adaptation between the genera. We discuss implications of the data for niche partitioning and ecological diversity in Bridgerian adapiforms.

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A new large species of Dunkleosteidae from the nearshore deposits of the Lock Haven Formation of Pennsylvania

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The partial remains of several arthrodires were recovered in 2024 from a quarry exposure of the Lock Haven Formation in northern Pennsylvania. Among these was the articulated posterior third of a head shield of an unusually large arthrodire which included portions of both the left and right central and paranuchal plates, as well as the midline nuchal plate. Although incomplete, the specimen shows a combination of apomorphies which distinguish it from all other known species and allow placement into a new taxon. This new species can be confidently assigned to the Eubrachythoraci based on the form of the articulation between the head and thoracic shields. Within the Eubrachythoraci the new taxon is provisionally assigned to the Dunkleosteidae due to the relatively squat trapezoidal form of the nuchal, presence of tuberculation, thickness of the posterior margin of the head shield, and overall large size. It has the most features in common with *Eastmanosteus pustulosus* and the recently redescribed *Elmosteus lundarensis*, both North American members of the Dunkloesteidae. Assuming this affinity is correct and that relative sizes of plates were similar within this clade, the new taxon would have been comparable in size to some of the largest arthrodires currently known. This makes this find particularly notable for two reasons. First, the Lock Haven deposits are early late Famennian in age filling a temporal gap of large North American Dunkleosteidae between the Frasnian "*Dinichthys" magnificus* and the late Famennian *Dunkloesteus terrelli*. This suggests a persistence of a large body-size lineage across the Kellwasser Event at the Frasnian–Famennian boundary. Second, the Lock Haven Formation preserves nearshore marine environments thus extending the ecological range of Dunkleosteidae into shallow marine environments suggesting the

group, though never as diverse as other lineages, was nonetheless flexible and able to exploit a broad range of habitats. The discovery of multiple large-bodied arthrodire remains in the shallow marine Lock Haven Formation suggests that these placoderms commonly occurred in nearshore deposits of the northern Appalachian Basin during the late Famennian thus complementing the arthrodire fauna know from further offshore deposits of the Cleveland Shale.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

The influence of faulting on the Pleistocene hominin landscape in Olduvai Gorge, Tanzania

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Frequency and functional morphology analyses of herbivorous fossil mammals are characterized by expected trends relative to distance from paleolake Olduvai. Previous research at this site has hypothesized a connection between stone tool density patterns and faults transecting the ancient landscape. While active faults produced a repeating series of elevated footwalls and sunken hanging walls, our work does not show a strong correlation between the faunal data and this patterning during the Lowermost Bed II interval [LBII, 1.80–1.71 Ma]. By sampling 128 fossils (including 86 teeth) to approximate herbivore family frequencies across sites, we found an increase in frequency of Bovidae specimens with distance from the paleolake, but no strong correlation with fault-induced topography. Functional morphology of bovid postcrania can be used to infer habitat preference of fossil specimens without reliance on tribe classification. We analyzed 17 bovid phalanges by taking linear measurements of fossil specimens and using discriminant function analyses derived from modern specimens to characterize habitat preference trends. While this analysis produced expected findings with respect to distance from the paleolake (i.e., an increase in open habitat preference), there was no strong correlation with fault-induced topography. Taphonomic bias resulting from preferential preservation of hypsodont teeth, the high mobility of the animals in life relative to the study site scale, and a dynamic fluvial landscape may have affected spatial distributions of fauna preserved in the fossil record. Future work will focus on assessing modern ecological systems and the magnitude to which topographic heterogeneity and climate context influence landscape faunal distributions. This work will allow us to determine which criteria can be quantifiably applied to the Olduvai paleolandscape and whether fault-induced topography may have shaped its ecology.

Funding Sources: Department of Earth and Atmospheric Sciences, Indiana University Bloomington; Indiana University Global

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Prey, mummy, and centerpiece: An extraordinary *Edmontosaurus* fossil from the Lance Formation and its pathologies and soft tissue preservation.

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A partial, mummified hadrosaurid fossil (SMNC VPAL 2000, previously UNO LDP 956-1) was excavated from point bar sand deposits in the Niobrara County, Wyoming, outcrops of the Lance Formation in 1995. The posterior trunk, pelvis, and tail are articulated and prepared, disarticulated ribs have been mostly prepared, and at least one proximal hindlimb element is preserved, but unprepared. Ossified tendons running the length of the tail and skin impressions associated with the distal half of the tail are preserved and prepared. Multiple pathologies point to at least two distinct injury events in this individual's life. At least the three posteriormost preserved caudal vertebrae display a notably more rugose texture than the proximal vertebrae, and the bone has clearly been remodeled post-trauma so that these vertebrae have been fused together across the intervertebral space. The distalmost portions of skin impressions begin to wrap around the posterior surface of the final vertebrae, suggesting that this injury occurred

much earlier in life, and that the animal healed the wound while missing a large portion of its tail. At least one additional trauma event likely occurred more recently, wherein damage to the caudal vertebrae was sustained anterior to the fused caudal series. Some caudal vertebrae are highly crushed and fractured compared to others, though this may be explained by localized preservational differences. A minimum of three neural spines in a row are deformed into s-curves, with rugosities on the dorsalmost surface of the spines. At least three neural spines also possess small, open cavities ringed by reworked bone consistent with weeping wounds and osteomyelitis. This suite of injuries may be consistent with attack from a large predator, with *Tyrannosaurus rex* being the only known viable candidate for an attack on the dorsal surface of an adult *Edmontosaurus* tail in the Lance. The amount and degree of reworked bone strongly suggests this *Edmontosaurus* individual survived the attack but died before fully healing. Ossified tendons extending down the caudal series are systematically bowed, indicating that they were likely pre-stressed, and flexed after coming loose prior to fossilization. This fossil adds to the suite of Lance hadrosaur mummies and reveals new pathologies which hint at the group's paleoecology. This specimen is now reposited and on permanent exhibit at the Schiele Museum of Natural History in Gastonia, North Carolina.

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

Variation in the maxillary canal morphology of Zambian gorgonopsians with preliminary implications for gorgonopsian phylogeny and ecology.

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The maxillary canal is an osseous tube that runs parallel to the alveolar margin of the maxilla and carries trigeminal nerve fibers that innervate the soft tissue structures of the face. Recent studies have shown that non-mammalian synapsids possess a complex and highly ramified maxillary canal, implying an increased degree of facial sensitivity for members of the clade. Despite these recent discoveries, the neurosensory capacity of some major synapsid groups remains understudied. Specifically, little attention has been paid to the maxillary canal morphology of gorgonopsians, the dominant large-bodied predators of late Permian ecosystems. Here, we present preliminary data on the maxillary canal morphology of seven Zambian gorgonopsian specimens representing six genera. All gorgonopsian maxillary canals in the study were characterized by an extremely dense network of branches that radiated outwards from a central canal and terminated in foramina on the surface of the bone. All specimens also displayed short, posterodorsally projecting branches located at the caudal end of the canal. Similar branches have been identified in some therocephalians and anomodonts, but no therapsid clade has previously been united by this feature. In addition, the external nasal division of the neurovascular canal bore a remarkable number of branches, many of which were angled posteriorly. Though this feature is somewhat uncommon among Permian therapsids, it is notably present in dinocephalians, including the carnivorous *Anteosaurus*. There were also a number of characters that seemed to distinguish gorgonopsian taxa from one another. In all but the two basal-most taxa (*Gorgonops and Scylacocephalus*), the alveolar rami shared a common trunk, suggesting that this character may be a derived feature. In addition, both specimens referred to the genus *Lycaenops* displayed a number of fine branches that projected laterally from the main canal. This feature is unique among therapsids, with a somewhat similar condition only having been observed in the biarmosuchian Pachydectes. Given that maxillary canal morphology has been previously used to infer phylogeny and ecology in non-mammalian synapsids, our findings, which include quantitative analyses of canal complexity, may prove useful in resolving hypotheses about gorgonopsian taxonomy and behavior.

Funding Sources: University of Washington Department of Biology

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

New insights into F.V. Hayden's mysterious 1869 discovery of the first *Allosaurus* fossil and Colorado's first dinosaur fossil: the case of the "curious vertebra"

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While conducting his 1869 survey of Colorado, F.V. Hayden obtained a "curious vertebra" fossil. The partial vertebra was identified by Joseph Leidy as belonging to the dinosaur *Poicilopleuron* but ultimately would be regarded as from the famous Jurassic theropod *Allosaurus*. This vertebra is the first discovery known of *Allosaurus* and was the first dinosaur fossil discovered in Colorado. Although attributed to Hayden, he got the fossil from someone else. Despite its importance, exactly where and how the specimen was collected still remains a mystery. Leidy presented on the fossil at an 1870 Academy of the Natural Sciences of Philadelphia meeting. Published meeting minutes state that Hayden "thinks" it was derived from a Cretaceous formation in Middle Park and locals called it "a petrified horse hoof." Originally, when Hayden wrote to Leidy during his survey, he asserted the fossil was from South Park. Hayden shipped the fossil shortly after his visit to Middle Park, but before traveling to South Park, indicating the fossil was not found in Middle Park by locals and given to Hayden during his exploration there as long suspected by historians. More likely Hayden obtained the specimen from a mineral cabinet in a bank in Georgetown during a visit as the bank had recently acquired "a pair of petrified pony hoofs." These "hoofs" were publicized in the local newspaper and were found by a prospector "somewhere west of the range." Without explanation, after the 1870 meeting, the stated location of the fossil changed from South Park to Middle Park in the final published minutes. We argue the location was changed because Hayden did not know specifically where the specimen was collected; and after it was determined to be a dinosaur, he ascribed a Cretaceous age to it. During his survey Hayden determined that South Park was principally composed of Triassic strata, whereas Middle Park had significantly more Cretaceous units, and thus, the fossil was more likely from Middle Park. However, if indeed the *Allosaurus* vertebra was collected by a prospector, a probable location for the fossil would have been where active gold/silver mining and exploration, and outcrops of the Jurassic Morrison Formation were in proximity to each other. In this scenario, the fossil was not likely from Middle or South Park, but from Morrison Formation outcrops near the Breckenridge-Silverthorne area.

Technical Session VI: Dinosauria II: a "bird-hipped" bonanza (Thursday, November 12, 2026, 8:00 AM)

Reevaluating pachycephalosaurian relationships through expanded morphological character sampling

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Pachycephalosauria is a clade of medium to small-bodied bipedal ornithischian dinosaurs from the Late Cretaceous of North America and Asia. Pachycephalosaurs possessed thickened and ornamented cranial elements, and most fossils recovered for the clade consist of these isolated or associated cranial bones. Postcranial elements and complete skulls are rare, making phylogenetic relationships within Pachycephalosauria difficult to disentangle. Understanding pachycephalosaurian cranial morphology is further confounded by ontogenetic variation in cranial ornamentation and development of the frontoparietal dome. Our phylogenetic analysis includes four outgroup taxa representing major ornithischian clades and 20 ingroup taxa, including recently described pachycephalosaurian taxa and undescribed specimens. We reevaluated and modified published characters and added characters, more than doubling recently published character sets. This expanded character set captures morphological variation in cranial anatomy, dentition, postcranial anatomy, and ornamentation, with postcranial characters comprising 50% of the matrix. Compared with previous analyses in which more than 80% of characters sampled cranial anatomy and ornamentation, our broader anatomical sampling recovers new tree topologies with fewer polytomies and different evolutionary affinities. Our strict consensus results recover

specimens first identified as *Dracorex* and *Stygimoloch* as sister taxa, but not *Pachycephalosaurus,* casting doubt on the hypothesis that these three taxa represent a single ontogenetically variable taxon. The most speciose genus within Pachycephalosauria, *Sphaerotholus*, is not recovered as monophyletic, suggesting that some taxa currently assigned to *Sphaerotholus* may require reclassification. The earliest branching pachycephalosaurian taxa in our analysis, *Goyocephale*, *Wannanosaurus,* and *Zavacephale*, respectively, are Asian taxa representing different combinations of ancestral and derived character states across cranial and postcranial anatomy. Our results underscore the need for continued refinement of morphological characters and robust anatomical descriptions. Application of CT scanning to investigate key anatomical and developmental characteristics will be critical for future research clarifying pachycephalosaurian ontogenetics, systematics, and taxonomy.

Funding Sources: The Harlan Graduate Research Fellowship

Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

New Late Cretaceous (Santonian-Campanian) mammals from Appalachia

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There are nearly fifty locations on Laramidia where Late Cretaceous mammal teeth have been found, with only four main localities on Appalachia, the eastern side of the Western Interior Seaway. For a variety of reasons, including increased sediment supply during deposition on the western landmass, and the rarity of fluvio-deltaic deposits in Appalachia, far fewer Santonian–Campanian mammal teeth have been found from Appalachia than from Laramidia. There are approximately 50 individual Santonian–Campanian mammal teeth from the whole of Appalachia, while there are hundreds of individual teeth from Laramidia. When Santonian–Campanian Appalachian mammals were first discovered from the Marshalltown Formation (Ellisdale Local Fauna) in New Jersey, workers deemed them to be most comparable to Judithian taxa from Laramidia. However, in 2010 and 2016, additional teeth from the Ellisdale site suggested that these taxa were not like the Judithian taxa, but were perhaps endemic to Appalachia, having descended from a time when Laramidia and Appalachia were still connected, but had since evolved in isolation. Several additional teeth from North and South Carolina not only increased the number of teeth (and sites) in Appalachia, but their large size hinted at a lineage different from generically similar taxa on Laramidia. Teeth are referred to cimolodontids, cimolomyids, and ptilodontoids from New Jersey, North Carolina, and South Carolina, but they are less derived than their counterparts on Laramidia. The only currently known metatherian teeth from Appalachia were discovered in New Jersey, including a complete M3 that has been identified as a probable stagodontid.

There has been a recent discovery of four additional Santonian–Campanian mammal teeth from a new location on Appalachia in northeastern Mississippi. This represents the southernmost mammalian fauna from Appalachia and is comprised of three multituberculate teeth (M2, p4, P4) from the Tombigbee Sand Member of the Eutaw Formation, and one multituberculate tooth (m1) from the Eutaw Formation. Preliminary study supports the hypothesis that these populations represent a relict group that took a different evolutionary path due to different evolutionary pressures. A lack of archaic genera such as *Symmetrodontoides* on Appalachia also sheds light on the timing of the separation of the landmasses by the Western Interior Seaway.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Using machine learning models to assess variation in fossilized horse teeth for species classification in education

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Accurate species-level classification of fossil material is central to reconstructing evolutionary histories, yet identification from isolated elements such as teeth is often complicated by phenotypic variation and incomplete contextual data. This study describes the development and classroom implementation of an inquiry-based lesson that integrates machine learning to assess variation in fossilized horse teeth for species classification. The lesson was piloted in middle and high school settings and builds upon prior modules in which students investigate fundamental principles of evolutionary theory through hands-on analysis of 3D-printed fossil horse teeth.

Students analyzed a dataset of upper first molar images representing six equid taxa spanning approximately 55 million years of North American horse evolution. Initial classification tasks required students to apply traditional paleontological approaches by sorting unlabeled specimens based on diagnostic morphological features, including protocone structure and enamel plication patterns. Students then trained and tested a supervised computer vision model (convolutional neural network) using labeled image datasets within a Jupyter Notebook environment, allowing for parameter manipulation and evaluation of classification outcomes. Comparisons between student-generated classifications and model outputs revealed both convergence and divergence in species assignments. Students also developed an understanding that machine learning models classify specimens differently than humans, identifying patterns in numerical representations of images rather than relying on explicit recognition of morphological features.

The integration of both model use and examination of how the model operates represents a distinctive aspect of this lesson. Model performance varied across taxa and highlighted challenges associated with intraspecific variation and overlapping morphological characteristics. The results demonstrate the value of incorporating machine learning approaches into paleontology education to model authentic scientific practices and highlight ongoing challenges in species classification. Results from an effectiveness study will be shared to evaluate lesson effectiveness and support future education and outreach efforts.

Funding Sources: NSF 2147625

Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

One size does not fit all: parametrically designed 3D-printed storage solutions for museum collections

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Commercially available storage boxes and trays come in a limited range of standard sizes that may be suboptimally suited to the specimens they are intended to house. Partially filled containers reduce storage efficiency and can consume collections space that many institutions cannot afford to lose. Of greater concern, poorly sized boxes and trays may not properly support the contained specimens and may permit unwanted movement, increasing the risk of damage during handling and transport. 3D-printed storage solutions have several potential advantages over commercially available options. They can be tailored to specific storage dimensions, reduce damage risk by ensuring the specimen is properly supported, and maximize storage efficiency. While it is impractical to create bespoke 3D-printed storage boxes for every individual fossil specimen, parametric computer-aided design (CAD) is well suited to developing storage solutions for semi-standardized objects like histological slides and specimen vials. By allowing key design parameters to be adjusted dynamically, parametric models enable the in-house generation of customizable boxes and trays that can be adapted to a range of sizes and storage requirements, often at a price point that is more attractive than commercially available options.

To demonstrate the utility of this design philosophy, I developed a parametrically driven CAD file to produce customizable slide storage

boxes. Slide dimensions (length, width, and thickness) and storage capacity (i.e., the number of slides per box) are defined by the user. This flexibility enables the production of storage boxes that decrease damage risk by ensuring each slide is properly supported and restrained, while also reducing wasted space within collections by eliminating partially filled containers. Additionally, the box wall thickness can be adjusted to produce thin-walled boxes optimized for long-term storage or thicker, more robust thick-walled boxes optimized for shipping and transport.

This example demonstrates how coupling parametric design with 3D printing can provide adaptable, cost-effective storage solutions for a wide range of semi-standardized objects.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

A new multitaxic bonebed containing dinosaurs from the Lower Jurassic Glen Canyon Group, an expanding fossil record in Glen Canyon National Recreation Area, Utah, USA

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Body fossils from the Lower Jurassic Glen Canyon Group (GCG) have been documented in the literature since the early 20th century. Despite this, the variety of taxa and the overall number of specimens known from the GCG in Utah has remained relatively low, standing in contrast to the exceptionally high diversity and abundance of ichnotaxa. Most GCG body fossils in Utah have been found by happenstance or while prospecting for new ichnofossils. In recent years, discovery of monotaxic tritylodontid bonebeds while surveying for ichnofossils has yielded a recognizable and consistent search image for body fossils within the upper Kayenta Formation and lower Navajo Sandstone within Glen Canyon National Recreation Area (GLCA). Teams from the National Park Service and the St. George Dinosaur Discovery Site have utilized this search image in GLCA to survey for body fossils. Here, we report on a new discovery of the first multitaxic bonebed and the oldest dinosaur remains from the GCG within GLCA.

A carbonate-cemented sandstone horizon, containing multiple sand- and shale-dominant beds, was located by the first author in May 2026. The horizon is intermittently fossiliferous, with impressions of cortical bone surfaces preserved on the in situ, weathered exposure. The most fossiliferous bed is massive and well cemented, ranging between 5 and 15 cm in thickness. Float blocks from this layer have produced numerous tritylodontid teeth and jaws of different size classes. Three theropod dinosaur teeth, identified by their recurved profile and laterally compressed cross-sections, were also recovered. One of these teeth was found still within its bony alveolus, suggesting postmortem transport. Another of the teeth possesses well-defined distal denticles that were identifiable in the field. Additionally, possible crocodylomorph elements were found. The lithology suggests a lacustrine depositional environment.

The fossiliferous horizon is extremely hard, and preparation is ongoing. This site adds to the growing number of vertebrate body fossil sites within GLCA and the greater GCG exposures. Reevaluation of the GCG by land managers for Potential Fossil Yield classification may be warranted as a better understanding of the body fossil beds of the GCG emerges.

Funding Sources: National Park Service, Glen Canyon National Recreation Area, St. George Dinosaur Discovery Site, Idaho Museum of Natural History

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Technical Session XV: Dinosauria IV: a mostly “bird-hipped” bonanza (Saturday, November 14, 2026, 8:00 AM)

A new small coelurosaur (Dinosauria: Theropoda) specimen from the Romualdo Formation (Early Cretaceous, Brazil) sheds new light onto the early evolution of Ornithomimosauria in South America

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The Romualdo Formation (RF) in Northeastern Brazil is one of the most consequential fossiliferous units from South America, world-famous for the exceptional preservation of fossils. Among the groups represented are coelurosaur theropods, known from only four specimens, three of which are the holotypes of their own species, all incomplete and whose phylogenetic affinities remain the subject of debate. Here, we present a new coelurosaur specimen (MN 8063-V, housed at the Museu Nacional/UFRJ) from the RF and evaluate its phylogenetic relationships, along with the other coelurosaur taxa present in this stratigraphic unit. The specimen, which represents the most complete Brazilian theropod, was CT-scanned and paleohistologically analyzed. It consists of an almost complete and articulated skeleton, preserving most of the skull, vertebral column, and appendicular elements, with an estimated length of no more than 1.2 m. Its braincase is distinctly pneumatized, with expansive subcondylar, subotic, and parasphenoid recesses. A subotic recess is present in ornithomimosaurs and troodontids, whereas a well-developed parasphenoid recess is present in the troodontid *Sinovenator*. Its dentition is ziphodont mesially, like that of most theropods, but with pencil-shaped teeth distally, like those of basal ornithomimosaurs. The cervical vertebrae are long with extremely reduced neural spines and epipophysis, as in ornithomimosaurs, and pneumatized by two foramina depressed within a small fossa just posterior to the parapophysis. Unusually among coelurosaurs, the cervicals are strongly opisthocoelous. The posterior dorsal neural arches are deeply excavated by fossae and the neural spines are fan-shaped, with a long posterior spur-like projection, resembling the condition in *Pelecanimimus*, but unlike *Mirischia*. The humerus is long, slender and straight in lateral view, like that of ornithomimosaurs, and the femur has an anteromedially directed head and a small, ridge-like fourth trochanter, as in *Santanaraptor* and *Mirischia*. The tibia lacks the medial fossa present in *Aratasaurus*. Histological data reveals unambiguous evidence of somatic maturity and slow growth, with 16 cyclical growth marks. Phylogenetic analysis recovered the specimen as a basal member of Ornithomimosauria, as were the other RF taxa, but not as a monophyletic clade. These results shed light on the early evolution of Ornithomimosauria and place South America as a key region for the study of these dinosaurs.

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Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Trophic models incorporating microvertebrate data show stability of Late Triassic terrestrial vertebrate communities in equatorial Pangea across the Adamanian–Revueltian faunal turnover

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Reconstructing trophic interaction in extinct vertebrate communities allows inference of the processes that govern community assembly, faunal turnover, extinction, and recovery through major climatic shifts. However, building trophic networks can be challenging for deep-time assemblages dominated by fragmentary fossils; functional traits (e.g., diet, body mass, motility) can

be difficult to determine, and groups with larger body size are often overrepresented, and smaller body size groups are routinely excluded, leading to an underestimation of taxonomic and functional diversity. To rectify this, we constructed more realistic models of community structure by incorporating microvertebrates from the Late Triassic of the southwestern United States. These communities chronicle the Adamanian–Revueltian faunal turnover (~215 mya), an event coincident with aridification, as a case study on community structure across shifting climate. This event has been identified primarily by the replacement of large-bodied taxa (e.g., phytosaurs, aetosaurs), but small-bodied taxa, including early members of "modern" faunas, have yet to be fully investigated. We consider three geographically close sites (within ~50 km, metacommunity scale): the Adamanian Placerias Quarry, the Revueltian Green Layer locality, and the Bowman site. We also include the Lower Kalgary, Texas, and Bluewater Creek Sixmile Spring, New Mexico, localities as examples of Adamanian assemblages on a regional scale. We revised community compositions to include microfossils and scored all members for functional traits (using phylogenetic bracketing and new methods linking tooth height to body mass). We then built trophic networks based on guild-level interactions to quantitatively analyze community structure. Our results indicate a relatively stable post-turnover metacommunity in the Revueltian as shown by increase in connectance, link density, and lowered network diameter. This suggests higher complexity and a more densely connected trophic structure following turnover but minimal changes in network organization. Such changes are not detectable using analyses that exclude microfossils. Incorporating intensely sampled microsites changes interpretations of community structure by representing lower trophic levels. Inclusive sampling allows for more realistic trophic networks to identify the processes that drive community changes across local and regional scales and during periods of major environmental and evolutionary change.

Funding Sources: NSF EAR 1943286

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Dinosaur and plant ecology in a pre-angiosperm world: dinosaur habitat analysis of the Late Jurassic Morrison Formation

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The Morrison Formation of North America is one of the world's classic long records of continental vertebrate evolution, preserving an extensive record of Late Jurassic dinosaurs and their environments. Built from more than 150 years of collecting, this record offers a rare opportunity to examine how dinosaur distributions relate to plant-defined habitats in a pre-angiosperm world and to evaluate settings that supported some of the largest terrestrial animals. This study uses more than 600 taxon-locality occurrences to test geographic affinities between 11 herbivorous dinosaur groups and 14 plant groups. Dinosaur-plant pairings were evaluated with four spatial parameters: number of occurrences in a geographic range, centroid distances, non-overlap of geographic occurrences, and the ellipsoid distance ratio function, which compares mean dinosaur-plant distances with mean within-group distances. Each pairing was ranked from strongest to weakest affinity for each parameter and assessed using combined rankings from latitude-longitude occurrence data. Results indicate that Morrison dinosaur distributions are consistently associated with wetland and riparian plant groups, especially Equisetales. Equisetales, representing horsetails common along wet floodplains and stream margins, provide the most persistent habitat signal across nearly all dinosaur groups. Sauropods, including *Apatosaurus/Brontosaurus*, *Barosaurus*, *Brachiosaurus, Camarasaurus*, and diplodocids, show repeated affinities with Equisetales, with additional associations to Araucariaceae and Cupressaceae, suggesting wooded floodplain or lowland forest settings. Ornithischians show distinctive patterns: *Stegosaurus* and basal neornithischians are strongly linked to Equisetales but with some affinity to Pinaceae, whereas armored and plated

dinosaurs show stronger associations with Podocarpaceae, Pinaceae, Ginkgophyta, and groups that may indicate more open and better-drained habitats. Some associations require caution. The affinity with Equisetales, Charophyta, and Bryophyta may partly reflect taphonomic and depositional bias because dinosaur bones are commonly preserved in fluvial, pond-margin, and lacustrine settings. Even so, the repeated Equisetales signal is striking. These results suggest that horsetail-rich wetland and riparian habitats were major components of Morrison dinosaur diets and ecosystems, while variation among dinosaur groups records broader habitat partitioning across the Jurassic landscape.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Hidden in plain sight: When reexamination of museum specimens reveal new discoveries, and the unexpected benefits to institutions

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Museum paleontology collections represent an archive of natural history of Earth, and yet many specimens remain understudied or described with outdated techniques. The reexamination of fossil collections has revealed a wealth of specimen biodiversity in which were mislabeled, misidentified, or improperly assigned. Modern advances in paleobiological and geochemical techniques allow researchers to reassess historical collections with far greater precision than what was possible at the time of description. Such reassessments have led to the identification of numerous new species, such as *Tylosaurus rex*, a tylosaurine mosasaur which had been on display as different Tylosaurus species across the globe for decades. This is only one such example of how reviewing existing collections material consistently proves to reshape the interpretations of patterns of extinction and diversification. Furthermore, revisiting museum collections is cost-effective and scientifically sustainable, maximizing the research value of collected material without the need for extensive new field expeditions. The renewed analysis of legacy specimens can uncover critical data from rare or inaccessible fossil localities which may no longer be revisited. One such example of legacy material from an inaccessible locality would be the more than 50 specimens of Permian dissorophid temnospondyl genus *Cacops* yielded from the Cacops Bone Bed (CBB), Baylor County, Texas. Cacops material was nearly exclusively from CBB for the majority of the 20th century—this has been made an issue, as CBB has been completely underwater for more than 100 years due to the damming of Lake Kemp in 1923. With no ability to revisit CBB, the foundations of Cacops research for more than six decades were the *C. aspidephorus* specimens collected before the destruction of the type locality.

This study and its data highlight the importance of systematic reanalysis of museum collections as a fundamental component of modern paleontological research, emphasizing its role in improving taxonomic accuracy, expanding knowledge of past biodiversity, and preserving the scientific relevance of historical collections for future discovery.

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

The role of intraspecific variation in Eco-Evo-Devo

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Conceptually, the field of evolutionary-developmental biology has focused on identifying how evolution has impacted development (Evo-Devo) and how development impacts evolution (Devo-Evo). When applied to phenotypic evolution, studies often take the framework of evoking developmental biology as a mechanism for explaining evolutionary changes on macro-scale. These efforts have generated substantial advancements in our understanding of major vertebrate evolutionary events, for instance the role of duplicated HOX genes in generating serial structures. Currently, with advancing studies of intraspecific variation of phenotype and development, we can begin to move beyond

macroevolutionary questions and move into investigating microevolutionary questions.

Here, I aim to demonstrate how we may use knowledge of phenotypic variation to form testable hypotheses of how developmental traits vary within populations of a species and how we may simultaneously use our knowledge of developmental variation induced by environmental changes to test hypotheses of phenotypic variation, e.g., questions which are Eco-Evo-Devo in nature. To do this, I synthesize my efforts to characterize intraspecific variation of dental systems in rodents from both phenotypic and developmental perspectives. With a particular emphasis on the phenotypic variation in the sagebrush vole, *Lemmiscus curtatus*, over the past four million years, and the developmental variation of the common lab mouse, *Mus musculus*, as part of a controlled lab experiment. In addition to demonstrating how we may develop these hypotheses, I also emphasize where challenges remain and how we may overcome these challenges through combinatorial efforts of evolutionary and experiment-based studies.

Funding Sources: National Institute of General Medical Sciences of the National Institutes of Health

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Shifts in body mass in modern and fossil jaguar, *Panthera onca*

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Jaguars, *Panthera onca*, are the third largest living felid and the only living big cat (Pantherine) in the Western Hemisphere. Fossils of the species have been found widely from Oregon to southern Argentina and were on average 25% larger during the Pleistocene with some authors naming the North American specimens a distinct species or subspecies, *Panthera (onca) augusta*. Here, we investigate size differences in an example dataset of skeletal measurements of fossil and modern/historic jaguar using published regressions where linear measurements of skeletal and dental remains are used to estimate body mass. We also explore differences between mass estimates when using dental or postcranial measurements. In this initial study, Pleistocene jaguars were significantly larger on average than modern individuals using both dental and skeletal measurements. Measurements from the limbs resulted in larger mass estimates than those of the skull or teeth for fossil jaguars while the comparable modern specimen did not vary. These initial findings highlight the importance of understanding proportions in subject species and associated skeletons. Further efforts will require more complete modern and fossil skeletons and further understanding of skeletal proportions in jaguars.

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

Reevaluating Waco Mammoth National Monument (Texas, USA): Demographic and pathologic signatures of environmental stress in *Mammuthus columbi* assemblages

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Waco Mammoth National Monument (WMNM) is a series of late Pleistocene Columbian mammoth fossil beds. The largest of these, Fossil Bed 1 (66.8 ± 5.0 ka), preserves an assemblage of females with juveniles. These individuals, suggested to be analogous to familial herds of modern elephants, potentially present opportunities to better understand Columbian mammoth ecology. However, determining the mechanisms that formed Fossil Bed 1 has been contentious: it has been described as a catastrophic assemblage resulting from flash flooding, an attritional assemblage resulting from drought, and a "patternless" assemblage of unknown cause. This project seeks to resolve this discrepancy by determining the minimum number of individuals (MNI), creating a mortality profile, and assessing pathologies of individuals in the Fossil Bed 1 assemblage. The MNI was determined to be 18 individuals, adding 3 new individuals to the assemblage. Laws' aging method for African elephants was modified to create a new,

Columbian mammoth-calibrated method, and ages were determined for each individual. Comparing the resulting mortality profile to other elephantid mortality profiles, Fossil Bed 1 is most like African elephant herds affected by multiyear droughts, which affect population growth prior to mass mortality. Examination of individuals in Fossil Bed 1 revealed numerous pathologies, particularly in the upper limbs. Most individuals presented with Harris lines, which reflect disrupted bone growth. The presence of Harris lines in juveniles suggests physiological stress near the time of death. Interestingly, adults also presented with Harris lines, which would have formed during their juvenile years. Taken together, this suggests recurring ecological disturbances impacting population health.

Previously thought to be "problematic" with no discernible corollaries, our results demonstrate Fossil Bed 1 formed as a result of a short-term mass death event associated with ecological disturbance, similar to elephant death assemblages caused by drought. Further, the individuals experienced recurrent physiological stress caused by prolonged ecological disturbance that likely impacted the health of the population. These revised interpretations suggest that other poorly understood Columbian mammoth assemblages should be revisited, as new analyses may reveal previously obscured details.

Funding Sources: Cooperative Research and Training Program Grant #P21AC10517 and #P22AC01166 (National Park Service), Bryce C. Brown Research Fellowship (Mayborn Museum Complex)

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

The life cycle of collections-based paleo data

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The research data life cycle is a concept widely used to describe data-centric phases of decision making and tasks throughout the research process. These phases are frequently labeled Plan, Acquire, Process, Analyze, Preserve, Publish, and Reuse. Here, we adapt the generic research data life cycle for collections-based paleontological data. We highlight domain-specific considerations in each phase, and we contextualize the value of the data life cycle for paleontological researchers. We also point to commonly used resources—including data standards—and roles in order to make this perspective practical.

Critically, we aim to illustrate the cyclical nature of collections data: from initial capture to data mobilization and publishing, refinement and use in research products, and finally reintegration of resulting data back into the original collections data system for future discovery and reuse. Closely examining the entire life cycle of paleontological collections data ensures that each phase is optimized to best support ongoing stewardship, broad use, and coordination with research efforts. In addition, it facilitates alignment with key data principles leading to data that is more FAIR (Findable, Accessible, Interoperable, Reusable) in the long run.

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Histometrics and *μ*CT imaging reveal soft tissue correlates and illuminate the evolution of the avian cardiopulmonary system

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From high altitude soaring to active pursuit diving, crown birds (Neornithes) possess perhaps the most specialized cardiopulmonary system among vertebrates. Influenced by developmental, mechanical, and environmental factors, anatomical variation across this paired system directly affects the acquisition, circulation, and utilization of O_2 throughout the muscles and organs. Importantly, understanding the origin and evolution of this system illuminates the physiological and anatomical prerequisites for powered flight. However, because physiological processes can only be accurately studied in living animals, and soft tissue is rarely preserved in fossils, there is a critical knowledge gap in studies of the cardiopulmonary system across deep time. Here, I ask: Can reliable osteological correlates for erythrocyte size and attachment sites for pulmonary diverticula in pneumatized bone—termed "pneumosteum"—be identified in extant and extinct archosaurs, and is this system altered in response to changing environmental media or behavior? To address this uncertainty, I first integrated peripheral blood smear and histometric data from 20 extant and 20 extinct vertebrates into a phylogenetic eigenvector map framework to visualize broad patterns of erythrocyte size evolution over time, indicating aerobic capacity. I then assessed the validity of pneumosteum as an osteological correlate for pneumatic diverticula in 7 extinct and 21 extant amniotes. Finally, I identified the best of the tested correlates and used both osteological and μCT data to map out patterns of postcranial pneumatic expression across the most speciose clade of Mesozoic birds, the Enantiornithes. I ultimately found that red blood cell size reductions indicate fast O_2 uptake kinematics and elevated aerobic capacity along Avemetatarsalia, with subsequent diminutions occurring in extinct and extant birds. This would have been an important prerequisite for prolonged powered flight. Additionally, osteological correlates for pulmonary diverticula are lost in secondarily aquatic pursuit-diving birds, and strongly bounded pneumatic foramina are typically associated with both pulmonary diverticula and pneumosteum. Lastly, pneumaticity in enantiornithine birds was shown to be highly variable within the axial column between species, comparable to the variation seen in extant neornithine birds. These combined results enhance our understanding of cardiopulmonary evolution and cell-tissue interactions in birds.

Funding Sources: University of Southern California, Department of Earth Sciences Student Research Award; USC Donn S. Gorsline Endowment for Sedimentology Award

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Troodontid (Dinosauria: Theropoda) Remains from the Upper Cretaceous Kaiparowits Formation of Utah

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Troodontidae is an enigmatic group of paravian theropod dinosaurs known primarily from the Cretaceous of North America and Asia. While the Asian record of troodontids includes a series of exceptionally preserved specimens, the North American record is far sparser. One of the more complete North American troodontid specimens described in recent years is *Talos sampsoni* from the Campanian Kaiparowits Formation of southern Utah, comprising vertebral, pelvic, and hindlimb remains. Other fragmentary troodontid remains recovered from the Kaiparowits Formation cannot be referred to *T. sampsoni* because they lack skeletal overlap with the holotype specimen, yet are nonetheless critical for reconstructing the clade's diversity, evolutionary history, and biogeography. Here, we redescribe isolated troodontid teeth and skeletal elements from the Kaiparowits Formation, including a left frontal (UMNH.VP.16303). UMNH.VP.16303 is referable to Troodontidae on the basis of a raised orbital rim, enlarged cerebral fossa, pronounced supratemporal ridge, and approximate right angle between the medial and caudal edges. Although UMNH.VP.16303 cannot be referred to *T. sampsoni*, it does possess traits that preclude referral to other named troodontids from the Western Interior Basin, suggesting it either belongs to *T. sampsoni* or a new taxon. This includes a relatively shallow lateral endocranial wall and a more pronounced cerebral bulge in dorsal view.

Relative proportions of the length and widths at different points of the orbital margin are consistent with those of other North American troodontid frontals, although uncertainty in the intraspecific and ontogenetic variation in orbital margin shape prevents more precise interpretations. UMNH.VP.16303 and other fragmentary materials expand the known morphologic variation in troodontids and highlight the distinctiveness of the Kaiparowits faunal assemblages relative to other well-known formations across the Western Interior Basin, including poorly known small-bodied theropod taxa. Continued collection of specimens and analysis of additional skeletal remains and teeth from troodontids will help elucidate the largely enigmatic evolutionary and biogeographic history of troodontids in North America.

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Intra-trackway variation in the theropod ichnogenus *Irenesauripus* at the Nîsôtêw Nimisêw Waciy Tracksite, Gething Formation (Lower Cretaceous), northeastern British Columbia, Canada

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The theropod ichnogenus *Irenesauripus* was first described from abundant tracks in the Peace River Canyon of northeastern British Columbia, in the Aptian–Albian Gething Formation. *Irenesauripus* tracks at this site average around 39 cm in length and are considered to have large allosauroid origins, although no skeletal material is known in the Gething Formation. The original diagnoses of the three ichnospecies of *Irenesauripus* lack sufficient detail in a modern ichnotaxonomic context and rely on common features found in many theropod dinosaur tracks. However, the recently excavated Nîsôtêw Nimisêw Waciy Tracksite, located near Carbon Creek to the southwest of the original Peace River Canyon sites, preserves dozens of theropod tracks in multiple continuous trackways that are referable to *Irenesauripus*. We use the large sample size of natural replicates in these trackways to test ichnotaxonomic hypotheses. Measurement and photogrammetric data from the tracksite were collected during 2023 and 2024 fieldwork by the Royal BC Museum. A 2D geometric morphometric analysis and principal component analysis (PCA) was conducted using multiple theropod trackways from the study site and museum specimens from separate localities that have been previously identified as *Irenesauripus.* The most prevalent ichnite of the study site is cf. *Irenesauripus acutus*. Toe divarication often matches the characteristic asymmetry of *I. acutus*, but some tracks within these trackways lack asymmetry. Preliminary data from the PCA suggests that toe robustness and the length of the tarsal region explain most of the shape variation in the tracks. Associated tracks within an entire trackway cluster together rather than by any perceived level of preservation quality. The *Irenesauripus* material external to the study site does not cluster together, but individual external specimens of *I. acutus* overlap with the morphospace of some trackways in the study site. The results suggest that morphospaces of each trackway are unique and are likely influenced by the kinematic and sedimentological circumstances experienced by each trackmaker. The current definition of *I. acutus* could be amended to reflect these natural variations. Future steps intend to disentangle possible differences in foot morphology between different trackways.

Funding Sources: NSERC Discovery Grant RGPIN-2020-04012

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Styracosaurus albertensis* growth series recovered with cladistic methods is found to share growth changes with *Centrosaurus apertus

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Styracosaurus albertensis is a centrosaurine from the Campanian Dinosaur Park Formation of Alberta, Canada. It is a close relative of the well-studied and sampled *Centrosaurus*, yet its growth series has not been cladistically recovered. Its

fossil record includes specimens of various sizes, and, presumably, different levels of maturity. The goal of this study was to recover the growth stages of *S. albertensis* using cladistic methods. Fifteen ontogenetic characters were coded in a Mesquite data matrix for eight specimens, including the holotype specimen (CMN 344). Characters were coded based on descriptions and photographs in the literature.

The analysis was done in PAUP and three trees were recovered, each with 23 steps and a consistency index (CI) of 1.0 and a rescaled consistency index (RC) of 1.0. Five growth stages were identified. The first (= subadult) growth stage is supported by the absence of postorbital horncore resorption pits, open epiparietal sutures, and short and small parietal processes. The second growth stage (= early adult) is supported by the presence of postorbital horncore resorption pits, the 440 mm length and large relative size of the P3 process, and the 250–260 mm length and medium relative size of the P4 parietal process. The third growth stage (= adult) is supported by the 25–27 mm length of the P2 process, the 150 mm length of the P5 process, the medium relative size of the P3 process, and the large relative size of the P6 parietal process. The fourth growth stage (= late adult) is supported by the 510 mm length of the P4 process, the 230 mm length of the P5 process, the large relative size of both processes, and coalescence of the bases of both processes. The most mature growth stage (= senescent adult), represented by the type specimen, is supported by the smaller size of the P6 parietal process relative to the fourth growth stage.

These results are consistent with non-cladistically hypothesized growth stages in the literature. *Styracosaurus* and its close relative *Centrosaurus* share the growth patterns of closed epiparietal sutures in adults and reduced parietal processes in the most mature specimens. These shared growth patterns indicate inheritance from a common ancestor, the origins of which can be tested by recovering the growth series of their sister taxa.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A reassessment of fossils of proposed galliform affinities from the lower Oligocene Armissan Quarry, France

Janet A. Canamar[1], Julia R. Clarke[1]
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The Armissan Quarry located near Narbonne in southern France represents a late Early Oligocene (MP25; Rupelian ~28 Ma) lake environment known for fine-grained sediments that preserve delicate structures. Four fossil specimens collected from this quarry in the 19th century were assigned to two species with affinities to Galliformes. These fossils all comprise nearly complete but mostly disarticulated skeletons on slabs. Here, we describe the three specimens from this quarry housed at the Carnegie Museum of Natural History.

We identified CM 4459 as a missing specimen referred to species *Taoperdix pessieti* Gervais 1862, which was removed from its original matrix early in the 20th century, reassembled into a slab of cement, and then renumbered. Later in the 20th century, this species was referred to genus *Paraortyx* in the stem galliform taxon, Paraortygidae, potentially on the basis of the holotype in the Paris Museum of Natural History. Unlike the first specimen, the second skeleton, CM 88087, is still in its original matrix, informally labelled as "*Taoperdix pessieti*" but was never described. CM 2023 is the holotype of *Taoperdix keltica* Eastman 1905, which also remains in its original matrix. This species was characterized as distinct enough to merit a new genus and was renamed *Schaubortyx keltica* in 1964 and referred to the Phasianinae. In contrast to *Paraortyx pessieti, Schaubortyx keltica* has subsequently been considered a crown galliform. This study investigates whether crown and stem galliforms were commonly co-extant during the Oligocene and if the Armissan assemblage data supports this pattern. Here, we reassess the anatomy of the Carnegie specimens to analyze their phylogenetic position in relation to stem and crown Galliformes. This evaluation informs the overall understanding of the timing and pattern of the emergence of extant lineages of this clade.

Technical Session XVIII: Paleontological Practices: Education & Outreach (Saturday, November 14, 2026, 1:45 PM)

Integrating Latino American culture and heritage science through educational gameplay with Paleotería: A paleontological take on the classic game of "La Lotería"

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Hispanic communities are heavily underrepresented in many STEM fields, especially in geoscience areas such as paleontology. The reason for the matter is due to lack of accessible, informative resources or support from their community to pursue a career in STEM. To provide a creative solution for the inclusiveness of Hispanic spaces in science, we have developed an educational and entertaining way to appeal to Latino American audiences while promoting curiosity for paleontology through our game, Paleotería: La Lotería Paleontológica. Created through the Paleontological Society-National Park Service Artist in Residence program, Paleotería is based on the original game "La Loteria," a traditional bingo-style game beloved in many Latino American countries. This parody includes a set of 54 cards that highlight vibrant illustrations of fossils, animals, scientific careers, and tools in relation to paleontological processes and the rich fossil record that's preserved within the US National Park Service (NPS). The game also includes a single joker card that provides sources on how audiences can get involved in NPS Paleontology, and 20+ "tablas" (boards) with associated themes such as geologic eras, periods, or taxa. Designed for players of all ages, Paleotería is a fun fusion of culture and science that encourages inspiration, heritage pride, and paleontological literacy. Whether in a classroom setting or at a family "posada," our game provides learning and fun for all communities.

Paleotería serves as a culturally relevant tool to promote bilingual outreach and paleontological education, with a particular appeal to Hispanic and Spanish-speaking audiences, along with learners exploring Latino American heritage. The game encourages public engagement with paleontology by highlighting different kinds of extinct animals, fossils, concepts, and the importance of diverse communities in the form of science storytelling. While Paleotería has a fixed set of rules, many players and organizations have taken their own creative spin and liberty to make the game more entertaining and encourage learning. With hundreds of copies distributed at GSA Connects 2025, our game has made a significant impact on the inclusion of Latino American culture in STEM fields and audiences not just in the U.S and Mexico, but in countries around the world.

Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

What limits minimum body size in marine tetrapods? Evidence from multifactor agent-based models.

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In modern tetrapods, marine taxa often display much larger minimum body sizes compared to their terrestrial (or aerial) counterparts. This pattern is true for both ectotherms, e.g., snakes (*Tetracheilostoma carlae* ~6 g vs. *Hydrophis caerulecens* ~106 g), iguanian lizards (*Brookesia tristis* ~0.2 g vs. *Amblyrhynchus cristatus* ~600 g) and endotherms, e.g., mustelids (*Mustela nivalis* ~35 g vs. *Lontra felina* ~3,200 g), seabirds (aequornithes, *Hydrobates microsoma* ~18 g vs. *Eudyptula minor* ~550 g). This pattern holds true for the fossil record; the smallest fossil marine tetrapods are generally larger than their smallest terrestrial relatives, although direct comparison can be difficult due to phylogenetic uncertainty and incomplete preservation of fossil taxa. The overlapping mass ranges of ectotherms and endotherms suggest that factors outside of thermoregulation may contribute to minimum size limits. Whereas some marine tetrapods are endothermic, all need oxygen and carbon to maintain their metabolism through cellular respiration.

We integrated thermoregulation, oxygen balance, and performance submodels in a dynamic agent-based model (ABM) to test theoretical lower size

limits in marine tetrapods. ABMs provide a framework to tackle integrated systems, where regimes in one submodel directly affect components of other submodels. We simulated survival in an aquatic environment of varying temperatures. Mortality occurs when agents run out of oxygen (hypoxia), fall below a thermal threshold (hypothermia), or lose energy faster than it can be replenished (starvation). We applied the model to three fossil taxa that are amongst the smallest of their clades: *Aphanizocnemus* (Mosasauria), *Cartorhynchus* (Ichthyosauriformes), and *Dianopachysaurus* (Sauropterygia), using mass estimates based on preserved length and values for metabolism and conductivity informed by extant tetrapods.

Oxygen balance is a significant driver of death within our ABM, supporting the hypothesis that factors outside of thermoregulation influence minimum size limits in marine tetrapod taxa. Within the model, an endothermic physiology is intolerable for the simulated fossil taxa, especially when considering hypothetical newborns. Under ectothermic assumptions, taxa can survive at smaller body sizes but still incur deaths from hypoxia—supporting the idea that these organisms were operating close to minimum physical limits and were likely restricted to shallow marine lifestyles.

Technical Session IX: Archosaur paleobiology & pterosaurs (Thursday, November 12, 2026, 1:45 PM)

Taxonomic reassessment of the tapejarine pterosaurs from the Cretaceous of Cruzeiro do Oeste, Paraná, Brazil

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Caiuajara dobruskii is a tapejarid pterosaur known from the Cretaceous "Cemitério dos Pterossauros" site, which has yielded hundreds of tapejarine specimens representing different ontogenetic stages. Although assemblage has traditionally been regarded as monospecific, a recent study proposed a new genus and species, *Torukjara bandeirae*, based on two morphotypes among previously described specimens referred to *Caiuajara dobruskii*. Here, we reassess whether the tapejarine specimens from the "Cemitério dos Pterossauros" represent two distinct genera and species. We reexamined the diagnostic features proposed for the referred holotypes and for additional specimens assigned to each taxon and morphotype to test the validity of the proposed distinction. We also conducted linear morphometrics analyses using an expanded sample which includes new specimens and comparative taxa to evaluate whether the proposed morphotypes are quantitatively distinct. Different ranges of downward rostrum deflection were proposed as diagnostic for each species. However, we found no significant differences related to this angle between specimens referring to *C. dobruskii* and *T. bandeirae*. In contrast, pairwise t-tests recovered significant differences among *Tapejara*, *Tupandactylus*, and *Caiuajara* (or *Torukjara*). Qualitatively, several proposed diagnostic features are ambiguous, including the presence or absence of a palatal ridge and the number of palatal foramina. Other features appear to have been misinterpreted because of taphonomic distortion (e.g., the opthotic, which the holotypes do not preserve at the same degree). In addition, some postcranial characters, such as those from the cervical vertebrae, are not appropriate for diagnosis because they are preserved only in the holotype of *C. dobruskii*. Our quantitative results show that the morphospace occupied by *T. bandeirae* is entirely encompassed by that of *C. dobruskii*, even after accounting for size-related variation. The specimens referred to both taxa of similar size also occupy similar positions in morphospace, suggesting a shared ontogenetic trajectory. Together, these qualitative and quantitative results indicate that the characters proposed to distinguish *T. bandeirae* from *C. dobruskii* are not supported, and that the observed variation is better interpreted as intraspecific. We

therefore regard *Torukjara bandeirae* as a junior synonym of *Caiuajara dobruskii*.

Funding Sources: CNPq #308707/2023-0, #141114/2023-1, #309245/2023-0 #406902/2022-4; FAPERJ #E-26/200.558/2026

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Development of a workflow to characterize diagenesis in fossil material for isotopic studies

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Vast quantities of vertebrate material are stored in museum collections, providing a cost-effective resource for isotope paleoecological studies. However, sample quality, particularly the extent of diagenetic alteration, can strongly influence the reliability of isotopic data. Currently, there is no standardized framework for identifying samples unsuitable for isotopic analysis, making sample selection from museum collections challenging. To address this limitation, we developed a standardized workflow to quantify diagenesis in fossil tooth enamel and identify the most pristine material for isotope analysis. The workflow includes modern specimens of *Varanus salvator* (water monitor lizard), used as non-altered reference material that provides a baseline for comparison with fossil samples, twenty-nine mosasaur specimens from eleven North American geological formations, representing a wide range of diagenetic conditions. Non-destructive techniques, including micro–X-ray fluorescence (*μ*XRF) and Fourier-transform infrared spectroscopy (FTIR), were applied first. *μ*XRF generated elemental maps of Ca/P ratios across entire teeth, enabling assessment of enamel homogeneity and detection of localized alteration compared to modern samples. These maps guided targeted FTIR analyses, which assessed mineral structure, recrystallization intensity, and secondary mineral phases relative to the modern baseline. Samples selected for further study were microsampled and subjected to acetic acid leaching to remove diagenetic overprints. Resulting powders were analyzed for elemental composition, including Ca/P ratios and rare earth element (REE) distributions and compared with the modern material to further constrain diagenetic processes and depositional conditions. Results show widespread heterogeneity in fossil enamel, with *μ*XRF revealing alteration associated with fractures, surface flaking, and ornamentation. FTIR analyses further identified samples with clear evidence of recrystallization and secondary mineralization, while bulk elemental screening revealed inconsistencies indicative of complex diagenetic histories. All data was evaluated relative to our modern reference, which serves as the baseline for comparison, and all threshold criteria for assessing preservation in our workflow. Together, these results highlight the necessity of rigorous, standardized screening protocols when working with museum collections to ensure robust paleoecological reconstructions.

Funding Sources: Purdue University

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

New observations on a Late Pennsylvanian myricanthoid holocephalan from the Atrasado Formation of New Mexico and new record of a related taxon from the Middle Mississippian St. Louis Formation of Indiana

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Articulated full-body fossils of cartilaginous fishes are rare, yet vital for comprehensive comparative morphological analyses. Understanding the evolution of the Holocephali has been historically

difficult due to this rarity, as well as the bizarre morphology of many extinct species. Using X-ray micro-computed tomography, we present new data on a new chimaeriform genus from the Kasimovian/Missourian (Late Pennsylvanian) Atrasado Formation from the Kinney Brick Quarry of New Mexico and present evidence for an earlier origin of crown chimaeroid traits. Three full-body specimens, including two males (NMMNH-P 67717 and USNM/PAL781443) and one female (USNM/PAL781444), were studied and found to share multiple derived features with the Myriacanthidae—generally considered the sister group of crown Chimaeroidei—as well as with certain Menaspiformes (e.g., *Traquairius*). This new work reveals unprecedented detail of the dentition, dermal armor, squamation, jaws, paired fins, and reproductive anatomy of these animals. Sexually dimorphic traits evident in male specimens include a massive fanged tenaculum (frontal clasper) with a broad saddle-like base, six large cranial dermal spines, numerous sharp denticles along the anterior of the snout, and a set of specialized denticles anterior to each pelvic fin, suggesting presence of a pre-pelvic clasper. In addition, an isolated myriacanth-like tenaculum (USNM PAL 794837) from the Viséan St. Louis Formation of Indiana is observed for the first time from this geologic horizon. As the earliest recognized myriacanthids are from the late Triassic, these new specimens not only test the characteristics and monophyly of the Myriacanthidae but also extend the range of nearly modern holocephalans into the Pennsylvanian and perhaps into the Mississippian. These new data transform the sequence and timing of holocephalan trait evolution, which will likely require further revision. The emerging picture reinforces an interpretation of modern chimaeras as Paleozoic relics and echoes the findings of genomic studies that place this clade firmly in the slow lane of vertebrate evolution.

Funding Sources: NSF IntBIO 2433267

Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

***Tyrannosaurus rex* postorbital horns reflect ontogeny, not taxonomy or sexual dimorphism, and cast doubt on "*Nanotyrannus lethaeus*"**

Thomas D. Carr[1]
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Recently, nine morphotypes of postorbital horn morphology were hypothesized to reflect taxonomic variation and sexual dimorphism among the "*Tyrannosaurus rex* complex" of the late Maastrichtian of the American West. These claims were tested here by firsthand study of a growth series of *T. rex* (*n* = 20) and *Daspletosaurus horneri* (*n* = 1) fossils. Only fossils accessioned in public trusts were included in this work.

Four primary results were obtained: (1) the postorbital horn is a composite of two structures, including a horn core that is an intrinsic part of the postorbital bone, and a separate osteoderm—the epipostorbital—that clads onto the lateral surface of the horn core, producing an accordingly termed "postorbital horn complex"; (2) fusion between the epipostorbital and the postorbital bone only occurs in some (*n* = 5), but not all, adult specimens; (3) the epipostorbital undergoes stepwise growth changes that greatly modify its size and shape; and (4) the epipostorbital is also seen in *D. horneri* and *T. bataar,* indicating that its presence is synapomorphic at the level of—at least—derived tyrannosaurines.

In the light of these results, the morphotypes proposed to support the taxonomic and sexual dimorphism hypotheses are artifacts of missing epipostorbitals and the lack of recognition of their presence; therefore, the morphotypes are paleobiologically uninformative. Instead, the ontogeny of the complete horn complex (horn core + epipostorbital) of *T. rex* serves as a framework for understanding its growth and phylogeny among derived tyrannosaurines.

In addition, the postorbital horns of the holotype of "*Nanotyrannus lethaeus*"—and an extensive number of features across the entire skeleton—are identical to that of juveniles in all species of the *Bistahieversor* + Tyrannosauridae clade, wherever subadult material is preserved. In addition, the "*N. lethaeus*" holotype has features that are only seen

in adult *T. rex*. Therefore, the juvenile *T. rex* hypothesis is a simpler hypothesis than symplesiomorphy to explain those similarities.

Funding Sources: A. Parisi gift to the paleontology program at Carthage College

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Functional morphology of the macropod mandible: correlating medial masseter muscle insertion and size

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This project investigates the functional link between specialized tooth shape and chewing mechanics across the diverse family Macropodidae (kangaroos and wallabies). Macropods exhibit a wide spectrum of dietary specializations, ranging from dedicated grazers that process abrasive grasses to browsers that consume tough stems and leaves. A key morphological adaptation is the co-evolution of the bladed third premolar (p3) and the powerful medial masseter muscle (indicated by a deep mandibular fossa). While previous comparative anatomy has established a correlation between p3 size and fossa depth, these studies, relying on linear measurements, cannot quantify the internal stress and strain placed on the bone during chewing. I hypothesize that the presence of a larger, more pronounced p3 and an increased fossa is a specialized adaptation associated with the high-force shearing required for browsing, whereas the smaller p3 and shallower fossa reflects the lower shear-force mechanics of grazing. I will examine Macropodidae museum specimens to gather high-resolution anatomical data, moving beyond traditional descriptions toward a quantitative comparative analysis. By measuring the physical properties of mandibular structures, I aim to find significant correlations between bone geometry and chewing efficiency. These metrics will be used to simulate functional performance, revealing the biomechanical links between jaw muscle development and tooth morphology. Ultimately, this research clarifies the evolutionary relationship between structural design and dietary shifts in macropods.

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

New remains of sauropod dinosaurs from the Middle Jurassic of Kachchh, Gujarat, western India

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The Middle Jurassic period represents a time during which several important sauropod groups originated and radiated. The oldest diplodocoids and macronarians are found in rocks of this age, alongside numerous eusauropod lineages with older pedigrees. The diversification of these lineages occurred at a time of widespread continental connection, but there is also evidence for faunal regionalization. However, records in many important geographic areas remain sparse, including much of central and eastern Gondwana. Recent fieldwork in western India has discovered new and more informative sauropod materials from Middle Jurassic deposits in Kachchh, Gujarat, that have previously produced highly fragmentary remains. These strata crop out along the Kachchh Island Belt and were deposited in rift-basin settings during the early breakup of Gondwana. They primarily represent high-energy fluvial systems and nearshore marine settings in which dinosaur occurrences are isolated and infrequent. The new finds include two associated eusauropod individuals. The first, from the Khadir Formation of Khadir Bet, is extremely fragmentary but includes multiple articulated sacral vertebrae. It was recovered in 2023–2024 and is accessioned at the Indian Institute of Technology Roorkee. The second, from the Kaladongar Formation of Kuar

Bet, is more complete with an associated series of sacral and caudal vertebrae, a hind limb, portions of the pelvis, and an incomplete forelimb. Although discovered in 1999, the materials (held in the Subir Raha Oil Museum, Oil and Natural Gas Corporation, Dehradun, Uttarakhand, as well as the ONGC campus in Panvel, Maharashtra) have only recently been available for study. Aside from modern weathering, the bones are well preserved and preserve numerous morphological details. It represents a eusauropod with unusual anatomical details of the femur but lacks characteristics that would indicate affinities with either turiasaurs or neosauropods. This skeleton was associated with a second, larger individual represented only by a proximal femur. Together with other finds, these remains support the presence of two (possibly three) sauropod lineages in western India during the Middle Jurassic, perhaps very similar to the situation in (then-nearby) Madagascar—but distinct from Europe and eastern Asia at this time.

Funding Sources: Smithsonian Institution Macmillan Fund, Florida Museum of Natural History

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Osteohistology of the Cretaceous tyrannosauroids *Appalachiosaurus montgomeriensis* and *Bistahieversor sealyi*

Caeden Carter[1], Riley Sombathy[2], Keegan Melstrom[3], Thomas Williamson[4], Michael D'Emic[1]
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Many theropod dinosaurs exhibit rapid growth relatively quickly after hatching. In contrast, the growth curves of some derived tyrannosauroids have been reconstructed as strongly sigmoidal, with a significant delay in the onset of rapid growth. This specialized life history strategy has been argued to have important effects on the paleocommunities they inhabited, with juveniles and adults of the same species occupying different niches throughout ontogeny. When this specialized life history strategy evolved is currently unknown due to uneven sampling within Tyrannosauroidea. We remedy this sampling gap by describing the osteohistology of a femur, tibia, and fibula of the only known individual of the non-tyrannosaurid tyrannosauroid *Appalachiosaurus montgomeriensis* from the Late Cretaceous of Appalachia and a tibia and dorsal rib of two individuals of the early diverging tyrannosaurid or tyrannosauroid *Bistahieversor sealeyi* from the Late Cretaceous of Laramidia. All sampled bones exhibit well vascularized fibrolamellar bone with circumferential and longitudinal vascularization. Both the *Appalachiosaurus* and the larger of the two *Bistahieversor* individuals were nearing somatic maturity at the time of death, when they reached substantially different asymptotic body masses (ca. 900 kg for the former versus more than 3,000 kg for the latter). The sampled tibiae of both taxa preserve approximately a dozen circumferential growth marks, whereas the femur of the *Appalachiosaurus* individual preserves nearly 20 lines of arrested growth, including several closely spaced marks near both the endosteal and periosteal margins of the bone. The endosteal growth marks indicate slow growth in early ontogeny, indicating that *Appalachiosaurus* shared the specialized growth pattern present in some later diverging tyrannosauroids. More data, especially from younger individuals, are needed to confidently infer the life history of *Bistahieversor*, but preliminary data imply that specialized growth histories characterized a larger clade of tyrannosauroids than previously thought.

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Diversity and energy use of mammalian faunas through Miocene warming and cooling

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Climate and topography are important drivers of variation in modern ecosystems worldwide. Mountains and other topographically complex landscapes have major effects on terrestrial biodiversity patterns, through mechanisms such as the formation of barriers and the creation of new ecological niches through increasing habitat heterogeneity. While present-day relationships between climate, topography, species richness, and ecological productivity are well documented, studies integrating the effects of climate and topography on communities across major climatic episodes of the geologic past remain limited. Uniting data from 253 mammalian fossil assemblages from western North America with local-scale landscape (climate and elevation) data derived from geophysical and general circulation models, we quantified how richness and energy use of mammalian communities varied in relation to eight landscape variables during the Miocene. We compared these relationships between large- and small-mammal faunas, between tectonically active and passive regions, and during versus after the Miocene Climatic Optimum, a notable global warming event. Landscape variables were consistently strong predictors of local richness and energy use, although relationships frequently differed between size groups, regions, and climate configurations. These differences are associated with variation in topographic complexity, its contrasting effects on climate, and differences in how species of different body sizes partition resulting variation in habitat heterogeneity. Temporal shifts in the principal landscape drivers occurred for both metrics as the climate cooled, with elevation and climatic seasonality replacing mean annual temperature as the primary predictors of richness and energy use, respectively. Thus, richness and energy use patterns were more similar during the warmer Miocene Climatic Optimum and more divergent during the subsequent cooling interval. Species richness and energy use are therefore governed by different environmental factors that produce strongly decoupled relationships with landscape variables, although the degree of decoupling varies between climate states. These results suggest that ongoing climate warming will differentially affect the richness and productivity of mammalian communities, highlighting the importance of assessing both richness and energetic variation in past and present communities to improve projections of future ecological change.

Funding Sources: NSF EAR Award 1814029

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

Intervertebral bending mechanics of *Eryops megacephalus*, *Diadectes sideropelicus*, and *Dimetrodon limbatus* through mutimaterial 3D printing

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By the late Paleozoic, many tetrapod groups had fully ventured onto land, creating and establishing terrestrial food webs and ecosystems for the first time. The Clear Fork locality in the Arroyo Formation of Texas is an exemplar deposit that captures lower-Permian terrestrial food webs. In this deposit, previous researchers proposed interactions among several predators and prey, including predation on diadectomorphs by both the temnospondyl amphibian *Eryops megacephalus* and the sphenacodontid *Dimetrodon limbatus*. Previous research to understand the predator's roles in their food web has concentrated on studying limb mechanics and examining dentition, while there has been limited attention to the mechanics of the vertebral column. Within these predator–prey interactions, there are different vertebral architectures: the multipartite, rhachitomous vertebrae in *E. megacephalus*, and variations of gastrocentrous forms in both *D. sideropelicus* and *D. limbatus*. While some studies have understood the vertebral column in either a static stiffness framework based on vertebral shape or in pure kinematics with no description of stiffness, understanding vertebral function during predator–prey interactions requires recreating the plausible motion under which the spines were acting, i.e., dynamic, cyclical loading. To investigate how these differences in vertebral morphology influenced this set of predator–prey interactions, we characterized the dynamical

mechanical properties of the intervertebral joints. Using a custom-built bending apparatus, we applied external loads to 3D-printed multimaterial single vertebral joints from *E. megacephalus*, *D. sideropelicus*, and *D. limbatus*. We measured force-displacement values of the 3D-printed vertebrae in dorsoventral flexion, mediolateral flexion, and long-axis rotation. Following this, we fit spring-damper models to the dataset to capture the stiffness profiles of each taxon. We found that, overall, *E. megacephalus* had the stiffest spine, followed by *D. limbatus* and, lastly, *D. sideropelicus*. Within individual taxa, the stiffness profiles were the same: dorsoventral flexion had the highest stiffness values, followed by long-axis rotation and, lastly, mediolateral flexion. These results reflect the mechanical differences between predators' and prey's locomotor needs. By taking this approach, we captured spring-damper values that can be used in robotic models to understand how local vertebral mechanics affect locomotion.

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

Frontal inflation in durophagous carnivorans and primates

Matt Cartmill[1], Matthew R. Borths[1]
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The bone-cracking canid *Borophagus,* the giant panda (*Ailuropoda*), the cave bear (*Ursus spelaeus*), and some related carnivorans share a pattern of frontal inflation that produces a conspicuously bulging forehead profile. Functional hypotheses advanced to explain the enlarged frontal sinuses in these animals include dissipation of bite forces across the skull and expansion of the nasal region as a cold-weather adaptation. Here, we document the presence in these taxa of a convergent morphological complex characterized by 1) a "domed" frontal region; 2) reduction of the length of the face; 3) extreme molar wear; and 4) a rostral shift of the orbit relative to the cheek teeth. We interpret these changes as being associated with a specialized enlargement of the anterior part of the temporalis muscle, developed as an adaptation to durophagy in all these carnivorans and serving to concentrate chewing forces more effectively on the anterior cheek teeth. Among primates, morphologically different but functionally similar modifications of the skull are seen in the extinct giant lemur *Hadropithecus* and robust australopithecines, where they have presumably also evolved as adaptations for feeding on hard objects. This analysis explores the convergence of the enlarged anterior temporalis muscle in distinct lineages of carnivorans and primates by comparing durophagous taxa to closely related non-durophagous relatives and considers the constraints that may be acting upon these lineages as the durophagous complex evolves.

Funding Sources: IMLS MA-245704-OMS-20; NSF DBI 2023087

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Times of change: vertebrate paleobiodiversity dynamics in the Vallès-Penedès Basin (Catalonia) throughout the late Middle to early Late Miocene (12.5-9.0 Ma)

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The Vallès-Penedès Basin (Catalonia, Spain) preserves one of Europe's most densely sampled and best dated continental vertebrate records, allowing high-resolution analysis of faunal change across the late Middle to early Late Miocene. We synthesize specimen-based taxonomic data, biostratigraphy, magnetostratigraphy, and multiple paleoenvironmental proxies to reconstruct vertebrate paleobiodiversity dynamics between 12.5 and 9.0 Ma (late Aragonian–late Vallesian). Standing diversity and turnover rates identify three main phases: (1) an origination-driven diversification interval from 12.5 to 11.7 Ma, culminating in the highest diversity of the studied record just before the Middle/Late Miocene boundary; (2) a prolonged high-diversity plateau

from 11.7 to 10.0 Ma, combining substantial turnover near the Aragonian/Vallesian boundary (~11.2 Ma) followed by stasis with little turnover; and (3) a protracted diversity decline from 10.0 to 9.0 Ma, including a major extinction pulse across the early/late Vallesian boundary (~9.8–9.7 Ma) and a second latest Vallesian pulse likely enhanced by end-of-record effects. These results support the Vallesian Crisis extinction event, but not as a single abrupt diversity collapse preceded by an early Vallesian climax. Instead, maximum diversity was attained much earlier, in the latest Aragonian, and remained high for more than 1.5 Myr despite considerable taxonomic turnover. Global climatic data, large-herbivore hypsodonty, micromammal-based paleoprecipitation estimates, and site-specific paleobotanical and isotopic evidence together depict heterogeneous but overall humid environments, with local wetland forests, mesic woodlands, and moderate seasonality persisting through the Vallesian, rather than a simple environmental shift driven by abrupt aridification or cooling. Taken altogether, these proxies do not identify a single climatic trigger for diversity decline but suggest instead a more complex scenario involving progressive habitat fragmentation, increasing environmental openness, and late Vallesian cooling. Many of these environmental changes were already ongoing by the late Middle Miocene, but the Aragonian/Vallesian turnover would have temporarily buffered the diversity decline. Disentangling the roles of climatic forcing, and potentially also of biotic processes, in diversity dynamics will require a fully integrated multiproxy framework, which provides the most promising avenue for future work.

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

New insights into monotreme locomotion and lifestyle based on ancient postcranial material

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Our interpretation of what ancient monotremes looked like, how they moved, and their lifestyles are greatly influenced by that of the extant platypus (*Ornithorhynchus anatinus*) and the short-beaked echidna or spiney anteater (*Tachyglossus aculeatus*), so that early monotremes are reconstructed mostly as aquatic swimmers. Two postcranial specimens, a distal femur of *Monotrematum*, an early Paleocene taxon from Argentina, and a near complete humerus of an Albian taxon from Victoria, Australia, *Kryoryctes*, give us a different view of monotreme postcranial morphology compared to living taxa, as well as methods of locomotion and lifestyle. The distal femur of *Monotrematum* differs from the femora of *Ornithorhynchus* or *Tachyglossus,* in that the distal diaphysis is circular and narrow. This indicates that the *Monotrematum* femur is not capable of withstanding the mechanical stresses of either digging or swimming as seen in the living species, where femora are very wide mediolaterally. We tested our hypothesis, using femoral length/width ratios for shape and a related polar sectional modulus approach for femur rigidity with samples (n= 6–7) from *Tachyglossus*, *Ornithorhynchus*, and a variety of therian taxa, plus *Monotrematum.* The femoral length/width for *Monotrematum* was significantly less than that ratio in the platypus ($p = 0.0001$) or the echidna ($p = 0.0001$) but not different from therians ($p = 0.09$). For the polar sectional modulus values of the femur, *Monotrematum* grouped with values for the platypus but less than that for the echidna ($p = 0.01$), yet greater than for therians ($p < 0.05$). This would mean that *Monotrematum* has a similar femur shape to therian mammals, but it is more rigid than therians and like that of a platypus ($p = 0.01$), probably due to greater cortical bone thickness. The humerus of *Kryoryctes* has been interpreted as being adapted for swimming like a platypus. The anatomy of *Kryoryctes* shows that the proximal, broad, lateral flange is in the same vertical plane as the distal epicondyles as in echidnas, indicating fossoriality, differing from the 90° to the epicondyles in the platypus. The distal

humerus of *Kryoryctes* is unusual compared to extant monotremes in that it has wide trochlea between low ridged, radial, and ulnar condyles. *Kryoryctes* has a dorsomedial head of the humerus aligned vertically with the distal trochlea indicating a more vertical orientation of the humerus like pangolins and armadillos for digging.

Funding Sources: US National Science Foundation grant ANT-0003844

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Hunting types in North American Eocene–Oligocene carnivores and implications for the "cat gap"

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The late Eocene to Oligocene interval is traditionally associated with a shift from closed to more open habitats in North America. This time interval also saw the diversification and subsequent extinction of North American nimravids. It has been hypothesized that the extinction of this sabertoothed clade may have been related to competition with more cursorial, caniform predators in progressively more open habitats. Here, I analyze and compare the hunting types of Eocene and Oligocene predators via discriminant function analysis of the shape of the elbow joint. The data show that large cursorial predators decreased and ambush predators increased in proportion within the predator guild during the earliest Oligocene, in part due to the diversification of Nimravidae. An increase in the proportion of cursorial hunting predators only occurred in the Arikareean NALMA, eventually leading to the 8-million-year "cat-gap" after the extinction of nimravids. My results indicate that nimravids and contemporary canids had similar elbow morphologies, casting doubt on the idea that canids were more cursorial. However, my results comparing predicted amphicyonid and nimravid hunting types could indicate possible support for a competitive advantage for amphicyonids in the Arikareean. Ultimately, sampled carnivore elbow morphologies and diversification appear to indicate that ambush hunting was prevalent in the early Oligocene, and that more cursorial niches appeared as the Oligocene progressed.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Florida's fossil horses: A legacy beneath the horse capital of the world

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Taxa in the family that includes extant *Equus* first appeared in the Florida fossil record approximately 30 mya during the Oligocene, shortly after the first land exposure in the region. This fossil record has yielded many species classified in ~20 equid genera, commonly recovered from most well-sampled Cenozoic terrestrial localities. Many of the major morphological and ecological transitions of the equid family are well documented in the Florida fossil record. Despite the state's long record of equid evolution, targeted public programs specifically designed to introduce the state's equestrian communities to the fossil record of equids in Florida have been limited. Florida is commonly referred to as the "Horse Capital of the World," due to the substantial impact equine activities have on the state's economy, culture, and tourism. As a pilot study, a series of pop-up museum exhibits were designed and hosted at three equine venues for one private and two public events spanning hunter/jumper, dressage, and racing to connect with a broad portion of the equestrian sector. A museum-branded canopy was used at these outdoor events to capture attention with displays of Florida equid fossils to discuss morphological change through time in Equidae. Of the 243 event goers who acknowledged the exhibit, 93 interacted, and 44 of those answered a survey board. Survey respondents indicated that 96% enjoyed the outreach, 29% had some prior knowledge of the fossil record of horses, 78% would like to learn more, and 95% planned to share what they learned with others. While the Florida Museum of Natural History (FLMNH) is

within a 45-mile radius from event locations, only 33% of public event survey responders (n = 31) had visited the museum. However, survey responses (n = 13) from the private event provided an FLMNH visitation rate of 77%. Combined survey responses (n = 44) still show a less than 50% visitation rate to a local museum with free entry. According to survey responses, the low visitation rate is not correlated with a lack of interest, as 77% of public and 91% of private event respondents indicated an interest in learning more about the fossil record in Florida. Assuming that travel distance and communication about the FLMNH are the limiting factors, then pop-up museum exhibits tailored to local events are potentially important ways to broaden museum impact and share museum-based scientific research and collections with local communities who might not otherwise be engaged.

Funding Sources: The Toomey Endowment; Florida Museum of Natural History Division of Exhibits and Public Programs; The Southwest Florida Fossil Society Scholarship

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Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

Visual fields and eyeballs of extinct moa *Dinornis robustus*: evolution of neurosensory morphology and diel regime on an island

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Extinct moa of New Zealand were enormous, wingless, and small-brained. These flightless relatives of the South American tinamou were herbivores, but other life history details like diel patterns are unknown. Neurosensory changes, e.g., to eye size or visual field, likely coincided with modification of typical avian Bauplans (volant, small-bodied, big-brained) to support ecological shifts. Others suggested that one moa species, *Megalapteryx didinus*, had reduced orbits consistent with cathemerality, but no restoration of soft tissues was done. If such tissues are ignored, implicit assumptions attending any inference of light ecology, including eye size, may be imprecise, leading to poor estimates of visual function and inaccurate conclusions. Here, we restore moa visual systems with these caveats in mind. Eleven specimens of 6 species of moa were studied firsthand, focusing on one specimen of South Island giant moa *Dinornis robustus* (FMNH PA 35) to identify osteological correlates (OCs) of orbital soft tissues (e.g., extraocular and jaw muscles, glands, nerves). Growth trajectories were estimated with regression analysis for orbit and optic foramen, in context with diel pattern, across 150 species of modern birds plus moa. For a given orbit diameter, optic-foramen size predicts light conditions for which an eye is suited, so this analysis assessed if moa eyes were suited for nocturnality. Growth trajectories were also estimated for eye size and optical parameters (e.g., corneal curvature) of extant species and these quantities inferred for moa. Soft tissues were modeled based on OCs and phylogenetic bracketing in the software Maya. Inferred eye size was tested against soft- and hard-tissue constraints using digital models. Visual-field geometry was modeled for *D. robustus* using inferred eye size, optics, and ray-tracing software. Optic foramina of sampled moa are neither especially large nor small. The modeled visual field of FMNH PA 35 has binocular overlap at maximum of ~33° and a caudal blind area ~110° wide. The restored eye of FMNH PA 35 has a diameter of 32 mm and an axial length of 29 mm, or ~⅔ the size of ostrich eyes. These traits align with visual systems that perform adequately in daylight and twilight. A visual-field model with large blind areas suggests that overexposure of the retina to the sun was a selective pressure for *D. robustus*. Moa visual systems were likely reduced relative to other ratites due to evolution on an island with few predators.

Funding Sources: NSF IOB-0343744, IOB-0517257, IOS-1050154, IOS-1456503 to Witmer; SRC 2021-02973 to Witmer; NSF DGE 1060934 & NSF DGE 1645419 to Early; Ohio University SEA to Cerio.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Cretaceous two-steppin': New ichnological evidence for smaller theropod activity within the Upper Glen Rose Formation, Hamilton County, Central Texas, USA

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The Lower Cretaceous (Aptian–Albian) Glen Rose Formation and other similarly aged stratigraphic formations exposed across much of Central Texas are world-renowned for yielding thousands of fossilized tracks of theropod, sauropod, and ornithopod dinosaurs. The sedimentary context of the Glen Rose reflects the initial transgression of a transgressive-regressive (T-R) sequence within the Lower Cretaceous Trinity Group (Aptian–Albian), highlighting sea level fluctuations throughout Early Cretaceous North America. Typically, Glen Rose tracksites are found on shallow marine carbonate deposits that formed at sequence boundaries. The JCIC Tracksite assemblage, located in Hamilton County in Central Texas, represents a short-lived single event along a shoreline during a marginal-marine sequence boundary within the Upper Glen Rose Formation (Albian). The majority of tracks present at the JCIC Tracksite are interpreted to belong to large theropod dinosaurs, attributed to *Acrocanthosaurus atokensis* based on their size and shape. Many of the tracks have undergone some form of soft-sediment deformation due to the super-saturated rheology of the tracksite. One of these tracks at the JCIC tracksite (JCIC-28) has a total length of 12 cm, which is notably smaller than all other tracks at the site and that of any other published theropod tracks identified within the Glen Rose Formation (Total length > 20 cm). JCIC-28 is a right footprint that clearly preserves digit III (DIII) and digit IV (DIV), while digit II (DII) appears unimpressed. It has long been believed that substrate controls/taphonomic biases prevented the preservation of smaller tracks on the carbonate tidal flat settings of the Glen Rose Formation, with JCIC-28 likely being preserved due to the extremely muddy rheology present at the JCIC Tracksite. While it is possible that this smaller track could be attributed to a juvenile *Acrocanthosaurus*, the morphological characteristics of JCIC-28, including the lack of an impressed DII and spacing between digits, suggest that this is not the case. Instead, the track appears to be comparable to tracks attributed to smaller theropods (Total length = 10–20 cm), such as the ichnogenera *Grallator* or *Dromaeosauripus*. Taken together, the size, morphology, and occurrence of this unique track suggest that smaller, gracile coelurosaurs co-occurred with *Acrocanthosaurus atokensis* on the tidal flats of the Glen Rose Formation.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Jacked-up jackets: preparation strategies for field jackets with structural and material failures

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Field jacketing remains the primary technique for stabilizing and transporting fossils from the field to the museum, and it can significantly impact the integrity of specimens. While conceptually straightforward, jackets constructed under field conditions and inconsistent techniques can present structural and procedural challenges during preparation. Common issues include insufficient separation layers, deep undercuts, excessive or inadequate plaster thickness, missing labels, and the use of materials unsuitable for fossil contact. These factors can prolong preparation, increase the risk of fossil damage, and require specialized corrective approaches. In 2025, three problematic field jackets, each exceeding one meter in size and containing dinosaur specimens from the Upper Jurassic Morrison Formation, were prepared at the American Museum of Natural History. These jackets exhibited several of these common issues, as well as voids and fractures; one jacket also contained expanding foam applied directly to the fossil, complicating removal and posing health risks to preparators. To address these issues, a combination of approaches was implemented: stabilization and repair of the jackets to reinforce

unstable areas; controlled opening to minimize stress on the fossil; careful removal of the foam using appropriate personal protective equipment and tools such as craft knives, wire brushes, and dental picks; isolation of fossil elements from deteriorating jackets; grinding down plaster directly attached to the fossils; and construction of archival jackets to provide long-term support. These case studies provide strategies for preparing fossils affected by defective field jackets. They further underscore the challenges posed by compromised field jackets and demonstrate practical approaches for generating critical feedback between field and laboratory practices, thereby guiding improvements in future fieldwork and reducing preparation-related risks.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

A remarkably complete, large innominate (Mammalia, Eutheria, ?Cimolesta) from the early Paleocene of southwestern North Dakota

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Mammalian recovery following the Cretaceous–Paleogene (K–Pg) mass extinction in the Western Interior of North America has primarily been studied through the analysis of dental and gnathic remains. Though fossilized dentitions have been useful in reconstructing dietary niche specialization and documenting body mass increases of mammals throughout the first million years of the Paleocene, analysis of postcranial elements, which are less commonly preserved than teeth, is required for reconstructing positional behaviors of extinct mammals. Here, we report an isolated innominate of a mammal from the early Paleocene Puercan (Pu1) North American Land Mammal Age (NALMA) Merle's Mecca fossil vertebrate locality (DMNH Loc. 20328) in Slope County, southwestern North Dakota. This locality, ~15 meters above the K–Pg boundary and within magnetochron 29r, has produced fossils of many vertebrates including fishes, salamanders, turtles, crocodilians, and mammals. The innominate is remarkable for the early Puercan NALMA because it is virtually complete and represents an unusually large mammal for this time period. The ilium, origin for the gluteus medius, is abraded but clearly relatively narrow, suggesting this mammal would not have powerfully extended its thigh. The anterior inferior iliac spine, origin for the rectus femoris, is also small, suggesting this mammal would not have powerfully extended its leg. The acetabulum is fairly deep and subcircular in outline, which suggests the hip joint would have been rather restricted to the parasagittal plane unlike the more mobile hip joint of arboreal mammals characterized by a more elliptical acetabulum. Overall, the innominate displays features that suggest it belonged to a generalized terrestrial mammal that lacked postcranial specializations for speed or endurance running. The length of the innominate is approximately 12.5 cm, which is larger than any known postcranial element previously attributed to a Pu1 mammal. The innominate is not dentally associated, but we tentatively attribute it to *Alveugena carbonensis*, which is the largest mammal known from dental fossils at this locality. *Alveugena* has been classified as a cimolestid and phylogenetic results have supported it as the sister taxon to the Taeniodonta. Regardless of whether this tentative designation is correct, this innominate provides new data concerning the evolution of mammalian positional behaviors and body mass shortly after the K–Pg mass extinction.

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Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

A Novel Quantitative Method for Estimating Transport Potential of Bones in Fluid Flow

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Understanding taphonomic processes that shape the fossil record is integral to interpreting the

composition and functioning of extinct ecosystems. Bones preserved in fluvial environments make up a major part of the terrestrial vertebrate fossil record, and the preferential transport and sorting of bones can bias fossil data. Experimental work going back more than 50 years has resulted in the creation of methods for interpreting transport and sorting of bones in the fossil record, with Voorhies Groups being the most widely used. Voorhies Groups attempt to describe the relative transport potentials of bones, acting as a qualitative equivalent to critical mobility conditions (flow conditions required to move an object) in sediment transport. Application of Voorhies Groups in the literature outstrips the limited scope of the initial experiments used to define them, and some researchers have raised concerns that bones of varying sizes and shapes could exhibit different mobility patterns than implied by their Voorhies Groups classification. New quantitative methods for predicting the transport potentials of bones in fluvial environments would be highly beneficial for interpreting taphonomic histories of field sites. We conducted a series of flume experiments at Saint Anthony Falls Laboratory to characterize the transport potentials of bones across a wide variety of bone sizes and shapes in a range of flow conditions. Measured transport potentials were correlated with a combination of bone size and density. However, transport potentials of many bones did not organize into the traditional Voorhies Groups or other similar transport categories. We therefore used our experimental data to develop a non-dimensional mathematical model that predicts critical mobility conditions of bones in flow based on similar models for predicting sediment motion. Estimated transport potentials can serve as null hypotheses for bones that can be compared to flow indicators in their sedimentological context (e.g., grain sizes and bedforms) to test whether distributions of bones can be explained by fluid transport. Our model facilitates comparisons of sorting across not just individual skeletons, but whole multitaxic fossil sites, allowing researchers to take advantage of broader sets of taphonomic data. Quantitative methods like ours will help produce more precise interpretations of biostratinomy at fossil quarries and aid in clarifying potential biases in the fluvial fossil record.

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Unusual preservation of fossilized gut contents in an articulated *Triceratops* from the Upper Cretaceous of Montana

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Unraveling the feeding habits of megaherbivorous dinosaurs can tell us much about their behavior and ecology. Yet, there is scant direct evidence of ancient browsing activity. Most inferences about ancient herbivory are based upon analyses of craniodental features that shed light on herbivores' abilities to masticate different vegetative tissues. However, browse choices also reflect physiological and ecological factors that are difficult to recognize in the fossil record. As such, new discoveries of gut contents continue to expand our understanding of ancient feeding habits and the preservation of digestive residues. Here, we describe fossilized gut contents within an iconic dinosaur that were preserved through an unusual taphonomic pathway. The cololite was found in the abdominal cavity of an exceptionally complete and articulated skeleton of *Triceratops horridus* (NMV P256878) preserved in a channel sandstone in the Hell Creek Formation of Montana. Vegetative inclusions were concentrated in a compressed, ~35 mm thick layer of plant tissues at the bottom of the abdominal cavity. The comminuted contents, confinement within the body cavity, paucity of inorganic clasts, sedimentological context, and taphonomic setting of these tissues indicate that they were present as ingesta within the carcass before burial. X-ray diffraction and microprobe elemental maps reveal that most of the morphologically distinct plant tissues in the *Triceratops* gut contents have been

replaced by authigenic clay or zeolite. These tissues retain negligible organic carbon but preserve some three-dimensional detail. It is likely that the tissues were lithified through bacterially-mediated clay authigenesis that replaced the organic tissues. This hypothesis is consistent with previous studies on clay authigenesis and the presence of countless microbes in herbivore guts. Furthermore, this is the second documented example of clay-rich gut contents; a cololite within a brachylophosaur from the Judith River Formation also contains large amounts of clay. The fragile, clay-replaced plant tissues in the *Triceratops* gut became vulnerable to physical damage or dissolution in water after the skeleton was exhumed. However, early recognition, protection, and study of the ingesta have provided new insights on the biology of this extinct megaherbivore and the taphonomy of gut contents in general. Careful excavation of other articulated skeletons may reveal comparably preserved fossilized ingesta.

Funding Sources: Museums Victoria & The University of Melbourne 2023 McCoy Project Seed Fund

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A vertebrate assemblage from the Late Cretaceous Fruitland Formation (Judithian: Campanian) of New Mexico

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The Fruitland Formation is an Upper Cretaceous geologic unit within the San Juan Basin of northwestern New Mexico with a rich history of fossil vertebrate collections. It is Late Cretaceous (late Campanian) in age, around 76.3–75 Ma, originating in mainly paludal and deltaic depositional environments. Here, we report some newly prepared fossils from a previously unpublished locality, New Mexico Museum of Natural History and Science (NMMNH) L-5140. This locality is in the Fossil Forest Member of the Fruitland Formation and was collected in 2002 by the NMMNH under permit by the US Bureau of Land Management (BLM) subsequent to an attempt to illegally collect fossils there. We have two larger specimens: an incomplete hadrosaur sacrum and a chunk of a turtle shell, the latter preserved within a concretion. The hadrosaur sacrum is likely one of two hadrosaurs: *Parasaurolophus cyrtocristatus* or *Kritosaurus navajovius*. The two dinosaurs are similar in size, so we will not be able to use measurements to get a size estimate. Determining hadrosaurs from each other is mainly done using their skulls, and we do not have any large skull fragments. There are four fused vertebrae preserved, while hadrosaurs, including *Parasaurolophus cyrtocristatus* and *Kritosaurus navajovius*, can have up to about 8–10 total fused vertebrae in their sacrum. We screenwashed matrix from the large jacket at L-5140 to get a concentrate, finding several gar scales, many bone fragments, and some tooth fragments. We have yet to identify the large majority of the fragments, but some are likely salamander and reptile bones. The sacrum requires further preparation in order to potentially narrow down ontogeny. In dinosaurs, the sacrum is fused vertebrae located around the pelvic region where the pelvis connects to the spine. The Fruitland Fm's lithology is mainly composed of interbedded sandstone, siltstone, carbonaceous shale, carbonaceous siltstone, shale, coal, and some limestone beds. The units surrounding the Fruitland locality are discontinuous, with the most continuous being coal beds. With this being said, the environment was marsh or swamp-like, while also including a river delta. Overlaying the Fruitland Fm is the Kirtland Fm, and there is discrepancy on where the boundary is, as there is a gradual change from the Fruitland unit into the Kirtland unit. The majority of the fossils collected from the Fruitland unit are from the upper Fruitland Fm, specifically from the Fossil Forest member.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Intraspecific variation and combat behavior in the placodont *Henodus chelyops*

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Recent discoveries of henodontid material from Portugal and Spain, including skull fragments and several shell osteoderms, highlight the necessity for a comprehensive reassessment of the type species *Henodus chelyops*. Despite a few specimens, the complete type series has never been studied in detail, particularly with respect to intraspecific variation, limiting the interpretation of newly discovered material. Here, we evaluate all eight known specimens of *Henodus chelyops* housed in the Tübingen Paleontology collection (GPIT) using traditional anatomical approaches combined with CT scanning, surface scanning, and 3D digital reconstructions. Our observations reveal previously overlooked anatomical structures, including a pelvic shield, that help clarify the phylogenetic position of *Henodus* within Cyamodontidae. Using geometric morphometric analyses of the similarly sized specimens, we recovered two distinct groups in morphospace, potentially indicating sexual dimorphism. In addition, some specimens preserve bite marks attributable to conspecific interactions. These traces provide evidence for intraspecific combat behavior, possibly related to mate competition or territorial combat. Our results provide a refined anatomical framework for *H. chelyops*, improve the interpretation of recently discovered henodontid material, and offer new insights into the biology and behavior of this highly specialized placodont.

Funding Sources: Landesgraduiertenförderung in Baden-Württemberg

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Turing the *Champsosaurus*: interactive paleoart utilizing augmented reality

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Turing the Champsosaurus is a 3D animated model that can be “placed” into the real world with a handheld device camera, inviting museum guests to imagine what prehistoric animals might be like if they could walk (or swim) among us today. Turing features three animations of hunting, swimming, and snorkeling behavior, and interacts with a gar fish and a small slice of its freshwater habitat.

Pioneer Trails Regional Museum in Bowman, North Dakota, is a small museum with a limited budget and is seeking to expand, modernize, and update the exhibits and outreach programs in creative ways. Interactive exhibits are becoming a standard in museums, as they add variety, engage visitors that may be less likely to read text signage, and slow people down for more mindful interaction. As museums compete with online media and incorporate more screens into their educational tools, augmented reality offers a balanced approach by blending digital content with media that is grounded in the present, real world. Additionally, the digital model can also become physical through PTRM’s new resin 3D printer. While the concept is simple, we hope that it will combine nicely with the recent and upcoming additions to the exhibits floor featuring Champsosaurus as part of an integrated, engaging modern exhibit. Turing is also suited to off-site outreach events, as it is accessible anywhere via QR code, and the miniature 3D printed likeness can be easily transported alongside small fossils and casts.

Paleoart is important to the public’s conception of prehistoric animals and can be an effective teaching tool. However, it usually does not clarify which traits are based in actual scientific literature and which are imagined by the artist, which can lead to confusion, misinformation, and even distrust. Turing is special among paleoart as it is accompanied by much-needed, often overlooked

interpretation. Text “annotations” point to parts of its body and expand when tapped, sharing information about the animal’s anatomy and behavior. We also created a video that goes into more depth about the science that informed Turing’s appearance, along with the artistic decisions.

To help assess the effectiveness of the project in education and outreach at PTRM, we developed a short survey. This will inform us on how Turing or any future AR should be utilized and allow us to strengthen its interpretation.

Funding Sources: Apex Clean Energy

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Chondrichthyans and osteichthyans of the Neva Limestone (Council Grove Group: Permian, Asselian) of Kansas

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The Neva Limestone, the uppermost member of the Grenola Limestone, was deposited during the Asselian Stage of the early Permian Period (298.9–293.52 million years ago) in what is now eastern Kansas. Previous examinations of the Neva Limestone have identified a diverse marine vertebrate fauna that includes symmoriiform, ctenacanthiform, hybodontiform, neoselachian, orodontiform, and petalodontiform chondrichythans, as well as palaeonisciform fishes. This investigation of sediment previously collected from roadside exposures of the Neva Limestone in eastern Kansas has identified teeth from a diverse assemblage of chondrichthyans. The teeth recovered include those of symmoriiform chondrichthyans (*Stethacanthus*), ctenacanthiform chondrichthyans (*Glikmanius myachkovensis*, *Heslerodus divergens*), cochliodontiform chondrichthyans (*Deltodus*), hybodontiform chondrichthyans (*Ossianodus nebraskensis*), eugeneodontiform chondrichthyans (*Agassizodus*, *Bobbodus*), and petalodontiform chondrichthyans (*Petalodus*, *Chomatodus*?), as well as palaeonisciform osteichthyans (Palaeonisciformes indet.). The presence of *Ossianodus* in the Neva Limestone marks an extension of its biostratigraphic range from the late Carboniferous.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Neuroanatomy of *Suchomimus tenerensis* (Elrhaz Fm. Niger) and the sensory similitudes and differences between spinosaurid clades

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The tomographic scanning and segmentation of two braincases and snouts of *Suchomimus tenerensis* have resulted in a very comprehensive reconstruction of its cranial neurovascular anatomy. The cerebral hemispheres, angles of pontine and cephalic flexures, and greatly developed flocculus and endosseous labyrinths with extremely long semicircular canals are very similar to the general form in other baryonychine spinosaurids as well as the spinosaurine *Irritator*. The main difference is *Suchomimus* has the smallest flocculus of any spinosaurid. The maxillary and premaxillary neurovascular network of *Suchomimus* exhibit greater differences. At the anteriormost end of the maxilla the canal migrates dorsally when passing to the premaxillae, adopting a sigmoid shape in lateral view while contouring the premaxilla when curving down anteriorly. In this area, the main canal branches into many secondary canals that innervates the entire premaxilla with foramina equally distributed throughout the surface. This contrasts with the spinosaurine *Spinosaurus* where the maxillary canal extends laterally to the row of tooth sockets without any change in direction in the vertical plane. The secondary canals branch once from the main canal to leave the premaxilla via the foramina covering its whole surface, with a higher number at the anteriormost end. Reduction in olfactory lobe size in spinosaurids, including *Suchomimus,* compared to other tetanurans implies a reduced olfactory sense in food detection. The extreme development of the neurovascular network on the

premaxillae, with foramina spread throughout its whole surface, indicates greater sensitivity. In addition, the extremely developed semicircular canals of spinosaurids indicate more sensitivity to fast movement of the head as suggested by their stronger neck ventroflexor muscles and "cervicalized" anterior dorsal vertebrae.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A diminutive polycotylid from the fluvial to estuarine Dinosaur Park Formation (Alberta, Canada)

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Plesiosaur remains have long been recognized from the Campanian-aged Dinosaur Park Formation (Belly River Group, Alberta, Canada) but have received little attention due to their fragmentary nature. Most of these elements belong to elasmosaurs, while isolated teeth have been tentatively identified as polycotylid. Here, we report additional polycotylid material from this formation: a diminutive femur potentially representing the smallest known adult polycotylid. AMNH FARB 5414 is a nearly complete right femur with heavily worn ends that retain some surface bone. The femur's sigmoid curvature along its shaft, strongly constricted shaft width, and relatively elongate proportions suggest it is a polycotylid femur, distinguishing it from the more robust propodials of elasmosaurs such as the contemporaneous *Fluvionectes*.

The femur was formerly inferred to be ontogenetically young due to its small size and narrow distal end, but histological evidence strongly suggests maturity. Cortical remodeling and other diagnostic changes have been documented in polycotylid long bones as individuals reached adulthood. Juvenile long bones have a medullary region with primary lamellar bone, a prominent Kastschenko line between the cortex and medulla, and cortical bone with vascular canals radiating from the center of the bone toward the edges, indicating rapid growth. In contrast, adult polycotylid long bones have a spongy medulla with trabeculae surrounding large erosion rooms, no Kastschenko line, and a remodeled cortex with vascular canals projecting longitudinally through the bone. We used micro-CT to examine sections of the Dinosaur Park femur and found each of these adult polycotylid long bone features.

The Dinosaur Park femur represents a rare example of polycotylid remains in a non-marine environment. It was found among paleochannel lag deposits on a Laramidian coastal plain, suggesting the polycotylid may have spent at least some of its time in fresh or brackish water. Fluvial to estuarine environments tend to limit the size of tetrapods with recent marine ancestors, as noted in extant river dolphins, non-marine leptocleidids, and the elasmosaurs of the Dinosaur Park Formation. The similarity of the polycotylid's narrow propodial to those of *Leptocleidus* may be due to shared adaptations to a non-marine setting. Its resemblance in size and morphology to the femur of *Unktaheela* may imply a close relationship, but more material is needed for a robust comparison.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Transforming passive learners into motivated researchers: the impact of paleontology-based undergraduate laboratory investigation

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Traditional undergraduate lab courses often emphasize following directions to obtain expected results rather than formulating and testing ideas using evidence-based reasoning. With few opportunities to engage in scientific discovery and little connection to genuine research practices, students are left unmotivated in the classroom and unprepared for future STEM careers. To address these limitations, I developed a multiweek paleontology-based lab module in which students conduct background research, form hypotheses, collect data, analyze results, and present findings in an original scientific paper. The goal of the module is to deduce the body mass of the extinct felid *Smilodon fatalis* after testing published paleontological body mass estimation methods.

Student lab groups research body mass estimation techniques, survey therian mammal cranial proportions and relative skull sizes, and hypothesize whether skull length (SL) or occipital condyle width (OCW) is a stronger predictor of body mass. Lab groups devise techniques to accurately measure SL and OCW using skulls from phylogenetically diverse extant therians with known body masses. After working together to measure dozens of skulls and build SL and OCW class datasets, students conduct linear regression analyses, comparing correlation coefficients and p-values to determine whether SL or OCW is a stronger proxy for body mass. Students apply their conclusions to estimate the body mass of *Smilodon fatalis* and write a scientific paper reporting their findings.

Student learning gains were evaluated in spring 2026 at Marshall University, where this lab module is used in the Principles of Biology I Lab course. Before and after completing the module, 82 students in seven sections of the course answered questions designed to assess their knowledge of paleontology, scientific methodology, and statistics. Student learning gains were measured by comparing the pre- and post-module assessment results. Mean assessment scores increased from 64% (11.5/18 ± 3.59) to 90% (16.2/18 ± 1.77). The increase was significant (paired t-test, $p = 1.34 \times 10^{-19}$) and represented a large effect size (Cohen's d = 1.32). The study cohort's absolute gain was 26%, relative gain was 41%, and mean normalized gain was 72%. The success of this module demonstrates that paleontology-based, inquiry-driven research experiences can effectively promote scientific literacy while motivating students to develop the skills used by working scientists.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Two new methods of multi-material fused deposition modeling offer more precise, less wasteful, and faster means of creating research-quality reproductions of vertebrate fossils

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Multi-nozzle (MN) and multi-extruder (ME) rapid prototyping are the most efficient filament 3D printing technologies, now closer to achieving the resolution and material qualities of traditional silicone-molded resin casts of vertebrate fossils than single-nozzle predecessors. 3D scanning and printing using multi-material filament 3D printing (FDM) is a safer alternative to resin casting and resin stereolithography 3D printing (SLA) for both human health and specimen handling/longevity/chemistry. Recent advancements in MN/ME printing facilitate the production of fossil replicas using different filament materials simultaneously with little to no waste. Such materials include carbon fiber-reinforced polylactic acid (PLA) that blends and obscures layer lines, combined with support interfaces printed in polyethylene terephthalate (PETG) or polyvinyl alcohol (PVA) as removable support materials that facilitate cleaner overhangs that would otherwise detract from resolution, enabling the production of more complex geometries. To compare MN/ME and novel materials against older filament printing technologies, fossil replicas were printed on three distinct FDM units, including one ME multi-extruder or toolhead changing unit, one MN nozzle swapping unit utilizing an Automatic Material System (AMS), and one previous-generation single-nozzle unit utilizing AMS. Replicas were compared and scored against five criteria: complex geometry, support interface fidelity, layer resolution, waste, and efficiency. MN with AMS provided a superior print quality with noticeably fewer surface defects, though print duration was up to twice as long as the ME unit. Single nozzle with AMS yielded more layer defects and noticeable print lines stemming in part from incomplete purges and contaminants accumulating in the nozzle. Printing was exceptionally slow and high in purge waste, though produced smaller prime towers in comparison to the MN unit. Filament saved on the prime tower did not, however, make up for the abundance of purge waste up to three times the mass of the final model dependent on the number of purge cycles per layer. Overall, multi-extruder and multi-nozzle FDM printing more thoroughly obscures support strut contacts. Using Full Spectrum Cyan, Magenta, Yellow + Black, or White (CMYK) software operations, these printers can capture both the

mesh and the texture of the 3D scan, enabling semi-full color printing of the scanned object using up to 24 colors and/or materials.

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

Enamel paleoproteomics from *Teleoceras proterum* and *Aphelops malacorhinus* from the Miocene Mixson Bone Bed, Florida, USA

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Recent paleoproteomic analysis of dental enamel has produced some of the oldest protein sequences known from taxa outside of the crown clades. We have extended these analyses to 10 enamel samples from *Teleoceras proterum* and *Aphelops malacorhinus* from the Mixson Bone Bed (~9–8 Ma) of Florida, USA, collected in the 19th century and originally referenced by Joseph Leidy. From these enamel samples, we successfully found the three most abundant enamel proteins (i.e., amelogenin, enamelin, and ameloblastin) with similar preservational patterns as other Miocene rhinoceratid enamel. Variations in preservation were evident between the teeth, with some recovering all three proteins whereas others only had amelogenin peptide preservation. We were able to show that these proteins are endogenous to the samples, with very high levels of glutamine and asparagine deamidation, as well as nearly complete oxidation and dioxidation of methionine and tryptophan, respectively. We also detected a single amino acid polymorphism from amelogenin, showing the primitive leucine residue in addition to the derived valine residue from the same individual. Using the protein sequences, we were able to place both species in the Perissodactyla phylogenetic tree.

Funding Sources: Smithsonian's Museum Conservation Institute, Smithsonian Institution Fellowship Program, National Endowment for the Humanities Award (PE-277136-21)

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

From ocean fertilization to whale giants: marine mammal responses to Late Miocene productivity and climate change

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The Late Miocene Cooling (7–5.4 Ma) was accompanied by major reorganizations of marine ecosystems, increasing ocean productivity, declining atmospheric CO_2, and the emergence of gigantism in baleen whales. Although these phenomena have traditionally been attributed to changes in ocean circulation and climate, the mechanisms linking marine productivity and marine mammal evolution remain incompletely understood. We compiled records of Central Andean volcanism, marine productivity proxies, and a global dataset of fossil and extant mysticete body sizes to evaluate how changes in ocean nutrient supply may have influenced whale evolution and migration during the Late Miocene. Our dataset includes published length estimates for fossil and living baleen whales spanning the past 20 million years, integrated with records of marine productivity and Andean volcanism. These records were compared with atmospheric ash-dispersion simulations (HYSPLIT) and Earth-system model experiments (CESM2 and cGENIE) that quantified the effects of volcanic nutrient delivery on marine productivity and carbon cycling. Marine productivity proxies show pronounced increases during intervals of intensified Central

Andean volcanism, particularly near ~7 Ma and ~4.5 Ma. These productivity pulses coincide with a marked increase in baleen whale body size beginning around ~7 Ma. Median mysticete body length increased from approximately 5 m in the Miocene to more than 12 m by the Pliocene, accompanied by the disappearance of many smaller-bodied taxa and the rise of large balaenopteroids and balaenids. Modeling results indicate that volcanic ash supplied bioavailable iron, phosphorus, and silica to the Southern Ocean, stimulating diatom productivity and enhancing carbon sequestration. Increased pelagic productivity likely expanded prey resources and favored larger body sizes capable of supporting long-distance migrations between seasonally productive high-latitude feeding grounds and lower-latitude breeding habitats. The temporal correspondence among intensified volcanism, increased marine productivity, whale gigantism, and marine ecosystem turnover suggests that enhanced nutrient delivery to the ocean played an important role in restructuring marine food webs during the Late Miocene. These results highlight a previously underappreciated connection between tectonic and volcanic processes, ocean productivity, whale evolution, and global climate change.

Funding Sources: National Science Foundation grants EAR-2020935 and EAR-2002543, German Research Fund DFG-390741603, and the Natural Environment Research Council (UK) grant NE/W009625/1

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Chondrichthyans of the Red Eagle Limestone (Council Grove Group: Carboniferous–Permian) of Kansas

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The boundary between the Carboniferous and Permian Periods in North America is well represented at the Tuttle Creek Lake Spillway near Manhattan, Kansas. At this locality, all three members of the Red Eagle Limestone are present. In ascending order, the members of the Red Eagle Limestone are the Glenrock Limestone, the Bennett Shale, and the Howe Limestone. The base of the Bennett Shale represents the Carboniferous–Permian boundary due to the presence of the conodont *Streptognathodus isolatus*. Invertebrate fossils, such as brachiopods, bryozoans, ostracods, and gastropods are found in all members of the Red Eagle Limestone. Chondrichthyan and osteichthyan material have been previously reported from the Bennett Shale and more recently, from the Glenrock Limestone. Vertebrate material, in the form of chondrichthyan and osteichthyan teeth, has now also been identified in the Howe Limestone. This investigation details the marine vertebrate fauna identified throughout the Red Eagle Limestone. Taxa identified in the Glenrock Limestone include symmoriiform chondrichthyans (*Stethacanthus*, *Denaea*), ctenacanthiform chondrichthyans (*Glikmanius myachkovensis*), Euselachians (*Cooleyella*), and palaeonisciform osteichthyans (Palaeonisciformes indet.). All of these taxa are also found in the Bennett Shale. Taxa unique to the Bennett Shale include bransonelliform chondrichthyans (*Bransonella nebraskensis*), phoebodontiform chondrichthyans (*Adamantina benedictae*), ctenacanthiform chondrichthyans (*Heslerodoides triangularis*), and eugeneodontiform chondrichthyans (*Bobbodus schaefferi*). Teeth identified from the Howe Limestone include symmoriiform chondrichthyans (*Denaea*), eugeneodontiform chondrichthyans, and palaeonisciform osteichthyans (Palaeonisciformes indet.).

Funding Sources: Paleontological Society Student Research Grant and Wright State University–Lake Campus Research Committee

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

DinoLino: a user-friendly software for 2D morphometrics

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Available morphometrics software options provide a diverse toolkit, but data collection for large image datasets is often slow and labor-intensive. DinoLino presents a means of rapid, easy data collection for 2D image datasets via a suite of in-built, partially automated geometric operations including three methods of approximating curvature (circular arc, parabolic arc, and spline), automated outline detection, Elliptic Fourier Analysis, and other geometric measurements that enable the quantification of curved or irregular biological shapes, with a focus on skeletal material, teeth, and claws. DinoLino is designed for efficiency and ease of use, with a specimen counter, keyboard shortcuts, undo and redo functions, adjustable parameters, tips displayed at the bottom of the screen, and predefined operations that constrain cursor movement when selected to ensure correct and fast geometric measurements. Accessibility features include dyslexia-friendly font options, adjustable text sizes, zoom functionality, colorblind-friendly color palettes, and adjustable picture brightness, contrast, and saturation. We showcase the utility of the software here by measuring the curvature of dentition across several extant and extinct reptile species, including secondarily aquatic mosasaurs (*Tylosaurus*, *Clidastes*) and the theropod dinosaur *Tyrannosaurus rex.* While the literature has suggested that pronounced tooth curvature may aid aquatic reptile species in directing prey towards the back of the oral cavity, aquatic reptiles in our sample exhibit lower degrees of tooth curvature compared with the sampled terrestrial taxa, particularly the Komodo dragon, *Varanus komodoensis*. Further investigation is warranted to elucidate how these patterns of dental curvature reflect dietary ecology and to better understand feeding behavior in extant vertebrates.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Critical reflection on the evolution of career definitions and their relevance to paleontology

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When many people think of a career in paleontology, they imagine an individual excavating fossils in remote locations or conducting scientific research at a university. While these roles remain important, contemporary career theory encourages a more expansive understanding of how people engage with a field of interest. From a traditional perspective, a career in paleontology might appear limited because relatively few university positions or specialist research roles exist. This could discourage individuals who are passionate about prehistoric life but uncertain about pursuing advanced scientific qualifications. However, applying the Systems Theory Framework (STF) reveals a much richer and more diverse network of career possibilities. Paleontology is inherently interdisciplinary. Scientific discoveries rely upon contributions from numerous professions and occupations. Geologists help identify fossil-bearing formations. Laboratory technicians prepare and preserve specimens. Museum educators translate scientific knowledge into public learning experiences. Collection managers maintain archives and research resources. Science communicators, journalists, authors, filmmakers, and illustrators help disseminate discoveries to broader audiences. Digital artists create reconstructions of extinct species. Engineers develop technologies used in excavation and analysis. Tourism professionals support paleontological destinations and museums. Indigenous knowledge holders may contribute valuable understandings of landscapes and heritage. Career development practitioners themselves may assist individuals in exploring pathways into these fields. From a constructivist perspective, career identity may be built around a passion rather than a specific job title. An individual may express their fascination with dinosaurs through education, conservation, museum work, science communication, digital design, tourism, teaching, or cultural heritage management. The STF supports such interpretations because it recognizes that career meaning emerges through interactions between personal interests, contextual

opportunities, and life experiences. This reflection challenges narrow assumptions that success requires becoming a professional paleontologist. Contemporary career theory suggests that meaningful careers can emerge through multiple pathways connected to a shared interest.

Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

Basicranial anatomy of the highly autapomorphic mammal *Fruitafossor* from the Late Jurassic of North America

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Fruitafossor is a basal mammal with postcranial specializations for digging, recovered from the Upper Jurassic Morrison Formation of Colorado and Utah. New specimens recovered from the Cisco Mammal Quarry (151.50 ± 0.28 Ma) include a nearly complete skull with associated postcrania, as well as an isolated partial braincase. Here, we use micro-CT data to investigate the petrosal and cranial base morphology of *Fruitafossor* and compare them with the basicrania of basal mammals and non-mammalian mammaliaforms. Both specimens preserve expansive ear regions. The inner ear vestibules are represented by extremely inflated endocasts (a morphology with no close models among extant or extinct mammals). The cochlea is short and straight, as is plesiomorphic for mammals. The fenestra vestibuli is elliptical and very large, measuring more than half the length of the promontorium. A large stapedial footplate (inferred from the size of the fenestra vestibuli) and an inflated vestibule correlate with sensitivity to low-frequency sounds in modern fossorial snakes and this may have also been the case for *Fruitafossor*.

The crista interfenestralis (separating the fenestra vestibuli and perilymphatic foramen) is plesiomorphic in being horizontally oriented. Lateral to the promontorium, an open lateral trough preserves a foramen for the facial nerve. A lateral flange is robust and triangular in ventral view; it slightly overhangs the lateral trough. The lateral flange serves as the base for a vertically extensive anterior lamina of the petrosal. The full extent of the alisphenoid is uncertain but it forms at least a low basal contribution to the sidewall of the braincase. The basicranial vasculature is plesiomorphic and reminiscent of *Ornithorhynchus* in that the ramus superior to the stapedial artery occupies a deep, broad, and relatively open ascending groove in the petrosal and open to the temporal fossa.

The basicranial anatomy of *Fruitafossor* is overall quite plesiomorphic among mammals; yet several aspects of the ear region are highly autapomorphic, in agreement with the hypothesis that this animal was uniquely specialized for underground life. This mosaic of plesiomorphic and autapomorphic characters continues to call into question the position of this bizarre creature among early mammals.

Funding Sources: Discovery Pool Grants, CNHA (Moab) University of Louisville School of Medicine, Dept. of Anatomical Sciences & Neurobiology Sam Noble Oklahoma Museum of Natural History

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Investigating pathologies preserved in the shell of *Euclastes wielandi*, a turtle from the Paleogene Upper Hornerstown Formation in Mantua, New Jersey

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Despite pathologies and bioerosion being common in extant aquatic turtle species, there is a lack of detailed analyses of these features in extinct taxa. The lack of illustration or detailed descriptions of osseous pathologies preserved in modern and fossil turtle shells makes it difficult to identify preserved structures. An associated skeleton of the sea turtle previously identified as *Catapleura*

repanda, now synonymized as *Euclastes wielandi*, was recovered from the Upper Hornerstown Formation at the Edelman Fossil Park in Mantua, New Jersey. Several costals and a peripheral preserve pathologic pitting, punctures, and excess bone growth. Circular to ovoid pits with smooth walls are present across the dorsal surface of the costals. A variety of different types are described, small circular pits with a range of 2 to 7 mm in diameter to larger ovoid depressions with lengths reaching 19 mm. These larger pits protrude through the shell and are associated with excess bone growth creating dome-like structures that portray smooth or filigree-like textures. There are three prominent circular punctures preserved in two articulated costals that cut through the cortical and cancellous bone, with diameters ranging from 15 to 21 mm. The edges of these punctures are smooth, indicative of healing while the animal was alive rather than peri- or post-mortem damage. One costal with pitting directly above a rib head was thin sectioned for histologic analysis. This lesion is associated with inflammation of the rib head on the ventral surface which preserves the excess bone growth. Potential causes include bacterial, algal, or fungal infection or from corrosion of shell material from anchoring of invertebrates on the sea turtle host. The smallest pits are consistent with corrosion from barnacle attachment, while the larger pits with filigree textured bone growth on the ventral surface suggest osteomyelitis and support an infectious origin. The distribution and morphology of the pathologies and lack of diagnostic markings (e.g., striations) rule out vertebrate and a variety of invertebrate feeding traces. Documentation of these features contributes to a growing framework of information for identifying pathologies and bioerosion in fossil turtles and will support future interpretation of similar lesions.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A preliminary overview of small and juvenile ornithopod and hadrosaur specimens from northwestern Colorado

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While Colorado is renowned for its dinosaur fossil localities as a state, Late Cretaceous deposits of Rio Blanco County and Moffat County in northwestern Colorado remain relatively unexplored. To date, the most recent geological explorations of the area were completed in the 1960s with very few multiyear paleontological surveys completed in the interim. Dominated by the Mesa Verde Group and especially the Williams Fork Formation along the Northern Piceance Basin, the areas surrounding Rangely, Colorado, represent a fluvio-deltaic environment that is rich in crevasse splay deposits that are interbedded with mudstones. Among the mudstone beds, recent discoveries have revealed a small-bodied(?) ornithopod and fragments of a juvenile hadrosaur. The tentative small-bodied ornithopod is represented by an isolated, mostly complete femur that measures 91.5 cm along its long axis and is from an organism that is calculated to have weighed ~1360 kg. The fourth trochanter is complete and three-dimensionally preserved as a tab-shaped wedge. A second instance of an ornithopod that was discovered early in the 2026 field season represents a small, heavily fragmented specimen that is represented by numerous right(?) mandible fragments, a partially preserved dorsal vertebra, a partial caudal vertebra, and various limb elements. An age has yet to be established for this individual, but internal widths of the dental battery's alveoli measure 3–4 mm wide, implying that this individual was at a particularly immature life stage. Both of these specimens suggest that there was a taxonomically and ontogenetically diverse ornithopod population near sources input for riverine systems. These specimens are important to our understanding of northwestern Colorado's Late Cretaceous terrestrial life as well as further our understanding of ontogenetically variable ornithopods in the area. To date, there are no identifiable hadrosaur materials outside of the yet-to-be described brachylophosaurine hadrosaur (colloquially named "Walter"). Further investigations into these specimens and field localities promise a taxonomically and ontogenetically diverse dataset for the region in the coming years.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A new marine reptile assemblage from the Tsaya Canyon Campanian Cliff House Sandstone of New Mexico.

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Presented herein is a preliminary report of the first marine reptile assemblage recovered outside of Chaco Canyon in the Middle Campanian Cliff House Sandstone of northwestern New Mexico, USA. In the study area at Tsaya Canyon in the San Juan Basin, the Cliff House Sandstone is a transgressive cliff-forming nearshore marine deposit that intertongues with the regressive terrestrial Menefee Formation. Recent fieldwork has recovered fossils of mosasaurs, plesiosaurs, and turtles, along with evidence of theropod dinosaur material. The depositional environment of the study area has been interpreted as shallow and high energy, with fossil remains largely represented by fragmentary and isolated bones and teeth. The mosasaur material is represented by an isolated anterior portion of an indeterminate maxilla, two small teeth referred to *Globidens* sp. that have possible affinities to the late Campanian species *Globidens schurmanni*, a strongly fluted plioplatecarpine tooth, and an abraded vertebra. The maxilla bears two large foramina and multiple tooth positions obscured in matrix, necessitating additional preparation to further its taxonomic resolution. Embedded in sandstone under the maxilla, a theropod limb bone fragment was also recovered, indicated by thick cortical bone and a hollow interior. The plesiosaur material is represented by a well preserved, isolated phalanx, and chelonian material comprises at least one isolated shell fragment. Further preparation is necessary to clarify the preliminary identifications of additional indeterminate reptilian fossils. These new discoveries in Cliff House Sandstone deposits at Tsaya Canyon contribute novel far-western occurrences of several Western Interior marine reptiles, including the westernmost global occurrence of *Globidens*. Though offshore and eastern occurrences of marine reptiles are well known in North America from Campanian units such as the Ozan Formation, Pierre Shale, and Mooreville Chalk, coastal Laramidian marine reptile assemblages are poorly described. The Cliff House Sandstone thus provides a new perspective into the distribution of aquatic reptiles in the westernmost portion of the Western Interior Seaway, broadening the visible scope of Campanian marine ecosystems.

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

New cranial material of *Ahdeskatanka russlanddeutsche* clarifies osteological anatomy and small-bodied alligatorid diversity in the early Eocene

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Ahdeskatanka russlanddeutsche is a small-bodied alligatorid from the early Eocene of the Golden Valley Formation of North Dakota. The holotype (YPM VPPU.016990) described in 2024, preserves much of the skull and was interpreted as skeletally mature based on external morphology, but lacked several regions critical to assessing feeding ecology and ontogenetic status. Here we describe NDGS 16140, a second specimen from the type locality, referable to *A. russlanddeutsche,* that is similar in size to the holotype and preserves anatomy unknown in the latter, including the mandible, the complete skull table, and the upper jaw-joint region. The specimen provides the first direct information on mandibular morphology in the species and permits revision of diagnostic characters and phylogenetic scoring. Osteohistological data from a humerus indicate an adult individual approximately 15 years old at death. The section preserves numerous growth marks and incipient development of an external fundamental system, suggesting that additional

growth was possible but would likely have been limited. We therefore interpret NDGS 16140 as an adult or near-skeletally mature individual rather than a juvenile. However, the section was sampled proximally from the minimum diaphyseal circumference, as this is all that was preserved and intersects the distal end of the deltopectoral crest; growth marks are also compressed near this region. Consequently, the specimen is inappropriate for quantitative growth-curve reconstruction beyond growth-mark count and broad maturity assessment. The adult status and holotype-comparable size of NDGS 16140 support the interpretation that *A. russlanddeutsche* was a genuinely small-bodied alligatorid, rather than a juvenile representative of a larger taxon from the site. This new specimen clarifies mandibular anatomy, strengthens the diagnosis of *A. russlanddeutsche*, and provides a rare opportunity to integrate cranial morphology and histology in evaluating maturity, body size, and ecological diversity among early Paleogene alligatorids. More broadly, these data highlight the importance of histological context when interpreting size and maturity in fossil crocodylians.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A biomechanical approach to bipedalism in the glyptodont *Panochthus intermedius* (Xenarthra: Cingulata)

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Glyptodonts were among the most important groups of South American megafaunal mammals during the Cenozoic. However, few biomechanical studies of locomotion have been conducted on this group, including specimens of the genus *Panochthus*. In this context, the present study aimed to test the hypothesis of bipedal posture in *Panochthus intermedius*, thereby expanding the knowledge about the locomotion of these animals. For this purpose, an almost complete specimen of *Panochthus intermedius* (MHNC-13491) was digitized using a handheld scanner to produce a 3D digital model, and the extensor and flexor musculature of the hindlimbs was reconstructed using the Extant Phylogenetic Bracket (EPB) approach based on myological descriptions of xenarthran species available in the literature (*Tolypeutes matacus* and *Bradypus variegatus*) and on two dissected individuals of *Dasypus novemcinctus*. We observed a conservative pattern of hindlimb musculature in *D. novemcinctus*, with muscles adapted to support the rapid and wide forelimb movements used in digging. For the biomechanical modeling used to estimate the *P. intermedius* specimen's potential to adopt a bipedal posture, the moment arms of muscles were estimated in Blender software at 10° intervals within the range of motion permitted by each joint. Our analysis of the reconstructed muscular moment arms for the hind limb of *P. intermedius* indicated a predominance of high-leverage extensor muscles, with peak moment arms occurring at maximum joint extension angles. Hip joint flexor muscles showed smooth increases from -20° to 30°, with most peaks at 30°. Extensor muscles of the knee joint showed gradual increases from -70º to 30º, with most peaks at 30º. The moment arms of the ankle extensors increased gradually from -30º to 30º, with peaks at 30º. Results suggest a biomechanical configuration of a hind limb primarily adapted for weight-bearing and postural stability, consistent with previous interpretations of glyptodont lifestyle. The hind limbs of *P. intermedius* may have been capable of maintaining the body in a semi-erect bipedal stance, as in many extant Xenarthra. This may have been the case for other glyptodonts, preserving limited bipedal capacity despite changes in body size and carapace dimensions.

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Technical Session XIV: Return of Reptile'O'Rama: Triassic time (Friday, November 13, 2026, 1:45 PM)

Ecological Functional Unit Analysis of Triassic Marine Reptile Diversity Highlights Disparity between Tethyan and Panthalassan Faunas

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The past several decades have seen a marked expansion in the recorded taxonomic diversity of Triassic marine reptiles. Although evolutionary radiations of marine reptiles are frequently invoked in Permian–Triassic Mass Extinction (PTME) recovery narratives, the influence of geographic dispersal on the timing and structure of ecological reorganization remains poorly defined. Here, we applied an ecosystem-level framework to 14 Spathian–Carnian marine reptile assemblages using ecological functional units (EFUs), where taxa are defined based on the ecomorphological traits of dentition, body length, and locomotion. This enables spatiotemporal comparisons of ecosystem architecture and functional diversity, which occurs independent of taxonomic turnover. Our results illustrate strong taxonomic and ecological disparity between Panthalassan and Tethyan assemblages. Panthalassan assemblages are dominated by fully pelagic predators, while Tethyan assemblages display substantially greater functional diversity within and between localities. In contrast with Panthalassan ecosystems, which preserve a remarkably constant functional diversity, Tethyan assemblages show a marked expansion and relative stabilization of ecological roles from the middle Anisian. Most Panthalassan EFUs were present in Tethyan assemblages, whereas the reverse pattern is not observed, supporting a reduced functional diversity amongst marine reptiles in Panthalassa. Although the relative importance of geography, habitat availability, and preservation bias remains unclear, the contrasting ecomorphological structure of these oceans suggests that dispersal constraints played an important role in shaping divergent pathways of community reorganization following the PTME. These results demonstrate how ecosystem-based datasets can reveal both macroecological and macroevolutionary patterns that are obscured by taxonomic composition and species richness alone. This approach quantifies how ecological functional roles are distributed within and between ecosystems, allowing functional diversity and ecological structure to be compared in deep time. This project opens up investigations into how dispersion barriers can create such stark differences in ecosystem composition throughout Triassic marine vertebrate assemblages.

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

The Central Andes: an archive of neotropical faunal and paleoenvironmental change during the Miocene

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Few neotropical regions preserve a succession of terrestrial mammal faunas suitable for investigating changes in Cenozoic faunas and paleoenvironments over large time scales. One of these is the Central Andes of northern Chile and Bolivia (18–22°S). Central Andean paleofaunas span most of the Miocene, a particularly important interval that includes the Middle Miocene Climatic Optimum and subsequent climatic deterioration. Additionally, the region likely experienced major uplift during this interval, though studies have differed widely regarding its timing. Integrated faunal and paleoenvironmental analyses are essential for reconciling these conflicting interpretations. The fauna of late Early Miocene

Chucal (Chilean Altiplano) includes unique species as well as ones typical of contemporaneous sites from southern South America (SSA). This suggests broadly similar habitats but significant latitudinal provinciality at this time. Early Middle Miocene Cerdas (Bolivian Altiplano) preserves a variably open shrubland paleoenvironment that received moderate and variable precipitation. New radioisotopic dates from Nazareno (Bolivian Eastern Cordillera) support previous biostratigraphic inferences that most of its fossils are similar in age to those of Cerdas. The presence of astrapotheres at Cerdas and Nazareno suggests low paleoelevations. Late Middle Miocene Quebrada Honda (Bolivian Eastern Cordillera) has yielded a diverse mammal fauna. Nearly all of its species are unique to the region and few, if any, are shared with the contemporaneous site of La Venta, Colombia (4°N). At higher taxonomic levels, its fauna is more similar to those of SSA than the Equatorial tropics. New paleosol studies from Member B-upper suggest a seasonal, semi-arid paleoenvironment similar to that recorded from Member A-lower. Ectothermic vertebrates from Quebrada Honda, including a giant tortoise (*Chelonoidis* sp.) and a very large snake (likely 4–5 m), indicate relatively low paleoelevation. Middle to Late Miocene Quehua (Bolivian Altiplano) has been little studied paleontologically, but stable carbon isotope data from notoungulates suggest the presence of C4 grasses, which do not occur at high elevations. Together, these data suggest that the Central Andes had not undergone substantial uplift prior to the Late Miocene, a conclusion that contrasts with isotopic studies that have suggested high paleoelevations (3,000–5,000 m) for several of these sites.

Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

Contrasting trophic networks in intracontinental and coastal ecosystems after the Cretaceous Thermal Maximum: case studies from the Gobi and Western Interior Basins

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The Cretaceous Thermal Maximum (KTM)—a hyperthermal event peaking at the Cenomanian–Turonian boundary—coincided with the rise of angiosperms predominantly in coastal systems. Together, these phenomena are thought to have substantially impacted the trophic structure of terrestrial ecosystems; however, to date, few studies have investigated changes in dietary ecology across the KTM. To establish trophic networks of terrestrial ecosystems thriving within 5 Myr post-peak KTM, and to contrast these between intracontinental and coastal (marine subsidized) ecosystems, we conducted geochemical analyses ($\delta^{13}C$ and $\delta^{18}O$) of fossil enamel(oid) of >130 specimens recovered from the Turonian-aged lower Bayanshiree Formation, Mongolia, and Smoky Hollow Member, Straight Cliffs Formation, Western Interior Basin, USA. Dromaeosaurids in the Bayanshiree Formation have a highly restricted range of $\delta^{13}C$ (-6.56‰ to -6.47‰), suggesting a specialized diet. Distinct $\delta^{13}C$ in a Straight Cliffs dromaeosaurid taxon suggests that thescelosaurids were not a primary dietary component (-1.71‰ compared to -5.90‰). We find dietary differences between some herbivorous taxa in both the Asian and Laramidian systems, including notable niche partitioning between sauropodans and hadrosauroids in the Bayanshiree Formation, and thescelosaurids and ceratopsians in the Straight Cliffs Formation. A 1–3‰ offset between Bayanshiree sauropodans and allosaurians suggests a predator–prey relationship. A mixed-feeding or omnivorous diet is preliminarily suggested for *Richardoestesia* in the Straight Cliffs Formation, with large $\delta^{13}C$ ranges. A comparison of the $\delta^{13}C$ and $\delta^{18}O$ isotope ecology of the Straight Cliffs and Bayanshiree formations allows for an evaluation of contrasting KTM effects. The sauropodan-allosaurian predator–prey relationship substantiated by our Bayanshiree data supports

hypotheses that the disappearance of allosaurian apex predators within the well-sampled Western Interior Basin during the initiation of the North American Sauropod Hiatus was the result of a predator–prey relationship between these taxa.

Funding Sources: Paleontological Society and Jurassic Foundation (EGC), NSF (2448142) to LEZ, TMC, CAS, EH, TC, RTT, and National Geographic Society (NGS-100601R-23) to TC, RTT, LEZ

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A diverse fish and amphibian-dominated microvertebrate fauna from a taxonomically-rich channel lag, Dinosaur Park Formation (Campanian, Upper Cretaceous) of Montana

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Microvertebrate assemblages have the potential to inform on small vertebrate ecosystem dynamics and provide a robust picture of paleocommunity structure across geologic units. Jack's Bonebed (JBB) is a multi-taxic bonebed in the Dinosaur Park Formation (equivalent mapped as Judith River Formation) located on Bureau of Land Management land, Hill County, Montana, and excavated under permit by Badlands Dinosaur Museum, Dickinson, North Dakota. This site provides a unique opportunity to investigate an exceptionally rich assemblage that preserves large, articulated, and associated vertebrate fossils and abundant microfossils. JBB comprises a fine–medium grained sandstone with intraformational mudclasts, fossil wood, and a basal lag of quartzite pebbles and bivalves. Microvertebrate remains were recovered by surface collecting, mechanical preparation, and bulk screenwashing. Chondrichthyians are not diverse, with only *Myledaphus* and cf. *Restesia* present. Actinopterygians are represented by Holostean A, *Arotus*, lepisosteids, amiids, *Belonostomus*, *Coriops*, *Paralbula*, acanthomorphs, *Estesesox*, and a variety of teleost centra morphotypes. Lissamphibians are represented by scapherpetontids, *Opisthotriton*, toothed anurans, and albanerpetontids. Non-dinosaurian reptiles include anguids, helodermatids, *Parasaniwa*(?), *Champsosaurus*, cf. *Leidyosuchus*, and alligatoroids. Theropods are represented by tyrannosaurids, *Richardoestesia*, and *Saurornitholestes*. One peculiar tooth may represent an avialan or eusuchian. Ornithischians at the site include hadrosaurids, ceratopsids, ankylosaurids, and possibly thescelosaurids. Multituberculates and therians have both been recovered. The JBB microvertebrate fauna includes at least 30 taxa. The JBB microfauna is dominated by lissamphibians and teleosts, with *Opisthotriton* being most common (hundreds of centra). Though dermal elements of semionotiformes are frequently collected, the most commonly collected fish jaw elements are those of amiids, *Coriops*, and escocids. The microvertebrate fauna of this assemblage is consistent with that of the Dinosaur Park Formation of Alberta, Canada, thus supporting the emerging interpretation that the Dinosaur Park Formation is present in northernmost Montana as laterally restricted valley fills.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Systematics of a marine chondrichthyan and osteichthyan assemblage from the Upper Cretaceous (Maastrichtian) Peedee Formation of Greenville, North Carolina, USA

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Understanding vertebrate paleoecology and paleobiogeography require in-depth knowledge of systematics and biodiversity. The Coastal Plain of North Carolina is well-known anecdotally for its fossiliferous units, although systematic collection and formal descriptions are rare. The Upper Cretaceous (Late Maastrichtian) Peedee Formation is one such unit, with outcrops exposed throughout the coastal waterways of the Cape Fear and Pee Dee river basins in North and South Carolina. To date, many putatively "Peedee Formation" collections are "float" specimens derived from these waterways. Here we review a more systematic collection of largely marine vertebrate fossils, originating from Peedee Formation spoils generated by excavations at the Greenville Wastewater Treatment Plant in Greenville, North Carolina.

The collection represents more than 40 vertebrate taxa, of which 28 are chondrichthyans. The taxa reported here have no prior formal descriptions from Greenville, although most are known anecdotally and many are mentioned in general accounts of Peedee Formation assemblages. The chondrichthyans include Hybodontiformes (*Meristodonoides*), Orectolobiformes (*Cantioscyllium*, *Ginglymostoma*, *Nebrius*, *Plicatoscyllium*), Lamniformes (*Archaeolamna*, *Squalicorax*, *Odontaspis*), Carcharhinodontiformes (*Palaeogaleus*), Myliobatiformes (*Brachyrhizodus*, *Rhombodus*), and sawskates (*Ischyrhiza*, *Ptychotrygon*). Two identified genera within the collection, *Archaeomanta* and *Pseudomegachasma*, have no prior records from the Atlantic Coastal Plain. *Archaeomanta* likely stems from the Eocene Castle Hayne Limestone overlying the Peedee Formation. In addition to chondrichthyans, the assemblage contains the remains of diverse, yet less identifiable, osteichthyans (Pycnodontiformes, Aulopiformes, Ichthyodectiformes, etc.). One pycnodontiform tooth may pertain to the family Gyrodontidae, representing a biostratigraphic range extension of the family, which ended in the Early Cretaceous, to the Late Cretaceous. Our review of this collection suggests that the Peedee Formation is a fossil-rich unit with a biodiversity matching other contemporaneous marine faunas known from Appalachia and Laramidia, with eastern Atlantic influences. The vertebrates of the Atlantic Coastal Plain are understudied compared to contemporaneous western strata, with prolonged gaps in comprehensive research, and additional collections from the region should be investigated and/or reevaluated for taxonomic significance.

Funding Sources: Undergraduate Research Assistantship, Office of Student Research, and the North Carolina Fossil Club

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Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

The oldest known placental mammal auditory apparatus

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The Cretaceous–Paleogene mass extinction and subsequent recovery represents a pivotal period in the evolutionary history of placental mammals. The archaic ungulates ("condylarths") epitomize the initial placental mammal diversification and quickly become the most speciose and one of the most numerically abundant groups during the earliest Paleocene. The hypothesized ancestral group from which several archaic ungulate families arose is the Arctocyonidae, a taxonomically contentious group with ambiguous phylogenetic affinities. The uncertain affinities of arctocyonids within the broader placental mammal radiation are likely driven, at least in part, by a fossil record that consists primarily of isolated teeth and fragmentary gnathic remains. Cranial fossils of arctocyonids, by contrast, especially those that preserve basicranial anatomy, are relatively rare.

Here, we report a partial skull of the arctocyonid *Loxolophus* from the middle Puercan (Pu2) North American Land Mammal Age of the Denver Basin of Colorado that not only preserves the first known ectotympanic and middle ear ossicles for an arctocyonid but also represents the oldest known auditory apparatus for any placental mammal. The ectotympanic is unexpanded and horseshoe-shaped with a large triangular styliform process.

The absence of ectotympanic expansion, evidence for an entotympanic, and pronounced processes of the petrosal, basisphenoid, or squamosal suggests that the ectotympanic was ventrally exposed and an auditory bulla was absent. The malleus has a rostral process that is strongly fused to the ectotympanic anterior crus with a manubrium that is parallel to the axis of ossicular rotation, and which is much larger than the incus. Overall, the ectotympanic and ossicular morphology of *Loxolophus* broadly resembles that of Paleocene pantodonts and Mesozoic eutherians, with similarities likely representing eutherian plesiomorphies. Functionally, this morphology indicates a relatively stiff middle ear suggesting that *Loxolophus*, like Mesozoic eutherians, was better attuned to high-frequency hearing with reduced responsiveness to low-frequency sounds. Whereas there is a well-documented increase in both body size and dietary disparity for placental mammals in the early Paleocene, bones of the auditory region appear to have remained relatively unchanged from those of Mesozoic eutherians, perhaps suggesting a similar evolutionary lag as previously proposed for the brains of Paleocene mammals.

Funding Sources: US National Science Foundation (FRES 2317672, FRES 2317666), National Geographic Society (NGS-93605R-22), Lyda Hill Foundation, and M.L. and S. Kneller

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Technical Session VIII: Fishes (Thursday, November 12 1:45 PM)

Specimen-level data reveal the deep-time macroevolution of chondrichthyans

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Chondrichthyans (cartilaginous fishes) represent one of the major extant lineages of jawed vertebrates, with a fossil record spanning more than 460 million years and ~1,300 extant species, including sharks, rays, and chimaeras. However, the deep-time macroevolutionary history of total-group chondrichthyans remains unclear. Here, we construct a comprehensive specimen-level dataset comprising 22,057 occurrence records and 4,281 species and use Bayesian birth–death modelling implemented in PyRate to quantify macroevolutionary dynamics of chondrichthyans across their entire history.

Total-group chondrichthyans exhibit a three-phase evolutionary history, with successive diversity peaks in the Early Devonian, Early Carboniferous, and Late Cretaceous reflecting the sequential dominance of stem chondrichthyans, holocephalans, and elasmobranchs, respectively. Stem chondrichthyans show a rapid radiation from the Wenlock (Silurian) to the Lochkovian (Early Devonian), followed by a long-term decline through the Devonian and Carboniferous, and eventual extinction in the early Permian or Cisuralian.

Holocephalans underwent a major radiation from the Late Devonian to Early Carboniferous, coinciding with the early stages of the Late Paleozoic Ice Age (LPIA), and were characterized by high net diversification rates and prolonged lineage longevity. Their diversity peaked in the Viséan, but this high-diversity state was transient: holocephalan diversity collapsed as temperatures rose briefly and remained persistently low throughout the Mesozoic and Cenozoic. AR1-GAMM analyses further indicate a negative relationship between holocephalan diversity and temperature, particularly during the Carboniferous. Elasmobranchs show a contrasting evolutionary trajectory marked by long-term resilience and sustained positive net diversification rates. Following an early Paleozoic radiation, they maintained relatively high but fluctuating diversity since the Late Carboniferous. A major diversification phase occurred during the Cretaceous, culminating in a Late Cretaceous peak, followed by a gradual decline toward the present. Overall, our study provides a comprehensive, data-driven reconstruction of macroevolutionary dynamics across total-group chondrichthyans and their major subclades, offering a quantitative framework for understanding the deep-time evolution of this key jawed vertebrate lineage.

Funding Sources: National Natural Science Foundation of China, Young Scientists Fund Project 42302005

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Small amniote remains expand the faunal assemblage of the Manda Beds (Middle Triassic, Tanzania) and shed light on the Middle Triassic distribution of allokotosaurs and other groups

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Archosauromorph lineages were most likely present before the Permian–Triassic mass extinction based on phylogenetically-informed divergence estimates; however, fossils of small reptiles that link lineages found in the Middle and Late Triassic are often sparse. As a result, our knowledge of early-diverging forms of most groups within Archosauromorpha and other Triassic lineages is poorly understood. Additionally, fossils of small reptiles from the Middle Triassic are poorly represented in Africa, leaving both biogeographic and temporal gaps in our understanding of the evolution of archosauromorphs and other lineages. Here, we report and describe isolated elements from locality Z183 in the lower part of the upper Manda Beds (Lifua Formation) of Tanzania. Previously reported taxa from this site include an azendohsaurid, the avemetatarsalian *Teleocrater*, *Cynognathus*, a temnospondyl, and the large dicynodont *Dolichuranus*. We identify at least one new taxon of small azendohsaurid based on a dentary with teeth, suggesting that there are both large and small azendohsaurids with different diets in the same fauna. Small femora could belong to the same small azendohsaurid, skeletally immature specimens of the larger azendohsaurid, or other small saurians. Other fragmentary limb bones, including proximal femora and a tibia, bear morphological similarities with early amniotes such as varanopids. A distal femur resembling early amniotes could also belong to a drepanosauromorph, one of the oldest occurrences of the group and the first from Tanzania. A nearly complete and well-preserved humerus may represent a kuehneosaurid, which would also be the first known from Tanzania. Although fragmentary and thus hard to concretely attribute to specific groups, these specimens possibly double the number of taxa from the locality, hinting at the potential survival of at least one early-branching amniote lineage through the Permian–Triassic mass extinction into the Middle Triassic as well as an older record of a clade (Drepanosauromorpha) known mostly from the Late Triassic. These new discoveries help fill gaps in the fossil record both temporally and geographically concerning the Middle Triassic of Africa.

Funding Sources: National Geographic Research Grant #9606-14; National Science Foundation EAR #1024036

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

Recent discoveries in the Olteţ River Valley, Romania

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Though the Olteţ River Valley Pleistocene paleontological sites have been known for some time, their use in comparative analyses has been limited. Here, we present recent discoveries and reappraisals of this significant paleontological region, with primary focus on the site of Grăunceanu. Dated to >1.95 Ma, Grăunceanu contains several rare taxa, including

Paradolichopithecus, a large-bodied papionine, and *Smutsia olteniensis*, the youngest pangolin in Europe. Additionally, the carnivore assemblage is one of the richest in the early Pleistocene of Europe with at least ten species. Ruminants from the region record a marked shift in taxa at the Villafranchian–Galerian transition. Some of the oldest traces of hominin behavior outside of Africa have been recovered in the form of cut-marked bones. Taphonomic analysis suggests Grăunceanu was likely formed by a series of over-bank flood deposits, recording carnivore and hominin behaviors. Evidence of seasonal occupation is demonstrated in cervids and equids. Multiproxy paleoecological reconstructions suggest the region consisted of primarily open vegetation, though more forested zones were found along the Olteţ River banks.

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Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

New specimens, updated associations, and refined perspectives on the anatomy of the titanosaur *Rapetosaurus*: insights from three stacked bonebeds in locality MAD 93-18 (Upper Cretaceous Maevarano Formation, Madagascar)

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The Maevarano Formation of northwestern Madagascar has yielded an unparalleled terrestrial vertebrate Gondwanan assemblage, including the titanosaurian sauropod *Rapetosaurus*. One locality, MAD 93-18, preserved the most complete titanosaur skeleton known: a closely associated juvenile excavated in 1995 and referred to *Rapetosaurus* based on cranial synapomorphies. This specimen became central to interpretations of titanosaur anatomy and evolution. However, the time-averaged nature of most Maevarano bonebeds, including MAD 93-18, has complicated specimen associations, left regions of the skeleton poorly characterized, and limited broader anatomical and paleobiological interpretations.

The MAD 93-18 locality consists of three discrete multitaxon bonebeds; two additional discrete horizons crop out in the few meters above the 1995 horizon. All three assemblages are dominated by bones attributable to *Rapetosaurus*. Each horizon preserves at least one well-preserved skeleton, along with fragmentary remains of other *Rapetosaurus* individuals. Specimen association is supported by spatial proximity, element size and representation, precise articulation, and taphonomic evidence of distinct postmortem histories.

The lowest horizon (1995) includes FMNH PR 2209, a juvenile skeleton (femoral length = 66 cm). Cranial elements associated with this skeleton exhibit precisely articulating sutures, but occur more than a meter apart within the quarry. This horizon also includes a few limb, vertebral, and cranial elements attributable to a second, similarly sized individual. The middle horizon (1998) yields an osteoderm, vertebrae, ribs, girdle, and limb elements of the largest known *Rapetosaurus* (femoral length = 143 cm). Postcrania of smaller subadults (femoral lengths = 38–86 cm), neonates (femoral length = 19 cm), and tiny hatchlings (caudal centrum < 1 cm) are also present in this horizon. The upper horizon (2003) is dominated by a partially articulated juvenile skeleton (femoral length = 85 cm).

Collectively, the three MAD 93-18 bonebeds document at least ten *Rapetosaurus* individuals, and include previously unknown elements (e.g., quadratojugal), articulated manus and pes, associated osteoderms, and a more comprehensive representation of caudal vertebrae. This expanded sample enables further study of morphological variation, growth, and intraspecific anatomical diversity, and provides key taphonomic and paleoecological context for sauropods in the Maevarano ecosystem.

Funding Sources: US National Science Foundation, National Geographic Society, David B. Jones Foundation, Macalester College, and patrons of the Denver Museum of Nature & Science

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Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

"Happy" to see you: *Haplocanthosaurus delfsi* secrets revealed

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The remounting of "Happy," the *Haplocanthosaurus delfsi* holotype (CMNH 10380), for the Cleveland Museum of Natural History's 2024 renovation let us study the original material. Collected in 1954, 1955, and 1957 and first mounted upright in 1963, the skeleton was diagnosed as a new species from photographs and the mounted bones, citing two dorsal vertebral laminar characters, unfused ischia, large size, and robustness. Remounting required Research Casting International to disassemble, clean, stabilize, and prepare each bone. With most paint and plaster removed and the bones examinable at ground level, we tested the vertebral characters. The first, V-shaped antero-laterally projecting laminae on the neural spines of the middle dorsals, was not substantiated once restoration was removed from middle dorsals six through eight; we read it as an artifact of restoration and ladder-level viewing between ribs. The second, greater development of the median laminae on the posterior dorsals, was confirmed but likely reflects body size and is not phylogenetically significant.

The "neural chamber" of *H. priscus*, a neural-arch fossa mirroring the centrum's pneumatic fossa and with a thin median septum, is absent from all *H. delfsi* vertebrae, a valid character separating the species. Hollow pedicles occur on the *H. delfsi* dorsal neural arches: an accidental break exposed sandstone-filled cavities, walls roughly 1.5 cm thick around a hollow, long-bone-like interior. "Happy" shows striking left-right asymmetry in laminae and fossae. D11 bears a deep (>3 cm) multipartite pocket on the left but a shallow (<1 cm) one on the right. In D9, paired spinopostzygapophyseal laminae enclose a deep (>3 cm) fossa, with a second at the postspinal lamina termination, where the left median lamina is well developed and the right barely present while the outer laminae reverse this. Treated as four laminae the structure is "balanced," yet shows what one vertebra can hold. Such variation cautions against diagnosing sauropod species on isolated laminar features.

While unmounted, we confirmed no neurocentral suture evidence and found the most proximal *H. delfsi* caudals procoelous, unlike the amphicoelous caudals of *H. priscus*. Complete pre-restoration scans are essential. Though similar, *H. delfsi* is differentiable from *H. priscus* via vertebral characters; with both lacking sutures, the size disparity proposed as a generic-level differentiator may hold.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Paleopathological and taphonomic traces on the bone surfaces of a nodosaurid anklyosaur specimen from the Dinosaur Park Formation of southern Alberta

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Ankylosaurian dinosaurs are known for their robust stature and extensive osteoderms. These osteoderms are believed to have been defensive/offensive armaments against predators and competitors. Recent surveys have found that these osteoderms were susceptible to dermatitis ulcerations, skin infections that may erode associated bony structures as reported in modern crocodylians and turtles. Coincidentally, few studies to date have analyzed tooth marks found on ankylosaurian remains, even though these traces provide valuable information regarding the behaviors and trophic interactions that produced them. This collectively suggests that both

pathological and taphonomic bone surface modifications in Ankylosauria deserve more attention in general. Here, we present a case study of a partial *Panoplosaurus* skeleton (ROM 1215) from the Dinosaur Park Formation of southern Alberta, Canada. Of its two complete sternal plates, five furrows were on the dorsal and ventral surfaces of the right plate. These marks were inclined 30–40° from the rostrocaudal axis of said plate, and several extended to the medial edge, fracturing it. This alignment indicates the marks were likely formed during a single bite as the plate was gripped between teeth with enough force to fully penetrate cortical bone, suggesting the actor was a medium-large-bodied tyrannosaurid. Additional scores were also found adjacent to the costochondral junction of four mid-sized ribs. Taken together, these marks likely represent attempts to manipulate these bones to access the abdominal viscera while the deceased ankylosaur was on its back, rather than remove the attached muscle. Additional marks were scores located on the right humerus, right ulna, and two caudal vertebral centra, suggesting potential defleshing/disarticulating behaviors. There was no evidence of osteophagy. Of the numerous osteoderms surveyed, 17 displayed ulcers on their superficial surfaces. They were found on osteoderms ranging from 2–18 cm in length, consisting of both singular and multiple coalesced circular/ovoid lesions, often found on or adjacent to the keel. These were almost always eroded down to the trabecular bone, often were rimmed by calluses, and lacked the crushing texture indicative of bite trauma. This specimen indicates that both pathological and taphonomic bone surface traces may be found on the same specimen, highlighting the importance of diagnostic criteria to distinguish them from one another.

Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

Life history and metabolic rate of the theropod dinosaur *Deinonychus antirrhopus* inferred from osteohistology

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The dromaeosaurid theropod dinosaur *Deinonychus antirrhopus* has played an outsized role in debates about dinosaur physiology and growth, but detailed study of the most straightforward source of data regarding these features, osteohistology, is lacking. We use traditional ground thin sections and micro-CT to investigate a histological sample that includes more than a dozen elements from eight individuals spanning both its geographic range and its ontogeny from hatching to somatic maturity. We compare models of body mass versus time using information criteria. *Deinonychus* bone cortices are composed of fibrolamellar bone with mostly longitudinal neurovasculature, with a transition to circumferential neurovasculature only in the last few years of life. Woven bone makes up a large proportion of the cortex in small individuals, whereas larger individuals have mostly parallel-fibered bone with a small lamellar component. Cortical remodeling begins in the first few years of life and is dense in the largest sampled specimens. Some smaller individuals that were previously inferred to be somatically mature on the basis of osteohistology are reinterpreted as juveniles. The best-supported growth models of *Deinonychus* are sigmoid, with several years of slow growth preceding a few years of explosive growth to reach asymptotic body size within approximately 15 years. One small individual in our dataset preserves embryonic bone surrounding the medullary cavity, separated from the surrounding periosteal bone by a sharp boundary that we identify as a hatching line. The circumference of the hatching line corresponds to a femur more than 10 cm in length, suggesting that *Deinonychus* eggs were large, in keeping with the large body size of the taxon relative to most other dromaeosaurids. Relative primary osteon area of the femur of a young individual predicts a metabolic rate similar to that of many extant birds and mammals. Overall, bone histology supports the traditional view of *Deinonychus* as a metabolically active, fast-growing taxon.

Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

Holocene bison diminution structured by predation pressure: modeling the selfish herd and non-extinction consequences of harvest pressure

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The survival of American bison (*Bison bison*) through the Late Pleistocene–Holocene mass extinction represents one of the most consequential and poorly understood outcomes of this extinction event. Not only did bison persist where other megafaunal grazers did not, but they achieved extraordinary population abundances, becoming the dominant large grazer on the continent by biomass. Coincident with the success of bison is a marked reduction in bison body size from the terminal Pleistocene through the Holocene. The drivers of this diminution remain debated. Here, I evaluate two hypotheses: dietary forage quality shifts associated with C3 to C4 grassland replacement, and selection for increased herd sizes as a response to human predation. Carbon isotope data do not support a consistent temporal trend in C4 dietary proportion, providing little evidence that grassland compositional change necessarily drove the observed diminution. In contrast, a mathematical model of predation probability under aggregated versus isolated group strategies demonstrates that human mass kill hunting can create the conditions to select for increasing herd aggregation, and that the combination of harvest pressure and density-dependent forage competition within herds would select for diminutive body sizes. This mechanism is corroborated by documented changes in bison horn morphology consistent with relaxed selection for lethal male-male combat in dense herding populations, a pattern analogous to neoteny observed in domestic bovids. Taken together, these findings suggest that sustained harvest pressure by human foragers shaped bison life history evolution, favoring larger herds, resulting in diminutive body sizes. Bison thus represent a case in which novel predation pressure did not eliminate a megafaunal prey species but instead transformed their behavior, contributing to the abundant population presence that defined the Holocene Great Plains.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Architecture of keel-headed amphisbaenians poses interesting challenges for phylogenetic analysis and interpretation of the evolution of amphisbaenian skulls

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Amphisbaenians have long been recognized to exhibit skull morphotypes that can be conveniently classified as round, spade-snouted, and keeled. Those morphotypes do not correspond to monophyletic groups but do seem to be associated with varied biomechanical aspects of head-first fossorial locomotion. Round-headed taxa (e.g., *Amphisbaena*, *Zygaspis*) and spade-headed taxa (e.g., *Rhineura*, *Diplometopon*) have been documented in the literature in some detail, but keel-headed amphisbaenians have not. Three African keel-headed amphisbaenian species in the genus *Ancylocranium* each have a uniquely aberrant skull morphology that, apart from a few published photographs, remain undocumented. We recently studied two less aberrant keel-headed species, the South American *Amphisbaena kingii* and the East African species *Geocalamus acutus*. In *Amphisbaena kingii* the keel structure is formed by a sharp angulation of the facial segment of the skull, in which the anteroventral portion of the premaxilla is posterodorsally inclined so that the teeth are directed more posteriorly than ventrally, the nasal process of the premaxilla is thickened to form the anteromedial part of the keel, and the nasal and frontal bones are inclined 52^0 from the horizontal. The posterior-most expression of that angulation is along the frontal-parietal suture, where strongly interdigitating processes on both elements articulate in a complex interlocking manner. The articulation facets are more vertically oriented, rather than the more horizontal orientation in round-headed amphisbaenians. In

Geocalamus acutus, the keel structure is much more subtle (34⁰), the premaxilla is not inclined posterodorsally, and the frontal-parietal articulations are more similar to round-headed amphisbaenians. The shifted orientation of the anterior bones poses interesting problems for establishing homology and for scoring matrices for phylogenetic analysis. Even casual perusal of skulls of amphisbaenians makes it trivially obvious that the still-common practice of scoring inclusive clades as terminal taxa in phylogenetic analyses is misleading at best and disingenuous or openly deceptive at worst. As an example, the family Amphisbaenidae includes species that display all three of the architectural skull types. It is also obvious that no single species can stand as a valid exemplar of the "keel-headed" condition.

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

Evolution of maximum body mass in aquatic mammals

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Extant marine mammals are remarkably large and typically outsize their terrestrial sister taxa. Blue whales (*Balaenoptera musculus*; Cetacea), the largest organisms ever to live on Earth, can weigh more than 190,000 kg. In contrast, hippopotamuses (*Hippopotamus amphibius*; Artiodactyla), their closest living terrestrial relatives, reach just 4,500 kg. The grizzly bear (*Ursus arctos horribilis;* Carnivora), which can weigh nearly 400 kg, is the largest terrestrial carnivoran, while the southern elephant seal (*Mirounga leonina*), an aquatic carnivoran, can weigh up to 5,000 kg. Sirenians (manatees and dugongs) are the exception: the largest ever sirenian, *Hydrodamalis gigas* (1.29 mya) weighed 5,500 kg. Its largest extant terrestrial sister taxon, *Loxodonta africana* (African elephant; Proboscidea) can weigh 7,500 kg. The maximum body mass of all groups of aquatic mammals increased through evolutionary time. The terrestrial archaeocete (early cetacean) *Pakicetus attocki* (52–48 mya) weighed 22 kg and was 0.01% the size of *Balaenoptera*. The pinniped *Pinnarctidion bishopi* (25.57 mya) was less than one hundredth the size of *Mirounga* at just 32 kg. The sirenian *Kutchisiren cylindrica* (21.74 mya) weighed 600 kg, a tenth of the size of *Hydrodamalis*. Here, we explore the evolution of maximum body mass (BM) in three orders of aquatic mammals: Cetacea (whales, dolphins, and porpoises), Pinnipedia (seals, sea lions, and walruses), and Sirenia. We compiled occipital condyle breadth measurements for extant and extinct specimens from each order (554 cetaceans, 57 pinnipeds, and 12 sirenians). We used published equations to estimate BM for each individual. We combined these estimates with directly measured BM as compiled for 60 cetaceans, 90 pinnipeds, and 93 sirenians. We binned the data by geologic age and isolated the maximum BM for each order in each bin and fit linear and nonlinear equations for each order. For each of the three orders, maximum BM increased asymptotically after the evolution of aquatic locomotion. Power models best fit the growth of maximum BM among Cetacea and had explanatory power for Pinnipedia and Sirenia ($dAIC < 2$). For all three orders, maximum BM increased with decreasing temperature. Cetacean and sirenian BM correlated with sea level, continental shelf area, and diversity of planktonic foraminifera, suggesting a correlation with increased glaciation. Cetaceans achieved very large size only recently, approximately 2.5 million years ago.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Inside a predator's brain: exploring the neuroanatomy of herrerasaurid dinosaurs

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Dinosaurs arose during the Triassic Period, approximately 235 Ma. Among the earliest dinosaurs, herrerasaurids comprise the first group of large predatory dinosaurs. Despite its unstable phylogenetic relationships, there is a growing

consensus that they were saurischians outside the Sauropodomorpha–Theropoda dichotomy. The holotype of *Gnathovorax cabreirai* (CAPPA/UFSM 0009) is an exquisitely preserved herrerasaurid that was unearthed from the Marchezan site and an additional specimen (CAPPA/UFSM 0433) was found in the Predebon site. Both sites are located at the municipality of São João do Polêsine, Brazil, and correspond to the lower portion of the Candelária Sequence of the Santa Maria Supersequence (*Hyperodapedon* Assemblage Zone, Carnian in age). The specimens preserve almost complete, uncompressed braincases, which allow us to reconstruct the endocasts and explore their neuroanatomy. Therefore, the braincases were CT scanned and the resulting datasets were processed in Avizo 3D (v2022), which was used to segment structures and produce three-dimensional models. The laterosphenoids, prootics, supraoccipital, otoccipitals, basioccipital, and parabasisphenoid are closely attached in CAPPA/UFSM 0009, whereas in CAPPA/UFSM 0433 the laterosphenoids are disarticulated. *Gnathovorax* possesses a well-developed tuberalis crest that separates the fenestra ovalis and metotic foramen and this appears present in most herrerasaurids. Only the pituitary cast and the hindbrain endocasts were completely reconstructed. The pituitary gland seems proportionately large compared to its floccular lobes, has an oval shape and projects vertically. The floccular lobes are fingerlike projections that taper to a rounded point and slightly expand through the anterior semicircular canal. The inner ear of CAPPA/UFSM 0009 has an anterior semicircular canal slightly taller than the posterior, which is rounded and anteriorly bowed. The lateral semicircular canal is rounded and forms a gap from the vestibule. The common crus have a faint posterior curvature, and its thickness is the same as the semicircular canals. Overall, the neuroanatomy of *Gnathovorax* resembles that of early diverging dinosaurs like *Saturnalia* and *Buriolestes*. *Gnathovorax* preserves the best braincases currently known for an early dinosaur and provides key insights to refine braincase character states and endocast morphology in early dinosaurs.

Funding Sources: Conselho Nacional de Desenvolvimento Científico e Tecnológico; Coordenação de Aperfeiçoamento de Pessoal de Nível Superior; Sepkoski Grant 2025

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

The Mammoth Site internship program: a review of 24 years of impact

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The Mammoth Site of Hot Springs, South Dakota (HSMS), is an active in-situ paleontological site and museum which has been in operation for more than 50 years. Since 2002, HSMS has hosted an annual summer internship program for college-aged students seeking hands-on experience working in a paleontology/natural history-focused museum. HSMS provides a unique opportunity for interns to continually educate and engage with museum visitors in tandem with developing skills in excavation, in-situ conservation, fossil preparation, and collections management. Although the structure of the internship has changed through the years (e.g., separate research and education interns, shift in focus from conservation internship to museum internship), interns gain valuable skills that often influence the direction of their career. We emailed a self-reporting survey, consisting of a mix of multiple choice and fill-in answers, to 106 previous HSMS internship participants to gauge if and how the internship program influenced their career trajectory and decision to continue their education into graduate programs. We received 45 anonymous responses (42% response rate) to our survey in which individuals were asked what year they participated in the internship program, the focus of their internship, their level of education at the time of the internship, their current employment, and highest current level of education obtained. More than 92% incorporate paleontology into their current profession (33.3% education, 23.3% research, 23.3% curation, preparation, or collections, and 13.3% cultural resource management), and 80% pursued an advanced degree post-internship. As many of the respondents were interested in paleontology

careers prior to the internship, they reported that the biggest takeaway post-internship was having a greater appreciation for science communication and teaching, which many incorporate into their current positions to this day.

Funding Sources: The Mammoth Site of Hot Springs, SD Inc. and David B Jones Foundation

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

New microvertebrate fossil assemblages from the Meeteetse Formation (late Campanian–early Maastrichtian) of the Bighorn Basin, Wyoming, USA

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Empirical studies of terrestrial ecosystem evolution approaching the end-Cretaceous mass extinction in North America have mostly focused on a narrow interval of time (ca. 2 million years) just prior to the Cretaceous–Paleogene (K–Pg) boundary. This is largely due to the Bearpaw Transgression of the Western Interior Seaway during the latest Campanian and early Maastrichtian (ca. 73–68 Ma), which left a gap in the terrestrial rock record. The Meeteetse Formation in the Bighorn Basin of Wyoming helps fill this temporal gap—it is a continental unit composed of floodplain mudstones with predominantly small sandstone channels that were deposited during the late Campanian to early Maastrichtian. Here, we describe new vertebrate microfossil assemblages from three localities within the Meeteetse Formation: Josephine's Rump, Cale's Clam Cache, and Dumbbell Hill. We underwater screenwashed >4,000 kg of fossiliferous sediment from these localities, sorting the concentrate under a microscope, and identified the fossils to the lowest taxonomic level possible. Preliminary observations indicate the presence of mammal and theropod teeth, turtle carapace fragments, squamate osteoderms and jaw fragments, amphibian jaw fragments, and actinopterygians and chondrichthyans vertebrae, teeth, and scales. Qualitatively, the vertebrate fauna from the Meeteetse Formation resembles faunas from the older Judithian North American Land Mammal Age (NALMA; ca. 79–74 Ma). For example, the Meeteetse Formation fauna includes the ray genera *Pseudomyledaphus* and *Cristomylus* (Chondrichthyes, Rhinobatoidea), which have also been found in the similarly aged Williams Fork Formation. The presence of these rays within the Meeteetse Formation may be their youngest occurrence yet documented, and the co-occurrence of these genera and *Myledaphus bipartus* (Chondrichthyes, Rhinobatoidea) may be characteristic of the Edmontonian NALMA. We find notable differences between the fossils found in each of these Meeteetse Formation localities, with Josephine's Rump containing a more complete, diverse assemblage, Dumbbell Hill hosting proportionally more bone fragments, and Cale's Clam Cache containing mainly fish and shell fragments—this is notable because all three localities represent different depositional environments. This ongoing work contributes to an emerging long record of terrestrial ecosystem change leading up to the end-Cretaceous mass extinction in the Bighorn Basin.

Funding Sources: David B. Jones Foundation

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Full-spectrum photography as a cost-effective, spectrally informed imaging tool for revealing hidden taphonomic and morphological features in fossils

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Ultraviolet-induced fluorescence (UVIF) photography and its laser-based counterpart, laser-stimulated fluorescence (LSF), are powerful tools for enhancing the contrast of cryptic fossil structures, including soft-tissue preservation. These methods exploit light emission following excitation by shorter, higher-energy wavelengths.

Fossils contain a range of “activator” fluorophores (e.g., rare earth elements, Mn, and remnant organic material) that reflect preserved tissue chemistry and can encode aspects of diagenetic history. Despite this potential, fluorescence imaging has largely remained descriptive, with few efforts to quantify spectral responses across multiple wavelengths, leaving the full sensing capacity of modern cameras underutilized. Most prior studies rely primarily on longwave ultraviolet illumination (or UV-A, typically 365 or 395 nm), with limited use of blue (~450 nm) and green (~520 nm) light. Red (620–700 nm) and near-infrared (700–2500 nm) illumination have not been systematically applied to fossils or integrated into a unified workflow, despite their sensitivity to mineralogical and organic variation that may be obscured under UV excitation alone. Here, we present an integrated methodology using a modified full-spectrum camera to capture images across the UV–VIS–NIR range (300–1,000 nm), combined with monochromatic LED illumination, consumer-grade long-pass filters, and polytetrafluoroethylene (PTFE) cards as a reflectance standard. Images were processed in ImageJ to extract pixel-level measures of light attenuation (absorption and reflection) and colorimetry (RGB values), which were further analyzed using principal component analysis to identify variance patterns in spectral responses. We applied this approach to fossils spanning diverse depositional environments, geological ages, taxa, and preservation modes. Results demonstrate strong potential for distinguishing taphonomic features. Notably, specimens from the Green River and Crato formations show distinct spectral responses between organic and mineral phases in both vertebrates and invertebrates. These findings support this framework as a viable, non-destructive first-line method for assessing fossil tissue chemistry and enabling comparative spectral analyses across fossil collections. Because the components of this project are low cost (<1,000 USD), this workflow is accessible as a low-barrier entry point for multispectral fossil imaging.

Funding Sources: Institute for the Study of Earth and Man (ISEM)

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Landmark-based identification of tooth indentations on microvertebrates allows for interpretation of ecologic relationships during the Eocene–Oligocene transition and in a modern Paraguayan microsite

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Microvertebrates are the most abundant vertebrates in ecosystems but are consistently an underutilized resource in paleontological research. Despite the ecological importance of microvertebrates, ascertaining predator–prey relationships is difficult as remains are frequently sparse or fragmentary. It is often impossible to taxonomically identify species from microvertebrate remains or even assign some fossils to an element. We used qualitative and quantitative descriptions alongside Procrustes analysis of taphonomic landmarks to identify the biters of microvertebrate remains from the White River Group of Nebraska, USA, as well as modern microvertebrates from the Paraguayan Chaco. The modern assemblage allows us to validate this method by using modern material and with animals where predator–prey relationships can be verified.

A subset of 1,066 microfossils and >200 modern bones were analyzed for breakage patterns; ~10% of which had multiple indentations inferred to be bite marks. The Geomorph package in R was used to record the coordinates and size of each suspected tooth mark alongside the cusp patterns from the teeth of likely potential predators/scavenger genera from the respective ecosystems. Observed indentation patterns were compared to potential biters using Procrustes analysis and fuzzy data matching, and the most

likely biters were identified. Three fossil genera were likely to produce the majority of the tooth indentations, suggestive of an omnivorous or carnivorous diet. Molar area ratios were then used to independently confirm that the common biters were likely omnivorous or carnivorous, while the infrequent biters were likely insectivorous. At present, limited modern data are more complex to interpret than fossil data, but a larger dataset is expected to resolve this inconsistency. This approach is a powerful tool to study animal dietary behavior in the fossil record.

Funding Sources: David B Jones Foundation University of New Mexico Grand Rapids Public Museum

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Spectacular new vertebrate terrestrial and swim tracksites in the Moenkopi Formation of Canyonlands National Park: A reassessment of the identity of the primary swim track maker

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For more than two decades, the Utah Geological Survey and National Park Service have partnered to inventory and monitor vertebrate paleontological resources in national parks across Utah. While many parks have received extensive baseline surveys, the fossil resources of Canyonlands National Park remained largely undocumented until the initiation of a comprehensive, systematic survey in 2020. During field surveys over the last five years, we identified more than 100 new tracksites within the Torrey Member of the Moenkopi Formation, representing the highest concentration of tracks known for this stratigraphic unit. The Torrey Member is Early Triassic in age and represents a low-energy deltaic and tidal flat environment. Discoveries include small terrestrial tracks assigned to *Procolophonichnium* and tentatively to *Rotodactylus* and *Synaptichnium*, along with several specimens that may represent novel ichnotaxa. Most notable, however, are numerous localities preserving spectacular vertebrate swim tracks. The first researchers to recognize these tracks in the mid-20th century suggested they were made by either amphibians or archosauromorphs. More recently, researchers favored the idea these swim tracks were produced by archosauromorphs (chirotheres). This attribution was based in part on: 1) striations preserved in the digit impressions suggesting reptile-like scales, 2) tracks preserving features interpreted as clawed digits, and 3) the general abundance of *Chirotherium* tracks in Early to Middle Triassic strata. We were able to observe thousands of swim tracks and documented many of the sites using photogrammetry. The excellent preservation of these tracks reveals several diagnostic features—most notably, the definitive lack of clawed digits—indicating that the traces were not made by chirotheres. Instead, the morphology strongly supports attribution to temnospondyl amphibians. The skull and mandible of *Parotosuchus* (Temnsospondyli: Mastodonsauridae) were discovered in Torrey Member rocks southeast of the park. The size and morphology of *Parotosuchus* makes it a suitable candidate for the trackmaker. Furthermore, the abundance and specific morphology of these traces indicate the trackmakers were not merely floating at the surface but were submerged and punting along the substrate and may have been fully aquatic as adults. The concentration of trace fossils suggests that these Early Triassic deltaic waterways supported numerous submerged benthic amphibian foragers.

Funding Sources: Canyonlands National Park, National Park Service Geologic Resources Division, Utah Geological Survey

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Is this truly *Vegavis* or someone else? Investigation into the identity and lifestyle of a large, mid-Maastrichtian specimen from the Antarctica Peninsula

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Currently, there are three members of the genus *Vegavis* including *V. iaai*, *V. geitononesos*, and an unnamed species, *Vegavis* sp. *Vegavis iaai* comes from the Sandwich Bluff Member of the Lopez de Bertodano Formation on Vega Island, dated as 69.7 Ma, and has been shown to be an ancestral anseriform living an amphibious lifestyle that involves pursuit diving. The recently described *V. geitononsos* comes from the Molluscan Allomember of the Lopez de Bertodano Formation on Marambio Island, just below the K–Pg at 66.05 Ma, has been described to have lived as a foot-propelled diver. The unnamed *Vegavis* species was recovered from the "Reptile Horizon" from the Sandwich Bluff Member of the Lopez de Bertodano Formation on Vega Island and dated as 68.5 Ma, making this avian younger than *V. iaai* and older than *V. geitononsos*. *Vegavis* sp. is significantly larger than any other member of the genus and was originally thought to have lived a cursorial lifestyle, but a univariate polar section modulus data on the femur suggests otherwise. Polar section modulus uses measurements taken from bones to calculate how bendable or rigid a given bone is. The bendability ratios found can give probable lifestyles for fossil avians by comparing the ratios with those of modern avians. Based on polar section modulus data, it is suggested that *Vegavis* sp. lived a seabird lifestyle, most like pelicans. This finding opposes the idea that *Vegavis* sp. lived a cursorial lifestyle, as it did not plot near any modern cursorial birds measured. While *V. geitononsos* cannot be plotted as the specimen's femur is incomplete, it is very similar in size to *V. iaai* and it and *V. iaai* plot far away from *Vegavis* sp. and near modern avians such as the common merganser. The data further suggests that *V. iaai* lived as a pursuit diving duck, as it plotted near a modern pursuit diving duck. *V. iaai* and *V. geitononsos* both would have lived similar lifestyles to each other, while *Vegavis* sp. would have lived a different lifestyle from both. The lifestyle difference, in tandem with the massive size difference between the femur of *Vegavis* sp. and the other two *Vegavis* species, suggests that the unnamed species of *Vegavis* may not be a part of the genus *Vegavis* at all, as it was a much larger bird living a different lifestyle.

Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

A new armored large-bodied lizard from the latest Cretaceous of Montana highlights unexpected anguimorph taxonomic diversity and life strategies prior to the K–Pg mass extinction

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Helodermatid- and varanid-like lizards (Squamata, Anguimorpha) were a conspicuous faunal component of Late Cretaceous (Cenomanian–Maastrichtian) terrestrial ecosystems of North America. Despite more than a century of collection, the record of these lizards remains extremely fragmentary, and most named taxa have been erected based on isolated, incomplete vertebrae (e.g., *Palaeosaniwa*) or solitary jaw bones with teeth (e.g., *Colpodontosaurus*, *Parasaniwa*, *Paraderma*, *Labrodiactes*, *Cemeterius*). Few of these taxa have other skeletal elements associated or referred to them. Consequently, the morphology, ecology, and phylogenetic relationships of these taxa are difficult to ascertain and not well understood. In 2024 and 2025, an associated cranial and postcranial skeleton of a large-bodied anguimorph was discovered and collected at a new locality called Krayt Dragon (University of Washington Burke Museum loc. C3566) in the uppermost Cretaceous Hell Creek Formation, Garfield County, Montana, USA. The specimen, UWBM 123200, is represented by hundreds of bones and bone fragments. To date, the inventory of identified elements includes those from the skull (frontals, parietal, jugals, premaxilla, maxillae, pterygoid), lower jaws (dentaries), axial skeleton (atlas intercentrum, dorsal, sacral, and caudal vertebrae [all partially to completely unfused]), appendicular skeleton (humerus, podials, metapodials, phalanges), and more than 50 osteoderms of various shapes and sizes. UWBM 123200 is remarkable for several reasons, including: 1) it is the most complete terrestrial

anguimorph lizard known from the Maastrichtian, 2) it represents an ontogenetically young individual despite its relatively large body size (skull length ~85 mm), and 3) it is one of only two large-bodied predatory lizards (both Late Cretaceous in age) known to possess caudal vertebral autotomy. The presence of caudal autotomy in Mesozoic large-bodied anguimorphs may represent a common anti-predator adaptation in dinosaur-dominant ecosystems that was lost in the Cenozoic alongside the demise of non-avian theropods. Finally, UWBM 123200 showcases a mosaic of anatomical features that contribute to its conflicting phylogenetic placements among Anguimorpha (e.g., Monstersauria versus Varanoidea) in different morphology and genomics-constrained datasets. Taken together, this important new specimen provides detailed insight into the complex evolutionary history of lizard evolution just before the end-Cretaceous.

Funding Sources: The Hell Creek Project

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Old shrews in new places: a new species of *Paranourosorex* (Soricidae, Anourosoricini) from Tennessee and its bearing on shrew paleobiogeography

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Shrews (family Soricidae) are small invertivorous mammals with a nearly global distribution. Despite a broad geographic range at the family level, more restrictive sub-clades within Soricidae (subfamilies, tribes, etc.) exhibit striking continental endemism, with an especially stark separation between the extant taxa present in Asia and North America. In contrast, the shrew fossil record shows that this modern division is a recent biogeographic phenomenon, as many shrew clades contain fossil members found well outside their current range. This includes the tribe Anourosoricini, which is restricted to southeast Asia today but is known from Miocene and Pliocene age fossil localities across Eurasia and North America. While the Eurasian record of Anourosoricini is extensive, the North American record is limited to just two endemic species in the widespread genus *Crusafontina*. Here we describe a new species of North American anourosoricine shrew from the Early Pliocene (4.9–4.5 Ma) age Gray Fossil Site (GFS) of northeastern Tennessee. Based on multiple synapomorphies, this new species can be confidently assigned to the genus *Paranourosorex*, a taxon previously only known from Eurasia. The GFS *Paranourosorex* thus represents the first North American occurrence of the genus. Morphological comparisons to other species within *Paranourosorex* indicate the new GFS species is most similar to central and east Asian forms. The GFS species displays a unique combination of craniodental characters for *Paranourosorex* and a surprising apomorphy: the loss of the third upper antemolar. In addition to representing a substantial range extension for the genus, the presence of a new *Paranourosorex* species at GFS reinforces the strong Eurasian biogeographic signal observed elsewhere in the GFS small mammal community. The occurrence of *Paranourosorex* across Eurasia and into eastern North America—but apparently not in western North America—supports the presence of a northern dispersal route for animals inhabiting a circumboreal deciduous forest. Additionally, the apparent lack of *Paranourosorex* in western North America indicates the existence of a faunal equivalent to the process behind the modern eastern Asian–eastern North American floristic disjunction, also likely caused by continued drying of the continental interior. The GFS *Paranourosorex* demonstrates that this pattern was established in the small mammal communities of North America during the early Pliocene.

Funding Sources: East Tennessee State University Center of Excellence in Paleontology and the Arizona State University School of Life Sciences

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Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

Original dinosaur skeletons anchoring the recently opened Elizabeth Williams Robinson Hall of Dinosaurs, Schiele Museum of Natural History, Gastonia, North Carolina

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Two original dinosaur skeletons anchor the newly opened Elizabeth Williams Robinson Hall of Dinosaurs at the Schiele Museum of Natural History (The Schiele): *Edmontosaurus* cf. *E. annectens*, SMNC VPAL 2000, nicknamed "Montie" (formerly UNO LDP #956-1) and *Tyrannosaurus rex*, SMNC VPAL 2001, nicknamed "Pete" (formerly UNO LPD #977-2). Both specimens were transferred from the recently closed Vertebrate Paleo Lab at the University of New Orleans (UNO). The fossils came from the type Lance Formation in Niobrara County, Wyoming. Both were previously described in preliminary publications, but neither was fully prepared nor thoroughly described. The purpose of this contribution is to outline a productive (and perhaps novel) approach that led to the transfer of these UNO dinosaurs to The Schiele. All parties benefited from the arrangement. First, UNO was contractually freed from the obligation to host and maintain paleontological research collections. Second, The Schiele acquired title to these skeletons without the expense of a field program or purchasing the fossils. In turn, this freed up their funds to hire an outside laboratory to finish preparing the skeletons. In fact, Triebold Paleontology, Inc. (TPI) originally suggested The Schiele rescue the orphaned specimens and proposed that TPI be considered for the preparation contract. And so, TPI became the third beneficiary in that they met their business goals. Fourth, the scientific community has continued access to two significant dinosaur fossils that could easily have been lost. Just as important, the fossils are more useful because they are now fully prepared. Finally, the public at large benefitted in that both dinosaurs are openly available for study and appreciation as the anchors of the Schiele's Elizabeth Williams Robinson Hall of Dinosaurs.

The existence of orphaned paleontological research collections is underappreciated. In one well-known case, an institution transferred its entire collection to another. There are other cases where research collections (including type materials) have simply been discarded, a result no less tragic than those lost to fire or warfare. Sadly, there are yet other cases where orphaned collections were quietly disposed of piecemeal, through a combination of private gifts, transfer to teaching collections, looting, and sale. The present case study demonstrates a productive alternative, where the aims of all parties are openly identified and accommodated

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Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

Where have all the browsers gone down under? Evidence for the decline of browse-dominated herbivore communities during the Quaternary in Australia

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Australia's modern herbivore communities are dominated by grazing and mixed-feeding macropods that exploit grass-rich ecosystems, leading to the perception that dietary flexibility buffered kangaroos and other marsupial herbivores against Quaternary environmental change. However, fossil assemblages from the Australian Pleistocene suggest a markedly different ecological structure. Here, we synthesize dental microwear texture, stable isotope, and faunal occurrence data from key Pleistocene assemblages—the Bingara Fauna, Cuddie Spring Fauna, Darling Downs Fauna, Lancefield Fauna, Mammoth Cave Fauna, and published data from the Naracoorte Fauna—to evaluate long-term changes in herbivore guild composition and resource use across southeastern Australia. Collectively, these faunas reveal herbivore communities with substantially greater representation of browsers than observed today. At Bingara and Cuddie Springs (New South Wales), browsing and mixed-feeding kangaroos dominated, with isotopic and microwear evidence indicating

widespread exploitation of trees, shrubs (including saltbush), and forbs, and relatively few obligate grazers. Similarly, the diverse Darling Downs fauna (Queensland) contained numerous large-bodied browsing and mixed-feeding marsupials, included taxa with no modern ecological analogs. Lancefield (Victoria) preserves a browse-rich megafaunal community prior to terminal Pleistocene extinctions, with even *Macropus titan* consuming substantial browse. Mammoth Cave (Western Australia) and Naracoorte Cave (South Australia) likewise demonstrate abundant browsers and mixed feeders, contrasting with modern macropodid communities where obligate browsing is rare. Together, these faunas document a continent-wide restructuring of herbivore communities from browse-rich ecosystems supporting diverse browser guilds to modern systems characterized by fewer browsing specialists and greater reliance on grasses. This transition coincides with environmental changes, including changes in aridity and vegetation at many sites across Australia. Rather than demonstrating resilience through generalized mixed feeding alone, the fossil record indicates the loss of entire browsing niches and associated consumers. The disappearance of saltbush-dominated feeding strategies and declines in browser diversity, suggests that changing resource landscapes fundamentally altered Australian herbivore community structure and likely contributed to megafaunal extinctions.

Funding Sources: National Science Foundation (1455198)

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Functional diversity of late Pleistocene and Holocene mammal assemblages across North America: How well do archaeological localities sample the broader mammalian community?

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Archaeological faunal assemblages are frequently interpreted as direct reflections of human prey selection, yet the degree to which they represent the full functional diversity of broader mammal communities is poorly understood. This study treats non-archaeological (i.e., paleontological) fossil localities as a census of the available regional species pool and archaeological localities as the assemblage to be evaluated for functional fidelity to that pool. We use the Neotoma Paleoecology Database (NEOTOMA), incorporating 5,331 late Pleistocene and Holocene localities across North America, to evaluate whether archaeological sites occupied a narrower functional space than non-archaeological localities. Dietary guild assignments derived from the Paleobiology Database (PBDB) for 379 species, encompassing browsers, grazers, mixed feeders, insectivores, and carnivores, are combined with body mass data to characterize the functional structure of both archaeological and non-archaeological assemblages. Jaccard similarity, Spearman rank-order correlation, and the Probability of Interspecific Encounter are used to evaluate the degree to which archaeological assemblages capture the functional attribute composition, rank abundance structure, and evenness of the broader species pool. Preliminary comparisons indicate that archaeological assemblages show visibly distinct body mass distributions relative to non-archaeological localities, with small mammals appearing overrepresented in archaeological contexts relative to expectations from the broader species pool. Systematic differences in these indices between archaeological and non-archaeological contexts would indicate that site formation processes produced assemblages that are functionally distinct between the two groups, independent of taxonomic richness alone. Spatial variation in functional diversity across archaeological localities will further address whether any functional narrowing was consistent continent-wide or varied regionally in association with differences in available community composition.

Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

Diversification of modern birds driven by early Paleogene climate patterns

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Ten million years after the end-Cretaceous extinction, a rapid period of global warming occurred dubbed the Paleocene–Eocene Thermal Maximum, or PETM. This warming event may have driven the diversification of angiosperms, herbivorous insects, and even placental mammals. However, the perceived paucity of Paleocene avian fossils has prevented similar studies on how this event affected avian evolution. Here, I conduct a broad scale analysis of avian fossil diversity across the Paleocene–Eocene transition in the wake of shifts in global temperature, taphonomic patterns, and the diversity of other tetrapods. I found that whereas many of the earliest members of major avian orders first appear following the end Cretaceous, there was a rapid increase in avian families immediately following the PETM. This increase deviates significantly from the numbers of avian families found in the Paleocene. Furthermore, I found that the dearth of Paleocene avian fossils mirrors the record of non-placental tetrapods, indicating that the avian fossil record reflects actual diversity and not taphonomic bias. These results increase the evidence that the PETM, in conjunction with the end Cretaceous, was instrumental in driving the diversification of organisms at the start of the Cenozoic.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

The cervical series of the western grebe (*Aechmophorus occidentalis*) as a potential source of comparative anatomy for sauropodomorph dinosaurs

Julian H. Diepenbrock[1], Mark T. Clementz[1]
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Sauropodomorph dinosaurs pushed the limits of terrestrial tetrapod morphology in numerous ways, attaining massive body sizes, possessing highly elongate necks and tails, and extensive postcranial skeletal pneumaticity. Consequently, few modern taxa can be used to inform our knowledge of sauropodomorph anatomy. Numerous studies have focused on the structure, posture, and ontogenetic development of sauropodomorph cervical vertebrae, with some examinations of both mammalian (camel, giraffe) and avian (ratite) taxa as useful modern comparisons. Here, we propose the cervical series of the western grebe (*Aechmophorus occidentalis*) as a potential source of comparative anatomical study for the same region in basal sauropodomorph dinosaurs, based on similarities in gross vertebral anatomy. The western grebe is a water bird native to western North America, notable for its large size and elongated neck compared to most other members of the order Podicipediformes, as well as its elaborate courtship displays. The cervical vertebrae of this taxon are elongated, with low neural spines, and possess well-developed ossified tendons along the latero-ventral and ventral margins of the cervical series. Grebes are atypical among birds in exhibiting a relative lack of postcranial skeletal pneumaticity, with little to no external pneumatic features present in the cervical series. These structures are not well documented in the literature but are broadly similar to those in the cervical series of basal sauropodomorphs, such as *Plateosaurus engelhardti* and *Macrocollum itaquii,* and may provide a valuable modern analogue for basal sauropodomorph neck structure.

We examined three western grebe specimens housed in the University of Wyoming Vertebrate Museum with hard tissue and limited soft tissue preservation, along with comparative specimens from smaller grebe species native to the area and two common loons (*Gavia immer*), which exhibit similar ecology but different morphology. Specimens were photographed, 3D scanned, and modeled for two- and three-dimensional landmark-based geometric morphometric analysis against various basal sauropodomorph and derived sauropod vertebrae, performed with the geomorph package in RStudio. Further study of analogous structures between the cervical series of the western grebe and basal sauropodomorph dinosaurs may help answer outstanding questions relating to neck posture, range of motion, and correlative tendon structure in sauropodomorph dinosaurs.

Funding Sources: University of Wyoming Department of Geology and Geophysics

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Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

The fall, sudden rise and decline of Late Cretaceous marine reptiles: a two-phase model of biodiversity driven by the OAE2 and K–Pg marine extinction events

Daniel Driscoll[1], Michael Benton[1]
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Late Cretaceous marine reptile evolution demonstrated complex changes and multiple turnovers of species that inhabited the all-prevalent epeiric seas to the deepest oceans. The rise and fall of multiple clades, including ichthyosaurs, pliosaurs, elasmosaurs, polycotylids, and mosasaurians is bracketed by two massive marine extinctions at the CT and K–Pg boundary. Many suggestions have been made as to the drivers of these changes such as sea level, continental land area, sea surface temperature, or biotic factors such as feeding guilds and interclade competition. However, the specific quantitative demonstration of the effect on marine tetrapod evolutionary rates and diversity surrounding the OAE2 event has been hampered by older methods, low sampling, and large time bins. We quantitatively model and analyze marine reptile diversity, extinction, and speciation around the CT boundary until the Late Maastrichtian using a large occurrence base of 5,000 catalogued specimens at the substage level. This includes 109 marine tetrapod genera. We find that Cretaceous marine reptile evolution was divided into two phases. The first phase shows a Late Cenomanian peak in diversity with a significant sudden shift in radiation of taxa at 85 Ma and rapid drop in diversity in the Early–Mid Turonian coincident with similar changes in sea level and temperature. Extinction rates increase significantly from 92 to 87 Ma for 5 My after the OAE2 event. In the second phase, there is a well-defined and highly significant explosion of diversification in the Late Santonian. Total marine reptile modelled diversity peaks in the Early Campanian and drops until the end of the Maastrichtian with a significant change in evolutionary rates at that time, co-occurring with the slow demise of Polycotylids. In the second phase, marine reptile diversity is less affected by changes such as sea level and temperature. We consider simpler models which suggest control over the whole range of a taxon's existence can be modeled with a few drivers and find that the drivers of diversity are interrelated; but herein, improved sampling, dating, and modeling sharply confirm the significance of the OAE2 perturbation in completely restructuring marine reptile biodiversity, not just affecting marine invertebrates. This effect lasts for 5 My and it makes room for the rapid evolution of mosasaurs, new elasmosaurs, and new polycotylids; only to show a decline from the Late Campanian until the crash at the bolide event.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Understanding public fossil dig participants: Demographics, expectations, and experiences compared between two long-running programs in North Dakota and Colorado

Stephanie Drumheller[1], Zhen Xu[2], Kimberly Jones[2], Clint Boyd[3], Julia McHugh[4]
[1]University of Tennessee, Knoxville, Knoxville, TN, *[2]University of Tennessee Knoxville, Knoxville, TN*, *[3]North Dakota Geological Survey*, *[4]Museums of Western Colorado, Grand Junction, CO*

Operating public fossil dig programs requires institutions to understand their participants to create successful marketing strategies, appropriate field training, and educational content. While established programs often maintain internal program metrics, these data are rarely available to the broader community. To understand demographics, expectations, and experiences of public fossil dig participants, pre- and post-excursion surveys were collected in 2025 from the attendees of programs hosted by the North Dakota Geological Survey (NDGS) and the Museums of Western Colorado (MWC). Surveys returned 89 responses to the pre-test and 84 responses to the post-test. The largest number of respondents came

from institutions' home states, but the total was spread across the US with limited international participation. Most respondents were first-time attendees, but NDGS had more that had participated in prior seasons. MWC respondents were more likely to choose half-day digs, while NDGS's were more likely to choose full- or multiday digs. MWC respondents were distributed among gender identities, while NDGS skewed heavily towards females. Respondents learned about the programs from a variety of outlets, particularly web searches, but NDGS had a much higher reliance on word of mouth. Respondents entered with positive opinions on paleontology and science, paleontologists themselves, and nature; these sentiments either remained high or rose slightly after the experience. Free responses showed common themes in participant motivations, but the majority expected a learning experience. While some were interested in paleontology as a career, many others were attending for personal fulfillment and/or support of a family/party member with more interest in the field. Respondents showed fairly realistic expectations about field work, along with the associated physical and environmental challenges. All respondents left with positive opinions on their experiences, organizers, and information gained during the programs. An updated survey will be implemented for 2026. However, both anecdotal evidence and national tourism data suggest 2025–2026 travel may not be representative as a whole for public fossil digs in the US. Additional work is needed to establish a baseline. However, the similar motivations in respondents are useful for guiding connections with future participants, while demographic differences may be the result of long-term marketing and outreach efforts.

Funding Sources: National Science Foundation, Division of Graduate Education: 2329408

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

First evidence of "death roll" behavior in a neochoristodere

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The iconic crocodylian "death roll" is characterized by an initial bite followed by full-body, axial rolling. It is often framed as a feeding behavior, leading to a common assumption that more slender-snouted species, which tend to specialize in smaller prey items, would not or could not death roll. This assumption has been extended beyond extant crocodylians to their close fossil relatives and more distantly related groups that exhibited a superficially similar body plan, such as the phytosaurs and neochoristoderes. However, death roll behavior is observed in extant, slender-snouted taxa, especially in the context of agonistic interactions, but also during feeding upon larger prey items. That observation opens the possibility that a variety of slender-snouted, extinct taxa could have performed this behavior. However, opportunities for testing this prediction beyond the realm of simple analogy remain limited.

Here, we report several bite marks present on a nearly complete, well-preserved specimen of *Champsosaurus* sp. (NDGS 16076), a neochoristodere from the Sentinel Butte Formation (Paleocene) of Billings County, North Dakota. These bites are present on the right humerus and femur, and possibly on the snout of the skull. The marks themselves can be classified as pits and scores, with the pits suggesting an impacting tooth with a broadly conical shape. The marks lack other diagnostic indicators of dental features such as carinae or serrations, and their dimensions and spacing are both broadly congruent with a similarly sized conspecific. Limbs, along with the snout and the base of the tail, are common targets during intraspecific combat in extant crocodylians. Furthermore, one score on the midshaft of the right femur spirals ~180 degrees around the circumference of the element, a length and trajectory that would only be possible if the tooth itself (and by extension, the jaws housing it) performed a partial rotation while gripping the bitten limb (i.e., during a death roll). This represents the first evidence of this specific behavior among neochoristoderes, expanding our understanding of the functional capabilities of this taxon's elongate snouts as well as the types of

intraspecific competition exhibited by members of this group. It also illustrates the utility of bite marks as an independent source of information for testing functional hypotheses of agonistic and feeding behavior in extinct groups.

Funding Sources: US Forest Service and the State of North Dakota

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Climate, taphonomy, and vertebrate community structure in the John Day Fossil Beds: a GIS-based analysis

Jarod Duckworth[1], Katharine Loughney[2]
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The Eocene–Oligocene transition was a major interval of global cooling, increasing aridity, and ecological reorganization. This study evaluates the relative influence of climatic change and taphonomic processes on vertebrate assemblage composition across the Eocene–Oligocene transition in the John Day Basin, Oregon, using fossil specimens and locality records from the Clarno and John Day formations. Fossil occurrence and specimen data from museum collections were analyzed using Geographic Information Systems (GIS), taphonomic metrics, and ecological classifications. Skeletal elements were categorized by Voorhies transport group, weathering stage, fragmentation, body size, locomotor mode, and dietary ecology. GIS analyses integrated fossil occurrences with topographic, hydrologic, vegetation, and accessibility variables to evaluate spatial patterns in fossil distribution.

Preliminary taphonomic analyses indicate differences in skeletal representation between formations, with Clarno assemblages exhibiting lower element diversity and John Day assemblages showing more even representation across skeletal elements. Locomotor guild composition differed significantly between formations ($\chi^2 = 47.67$, $p < 0.001$), with cursorial and fossorial taxa occurring exclusively in sampled John Day assemblages and aquatic taxa restricted to Clarno localities, suggesting a shift toward more open and seasonally variable habitats. Dietary guild composition also differed significantly between formations ($\chi^2 = 59.96$, $p < 0.001$), and dietary diversity was higher in John Day assemblages ($H' = 1.80$) than in Clarno assemblages ($H' = 1.34$). Predictive modeling identified spatial clustering of fossil occurrences associated with environmental variables and proximity to roads and trails.

These results indicate that climatic reorganization during the Eocene–Oligocene transition coincided with measurable changes in vertebrate community structure, while taphonomic variation influenced patterns of skeletal representation. Integrating GIS-based predictive modeling with quantitative taphonomy improves discrimination between ecological turnover and taphonomic effects and provides a framework for interpreting terrestrial vertebrate fossil assemblages in the John Day Basin and comparable fossil systems.

Funding Sources: Murray State University Watershed Studies Institute Summer Research Grant

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Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Testing trade-offs in the fossil record: socio-sexual vs. natural selection in the evolution of duck-billed dinosaurs (Ornithischia: Hadrosauridae)

Thomas Dudgeon[1]
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Exaggerated and “bizarre” structures are often discussed in the context of a trade-off between socio-sexual display and natural selection, but quantitative evaluations of such trade-offs in fossils are limited. This scarcity likely reflects the difficulty in quantifying display performance, but such questions can be addressed by instead testing for altered performance in related functional traits. Here, I use lambeosaurine dinosaurs as a model system to test for trade-offs between their socio-

sexual cranial crests and feeding function and explore whether such approaches are viable in the fossil record. Lambeosaurines exhibit extreme cranial modifications where the premaxillae and nasals expanded through ontogeny to form prominent hollow supracranial crests. These bones normally bear stress during feeding in amniotes, yet in lambeosaurines are delicate and hypertrophied. Their sister group, the hadrosaurines, exhibits the plesiomorphic condition, lacking hollow crests and having proportionately longer skulls. Although it has been suggested that lambeosaurines fed on softer vegetation, the functional consequences of crest evolution remain unknown. To test for trade-offs between crest evolution and feeding, I used finite element analysis to perform three comparisons that target ontogenetic, ecological, and phylogenetic trends: 1) through ontogeny in the lambeosaurine *Corythosaurus casuarius*; 2) between *C. casuarius* and the contemporaneous hadrosaurine *Gryposaurus notabilis*; and 3) across a suite of 10 lambeosaurines, hadrosaurines, and early diverging iguanodontians. Results show lambeosaurines had smaller jaw muscles and lower bite forces than hadrosaurines, but higher mechanical advantage. They also experienced a derived stress distribution with little stress in the preorbital region, whereas non-lambeosaurine iguanodontians experienced stress throughout the snout. Stress distributions in juvenile *C. casuarius* were similar to non-lambeosaurine iguanodontians, suggesting that these differences were not solely due to diet. In the face of this trade-off, lambeosaurines underwent radical changes in skull shape but were constrained to maintain feeding function through compensatory changes to muscle topology and cranial stress distribution. Taken together, trade-offs involving socio-sexual cranial structures can be explored in the fossil record, but they require integrated ontogenetic, ecological, and phylogenetic datasets to eliminate confounding factors.

Funding Sources: NSERC Vanier Canada Graduate Scholarship, Ontario Graduate Scholarship, Queen Elizabeth II Graduate Scholarship in Science and Technology, Dinosaur Research Institute

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Worn teeth = old age? Testing estimates of relative age vs. absolute age in a population sample of Eocene erinaceids

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Age estimations for fossil mammal individuals typically rely on relative proxies such as tooth eruption and wear, yet the extent to which these measures accurately reflect true chronological age is rarely critically evaluated in paleontological samples. Here, we use a population-level sample of a new erinaceid taxon from a single locality and depositional setting to test the relationship between independent measures of absolute and relative age; specifically, annually deposited growth marks in bone and the extent of tooth wear. Paleontological surveys of the Tepee Trail Formation (East Fork Basin, Wyoming) have yielded a unique sample of floral and faunal fossils suggesting a riparian, high-altitude paleoenvironment proximal to active volcanism. Magnetostratigraphic work demonstrates that the Tepee Trail Formation spans the middle of Chron C21n through Chron C20r. Faunal assemblages place this formation within the Ui1b interval of the middle Eocene Uintan North American Land Mammal Age, which, using 40Ar/39Ar and U-Pb radioisotopic dates and geochronological calibrations, is bracketed to within 47.0–44.8 Ma. We report a new species of yet-undescribed erinaceid (Eulipotyphla) from “Bone Bed A” (Chron 21n; 47.7 to 46.2 Ma), represented by 33 hemimandibles and maxillae, with dental wear conditions ranging from pristine (unworn) to extreme wear. The absolute ages of individuals in this population were investigated by counting periosteal rings (lines of arrested growth, LAGs) in mandibular bone revealed with micro-CT imaging, following methods validated in extant hedgehogs. Relative age was assessed by assigning specimens to one of five dental wear categories based on occlusal cusp erosion. The association between these two age measures was evaluated using Spearman’s rank correlation (ρ). We discuss

whether, and under what conditions, relative age proxies such as tooth wear reliably reflect chronological age, and the implications revealed by this population-level sample regarding individual variation, survivorship, and the correlative power between these measures.

Funding Sources: American Museum of Natural History

Technical Session VIII: Fishes (Thursday, November 12, 2026, 1:45 PM)

A new Carboniferous rhizodont with "tetrapod-like" anatomy with implications for the decline and extinction of Rhizodontia

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Rhizodonts are fully aquatic stem tetrapods known from the Middle Devonian to the Late Carboniferous, with increasingly fragmentary later occurrences. Their early evolutionary history, including a major Early Carboniferous radiation, is well documented, but relatively less is known about their later decline and extinction. In contrast to the rapid convergent acquisition of terrestrial exaptations seen among stem tetrapods in the Late Devonian, Carboniferous rhizodonts are perceived as morphologically and ecologically conservative. We argue this conflates two distinct axes: the clade did remain ecologically conservative, specialists of shallow freshwater habitats, but was far from morphologically static. Letognathus exhibits lower jaw characters paralleling early tetrapods, showing continued anatomical innovation despite a narrow niche.

Here we introduce a new genus of Carboniferous rhizodont, from the Late Viséan Ste. Genevieve Formation, Jasper Hiemstra Quarry of What Cheer, Iowa. The new taxon is known from more than 10 limestone blocks containing semi-articulated cranial and postcranial remains of a medium-sized rhizodont. The new taxon provides a unique window into rhizodont morphological variation between their Early Carboniferous radiation and subsequent extinction. Micro-CT analysis reveals convergent tetrapod-like features such as a dorsoposterior repositioning of the infradentary series, an ascending process of the maxilla and a postparietal with a broadly rounded posterolateral lobe. We ran a phylogenetic analysis of Tetrapodomorpha including the new taxon, which recovered it within Rhizodontia as sister to Letognathus.

To better understand the late evolutionary history and extinction of Rhizodontia we reassessed new occurrence data of rhizodonts including seldom considered fragmentary data from Late Carboniferous localities across North America (e.g., Joggins, Nova Scotia; Five Points, Ohio; Mazon Creek, Illinois). Combining these data with our phylogeny, we ran a fossilized birth-death model with nodes constrained to Late Carboniferous occurrences, revealing a Moscovian extinction of rhizodonts coincident with the withdrawal of the Illinois Basin seaway. Our analysis further reveals rhizodonts were not morphologically stagnant through the Carboniferous, but rather sustained innovation that was decoupled from ecological breadth and as a result became ecologically limited until they ultimately went extinct.

Funding Sources: Field Museum

Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

Going out on a limb: reconstructing the ancestral locomotor state of Theria

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A central question in mammalian evolution concerns the locomotor strategy of the ancestral therian—the last common ancestor of marsupials

and placentals: was it ground-dwelling (terrestrial) or tree-dwelling (arboreal)? Answering this is essential for understanding the origin and diversification of crown therians, the lineage that gave rise to nearly all living mammals. This question has long been debated, with some researchers reconstructing the ancestral therian as arboreal and others reconstructing it as terrestrial. Recently, exceptionally preserved Mesozoic taxa, such as the gliding euharamiyidans, have revealed unexpectedly widespread arboreality, leading several studies to argue that arboreality was ancestral for Theria and that later terrestrial groups descended from a climbing ancestor. This debate remains unresolved, in part because the postcranial fossils bracketing the therian node are scarce and often incomplete. Using a comparative framework, we link two-dimensional anatomical measurements and locomotor behavior in extant mammals to infer locomotor strategies in fossil taxa. Our dataset includes 55 linear skeletal measurements from the girdle and limb skeletons of 281 extant mammal species and 66 Mesozoic mammal species. We grafted fossil lineages onto a time-calibrated phylogeny of living mammals and estimated divergence times for the fossil clades, generating 100 trees to capture dating uncertainty. Ancestral states for all 55 measurements were reconstructed at each node, including the ancestral therian, for each tree using restricted maximum likelihood. Although data from Mesozoic and Early Paleocene taxa is sparse, reconstructed limb proportions at the therian node align most closely with extant arboreal mammals, suggesting that the last common ancestor of marsupials and placentals was adapted for climbing. These results support an arboreal therian ancestry, with later terrestrial radiations representing independent departures from a climbing ancestor. We caution, however, that this pattern could also reflect a preservation bias toward arboreal taxa in well-forested early therian localities. Reconstructing the locomotor behavior of the ancestral therian sharpens our picture of the lineage from which placentals, and therefore humans, ultimately arose.

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

Paleohistology of tylopods reveals a diversity of growth patterns and life history strategies during the Eocene–Oligocene Transition

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The White River Group (WRG) of the Great Plains (USA) records faunal, depositional and paleoclimatic changes across the Eocene–Oligocene boundary. The period preserved by the WRG was significantly impacted by a rapid shift from a hot, humid climate to a cooler, dryer one with higher seasonality. Despite the dramatic change in environment, the majority of WRG mammals remained morphologically and taxonomically unchanged across the boundary. Morphology, however, is not the only feature that may have been under selection during this period of climatic change. Here, we employ paleohistology to establish life history traits of two WRG tylopods from southeastern Wyoming to begin testing whether or not life histories were selected for during the Eocene–Oligocene Transition (EOT).

Our sample includes two tylopod taxa, the early camelid *Poebrotherium* and an oreodont. These two closely related taxa display highly divergent life histories. The paleohistology of *Poebrotherium* reveals rapid growth during the earliest stages of life, as evidenced by endosteally located, highly vascularized, disorganized woven and/or fibrolamellar bone. Immediately after the deposition of juvenile tissues, there is a shift towards a more slow-growing parallel-fibered complex. The majority of the cortices are composed of this slower-growing bone with intermittent interruptions in deposition, indicating a large sum of the sub-adult to adult growth of *Poebrotherium* was moderately paced and responsive to seasonality.

The WRG oreodont reveals an entirely alternative pattern of growth. The bone histology of the oreodont reveals that the individual grew rapidly

throughout ontogeny, as evidenced by a cortex completely composed of woven-to-fibrolamellar bone. The absence of lines of arrested growth further differentiates these taxa, as it implies that oreodonts grew without seasonal interruptions.

The variation in growth and life history between two taxonomically and spatiotemporally related taxa suggests that tylopods did not adhere to a single pattern despite experiencing an identical shift in environment. Instead, a diversity of growth patterns and life history strategies were employed during the EOT. These results have implications for evolutionary history of Tylopoda. The family Camelidae remains the only extant tylopod and their ability to seasonally modulate their growth may have contributed to their survival.

Funding Sources: Women In Science Enabling Research (WISER) internship and the Mulcahy Scholarship at Loyola University Chicago as well as the David B Jones Foundation

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A pathologic Late Pleistocene Atlantic walrus (*Odobenus rosmarus*) skull from coastal New Jersey, USA

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Pleistocene occurrences of the Atlantic Walrus (*Odobenus rosmarus*) found along the Atlantic Coast of New Jersey have been documented as early as the 1850s. Such specimens are typically found washed up on beaches after storm events, or more commonly, fossils are dredged from the sea floor. Commercial shellfishing in and around New Jersey has led to the discovery of a wide variety of Pleistocene mammal taxa including Jefferson's Ground Sloth (*Megalonyx jeffersoni*), American Mastodon (*Mammut americanum*), Woolly Mammoth (*Mammuthus primigenius*), Helmeted musk ox (*Bootherium bombifrons*), Stag Moose (*Cervalces scotti*) and the Atlantic Walrus (*Odobenus rosmarus*). A dredged skull from an Atlantic Walrus, NJSM 28985, collected on the Continental Shelf off the coast of southern New Jersey by a commercial fisherman in the 1980s was recently donated to the New Jersey State Museum. The fossil is presumed to be late Pleistocene in age and represents a nearly complete skull of an adult male walrus (*Odobenus rosmarus*), only missing the ventral surface of the braincase and the right upper canine (tusk). The tusks are divergent and the premaxilla-maxilla suture is obliterated, indicating that the specimen is likely an adult male. The overall length of the skull is 39.5 cm and the width at the rostrum is ~23.5 cm. The right maxilla is severely dorsolaterally swollen, consistent with osteomyelitis. This osteomyelitis may have been the result of an infection or an abscess. The dorsal surface of the right maxilla also presents a deep concavity that is consistent with a fistulous tract that formed to relieve pressure associated with infection. The surface of the broken tusk exhibits encrusting bryozoans and shows wear, suggesting that the tusk was broken in life or post-mortem rather than due to dredging. Although the broken tusk does appear worn on the broken surface, it cannot be determined when this breakage occurred. The core of globular dentin appears to be absent and the tusk is either pathologically hollow as a result of infection or weathered and crumbled away after the specimen was eroded out of the seafloor and brought to the surface. In modern walruses, fractures are only found in adults and are more common in males. These afflictions are often the result of feeding and/or intraspecific competition.

Funding Sources: Horace Richards Fund

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Late Eocene agamid lizards from the Fayum Depression, Egypt

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Agamid lizards are a diverse clade of acrodontan squamates with a broad distribution across Africa, Eurasia, and Australia. In contrast to their modern diversity, the Paleogene record of Agamidae on the Afro–Arabian plate remains extremely limited. The previously oldest well-documented African occurrence consists of cf. *Uromastyx* jaws from the earliest Oligocene deposits of the Jebel Qatrani Formation, Fayum Depression, Egypt. Here, we describe new agamid material from the BQ-2 locality of the Birket Qarun Formation, tentatively referable to the genus *Barbaturex* and dated to the earliest Priabonian stage of the late Eocene (~37 Ma). The specimens comprise two nearly complete left dentaries, three partial dentaries, and two partial right maxillae preserving information on tooth implantation and crown morphology. The BQ-2 material shares distinctive morphology with *Barbaturex*, including two anterior pleurodont teeth followed by posterior acrodont and pleuroacrodont teeth, labiolingually compressed triangular crowns, well-developed ventral mandibular ridges, an anteriorly open Meckelian sulcus, and posterior reduction of the splenial where preserved. Although tentatively referred to *Barbaturex*, the BQ-2 agamids differ from *Barbaturex morrisoni* in their smaller size, more slender dentary proportions, reduced ventral expansion below the Meckelian groove, and asymmetrical accessory cusps on some posterior crowns. They further differ from the earliest Oligocene Fayum cf. *Uromastyx* in having pointed, rather than crescentic, shearing tooth apices and retaining small accessory cusps on some crowns. The BQ-2 material is also distinguished from early Eocene Asian agamids, including *Vastanagama susanae*, *Suratagama neeraae*, and *Tinosaurus indicus*, by its lower number of anterior pleurodont teeth and differences in crown shape and accessory cusp development. These specimens extend the African record of Agamidae from the earliest Oligocene into the late Eocene and document a distinct *Barbaturex*-affiliated agamid morphotype in northern Afro–Arabia before the appearance of the *Uromastyx*-like Fayum assemblage. If the tentative referral to *Barbaturex* is supported, the BQ-2 material would represent a rare coeval genus-level acrodontan record across Africa and Asia. More broadly, the BQ-2 fauna adds a critical low-latitude African occurrence to the Paleogene record of Acrodonta and provides new evidence for evaluating faunal interchange between Afro–Arabia and Eurasia.

Funding Sources: Mansoura University (Fieldwork grant 2025)

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

A remarkably complete articulated catfish from the Late Eocene of the Fayum Depression, Egypt

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Siluriformes are among the most diverse freshwater ray-finned fishes and provide an important system for studying paleobiogeography. The upper Eocene fluviomarine Qasr el-Sagha Formation of the Fayum Depression, Egypt, has yielded several Paleogene catfishes, including *Fajumia*, *Socnopaea*, and *Eopeyeria*. Whereas *Eopeyeria* has consistently been assigned to the marine family Ariidae, the affinities of *Fajumia* and *Socnopaea* remain uncertain, having been linked to Ariidae, Bagridae, and Claroteidae. We describe a new articulated catfish from the Qasr el-Sagha Formation representing the most complete catfish skeleton known from the Paleogene of the Fayum, and possibly Egypt, missing only a few parts of the skull. The fossil exhibits exceptional preservation, retaining an almost complete postcranial skeleton, including the anal and pelvic fins, reported here for the first time in Egyptian fossil catfishes. It also preserves several elements previously recognized in Fayum taxa, including the nuchal plates,

opercles, ceratohyal, lower jaw, branchiostegals, pectoral girdle with associated spines, first and second dorsal spines, caudal fin, and the Weberian apparatus. The new material differs from *Socnopaea* and *Eopeyeria*, but more closely resembles *Fajumia*. In particular, its Weberian apparatus is preserved separately and lacks the firm cranial attachment characteristic of Ariidae and reported in *Eopeyeria*. It also possesses an open aortic canal, as in *Fajumia*, contrasting with the enclosed condition described in *Socnopaea* and *Eopeyeria*. The pectoral-fin spines are heavily ornamented and bear large lateral tubercles, unlike the weakly ornamented and predominantly longitudinally striated spines of *Socnopaea*. The cleithrum resembles *F. schweinfurthi* in tubercular ornamentation but differs in having more prominent and pointed posterior processes in the dorsal ramus. In addition, the dentary is slender, constituting a slightly larger proportion of the lower jaw than in *F. schweinfurthi*, accounting for approximately 36.0% of jaw length compared with 33.3%. Corresponding to its slender gnathic ramus, the dentary symphysis is much shorter than that of *F. schweinfurthi* and *Socnopaea*. This specimen provides important new anatomical information for understanding the diversity and relationships of Paleogene catfishes from the Fayum Depression. Ongoing CT-based analyses and broader comparative studies will further refine the systematic placement of Paleogene Egyptian catfishes.

Funding Sources: Mansoura University

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A survey of bite traces and pathologies in placoderms from the Upper Devonian Escuminac Formation of Miguasha National Park (Quebec, Canada)

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The Miguasha Lagerstätte (Escuminac Formation) in Quebec, Canada, has yielded exquisite evidence of a Late Devonian ecosystem, enabling research well beyond the typical scope of systematic paleontology. Skeletal pathologies and bite traces may be common in fish fossils, but they remain undersampled in the Escuminac Formation and elsewhere. Using a large collection of placoderm fossils at Miguasha National Park, we surveyed for bite traces and pathologies in *Bothriolepis canadensis* and *Plourdosteus canadensis*. Of 1,946 specimens of *B. canadensis* we observed, 16 were identified with skeletal abnormalities attributed to predation/scavenging, parasitism, or pathologies with ambiguous etiology. These include puncture, crush, and tooth scrape traces presumably caused by sarcopterygian fangs, healing evidence characterized by irregular tubercle growth, oval fossulae caused by ectoparasite fixation, and abnormal bone lesions/growths. Previously, similar pathological evidence was identified in nine out of 667 specimens of *Bothriolepis ciecere* from the Upper Devonian Ketleri Formation (Pavari Site) in Latvia, at a frequency more than double that of *B. canadensis*. The difference may be attributed to sampling bias where most specimens of *B. canadensis* are incomplete skeletons and minimally prepared. Nevertheless, our preliminary survey in Miguasha provides a comparative dataset for insights into trophic interactions and community ecology in these ecosystems. For *P. canadensis*, we identified three specimens in which vertebral elements are hyperossified. Although hyperossification has been observed in other placoderm species (*Millerosteus minor*, *Compagopiscis croucheri*, *Eastmanosteus calliaspis*), this is the first time it is attributed as being pathological. In one specimen of *P. canadensis* (a nearly complete juvenile caudal fin), most neural arches are swollen at the base, a feature previously observed in *M. minor*. Fracture calluses occur in the neural spines of all three pathological specimens of *P. canadensis*, and one also has small calluses in the hemal spines. Comparison to modern teleosts suggests that these repeating calluses formed due to chronic mechanical stress during locomotion.

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Dental topographic metrics are not taxon- or homology-free: lessons learned from a new, large dataset of carnivorous mammals (Carnivora, Hyaenodonta, and Metatheria)

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3D dental topographic metrics (DTMs) have been a popular tool for studying the dietary habits of extinct animals for more than 25 years. Because these methods mathematically quantify the gestalt functional performance of the entire occlusal surface topology, they are assumed to be taxon- and homology-free. This theoretically allows direct ecological comparisons between species with dramatically different dental morphologies, particularly extinct taxa with few modern analogues, but this assumption has not been extensively tested. Here, this idea is tested for the three most commonly used DTMs: orientation patch count rotated (OPCr, surface compexity), convex DNE (DNE, surface sharpness), and relief index (RFI, surface relief), using a new, large dataset of 3D carnivorous mammal molar dentitions representing 735 specimens and 277 species. Carnivorous mammals are an ideal case study for DTMs due to their dental and dietary diversity and because DTMs may resolve a long-standing issue where traditional dietary ecometrics are difficult to compare between carnivorans and non-carnivoran predatory mammals (e.g., Metatheria, Hyaenodonta) due to differences in carnassial count and primary carnassial tooth homology. All three DTMs show significant bias from homology, phylogeny, and allometry to the point of being uninformative in their present state. Values are not comparable between carnivorans and non-carnivorans in all cases. OPCr is biased by tooth count; hypercarnivorous metatherians show values comparable to folivorous carnivorans. OPCr values are not even comparable between carnivorans with similar diets yet differing molar row morphologies. Convex DNE is biased by the total number of cusps in the tooth row. This produces spurious results like similar DNE values in frugivorous viverrids and hypercarnivorous felids. OPCr and convex DNE both reflect occlusal complexity and uncalibrated values are largely redundant. RFI values in mustelids and non-carnivorans significantly differ from other taxa regardless of diet, which partly reflects the number of carnassials. Methods are proposed to correct for some of these issues, but bias cannot be completely removed (especially in RFI). This suggests DTMs are not inherently taxon- or homology-free and these methods must be revised to avoid producing spurious results. These results are concerning and reflect a broader issue in paleontology regarding a need for greater methodological caution and testing of classical assumptions.

Funding Sources: GSA Graduate Student Research Grant #16114 to R. Engelman

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Local carnivore guild dynamics through the Cenozoic in North America

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Understanding how carnivores coexist within their guild is key to revealing past community structure and dynamics. An abundance of large carnivores suggests the trade-offs of energy investment into size are minimal due to an abundance of resources. Whereas more small mammalian carnivores suggest energy is limited. Traditionally, diversity dynamics have been investigated at regional or continental scales. However, co-existence mechanisms which determine local guild membership operate at smaller spatial scales. In order to understand how local guilds of carnivores are structured through time, and therefore the flow of energy through ecosystems, we investigated carnivore body size dynamics at the scale of local bone beds and quarries—the closest approximation in the fossil record to a local community. North America has a diverse and reasonably well-sampled carnivore guild through the Cenozoic, providing an ideal system to study guild dynamics through time. We hypothesized that as large-sized carnivores diversified through time,

local carnivore guild size should also increase, and body-size distributions would skew to the left. We sampled North American carnivores using the Paleobiology Database. We excluded marine carnivores and communities with fewer than five species and limited our analyses to species identified to the genus level or below. We sampled body-size data from the published literature. We measured standard moments of the body-size distribution through time. Surprisingly, mean community body size of North American carnivores shows no significant long-term trend of increase in size. Furthermore, we did not see a change in skew through time either. This suggests carnivores at the local scale may not be as sensitive to changing environments. Future research will focus on the relationship between the size structure of local carnivore guilds to the size structure of herbivorous and granivorous mammals, along with a functional analysis to investigate changes in dietary traits across space and time.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Fighting Phytos: preservation of crocodylian-like facial injuries and interpretation of antagonistic behavior in Phytosauria (Archosauriformes)

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Preservation of behavior in deep time is rare, but inferences for extinct taxa can be made from living analogs, correlating certain physical features to behavior. For example, crocodylian features that aid in behaviors associated with a semiaquatic carnivorous ecology include conical teeth correlated with capturing fish, and eyes and nostrils situated on the top of the skull with ambush hunting. Evidence of behavior can also be understood from skeletal pathologies, such as bite marks where the teeth of one individual may have punctured another, implying a level of intraspecific or predator–prey interaction. Through antagonistic interactions, crocodylians may suffer from injuries resulting in the severing of limbs or other portions of soft and osseous tissues. Modern skeletal pathologies and behavioral studies reveal patterns within extinct taxa that preserve analogous features. Phytosaurs are Triassic archosaurs with morphology similar to that of modern crocodylians, and bite marks have been found in various phytosaur specimens similar to those found in crocodylians. We describe a new phytosaur skull from the Late Triassic Chinle Formation, Arizona, USA, that shows a severe pathology with the tip of the mandibles missing, inferred to be an injury similar to those incurred from face-biting aggression in crocodylians. The anteriormost portion of the dentaries comprising the first ~18 teeth is missing, and the bone posterior to that preserves a spongy external morphology similar to that of healed bone. Computed tomographic (CT) data revealed internal structures supporting evidence of partially healed regions of bone and mild uneven periosteal reaction adjacent to healed reactions, thereby evidence of an inflammatory response. Throughout the severed portion of the dentary, several diving tract canals are visible in CT, which are typically diagnostic features of possible infection. By studying pathologies in phytosaurs, we may reveal information regarding convergent behaviors with morphologically similar extant species.

Funding Sources: David B Jones, NSF

Technical Session XV: Dinosauria IV: a mostly “bird-hipped” bonanza (Saturday, November 14, 2026, 8:00 AM)

Reconstruction of wing muscle attachment in early paravians and its implied effects on early flight strokes

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Powered flight is made possible by wing movements that dramatically increase wing

airspeed and angle a component of the resultant lift as thrust. This flapping stroke requires wing shape changes throughout the stroke cycle. In modern birds, wing shape change is coordinated by manipulating joints in the wing, resulting in critical motions that include substantial wing rotations and changes in span.

The ability of modern birds to control and change wing shape during a complex flight stroke is expected to be present in their closest flying paravian relatives: certain fossil birds and birdlike theropods. To better understand the flight capabilities of fossil species, we focus on two essential but poorly studied aspects of their flight strokes: the ability to reduce span and rotate the arm.

Using preserved soft tissues and osteological details, we identify and map the shape, size, and position of relevant wing muscle groups in the key early paravian species *Microraptor*, *Anchiornis*, *Archaeopteryx*, *Jeholornis*, *Sapeornis*, and *Confuciusornis* fossil species to assess the rotational and span capabilities of their wings. To do this, the pectoral girdle, humerus, and ulna are examined for three aspects: 1) maximum length of the deltoideus scapularis muscle, 2) ratio of the protrusion of deltopectoral crest to the midpoint of the humerus, and 3) length of extensor muscle insertion upon the ulna.

Our results constrain and inform possible motions of the wing in early bird relatives. Among those results, we find: strong rotational capacities found in *Confuciusornis*, weak abduction and rotation capabilities in *Anchiornis*, and broad similarities in extension and rotation capabilities between *Microraptor* and early birds. Results uncover additional nuances to early paravian aerial locomotion and new evidence towards determining the flight capabilities of key species. This study provides a framework to study these capabilities in other fossil species and on which to build to study other aspects of the early flight stroke.

Funding Sources: International Joint Supervision of PhD Students Scheme and School of Life Sciences, The Chinese University of Hong Kong

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Technical Session XIV: Return of Reptile'O'Rama: Triassic time (Friday, November 13, 2026, 1:45 PM)

Paedomorphic development in duckbilled marine reptile *Eretmorhipis carrolldongi* with low-light foraging in the Early Triassic

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Paedomorphosis, a form of heterochronic development where adult organisms retain juvenile traits, is widespread in morphological evolution and has been proposed to be associated with ecological adaptations in some animal groups, including the marine reptiles of the Mesozoic. Here, we describe two new specimens of the Early Triassic marine reptile *Eretmorhipis carrolldongi*, which is a specialized hupehsuchian taxon with duckbill-shaped snout and small eyes, employing non-visual prey detection. Morphological comparisons and allometric analyses reveal that features seen in an early postnatal specimen, such as a flattened snout with unfused premaxillae, cranial proportions, and well-developed dorsal osteoderms persist into adulthood. *Eretmorhipis carrolldongi* also shows slow growth rates of the humerus and orbital region. The paedomorphic skull is associated with the non-visual prey detection strategy of this species, regarded as an adaptation to feeding in low-light marine environments. Meanwhile, some dermal elements, including limb osteoderms and gastralia, show ontogenetic variation, suggesting a protective function against predation. The ontogenetic trajectory of *Eretmorhipis* suggests that paedomorphosis might have driven morphological innovation and functional specialization in Hupehsuchia. Our findings reveal that heterochronic growth in Hupehsuchia was

associated with ecological diversification during the Early Triassic biotic recovery.

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A marginal marine vertebrate assemblage from the middle part of the "Mesaverde" Formation (Late Cretaceous, Campanian) in the eastern Bighorn Basin, Washakie County, Wyoming, USA

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The Teapot Sandstone in the Bighorn Basin of Washakie County, Wyoming, has produced most of the published vertebrate fossils for the "Mesaverde" Formation, including a rich elasmobranch and mammal assemblage. However, fossils lower in the section are not as well represented. Here, we report a vertebrate microfossil assemblage at the Oyster Gulch locality (RAM V2022016, Raymond M. Alf Museum of Paleontology) recovered through surface collection and screenwashing. The site is 76 m below the base of the Teapot Sandstone, stratigraphically the lowest vertebrates known for the formation in the area. Pending more detailed analysis of the depositional setting, abundant oysters and the dominance of marine vertebrates suggest a marginal marine environment.

Elasmobranch teeth are the most abundant identifiable fossil at the site; common taxa include *Archaeotriakis rochelleae*, *Carcharias steineri*, *Centrophoroides worlandensis*, *Cretolamna appendiculata*, and *Pseudomyledaphus* sp. Actinopterygian fish include lepisosteids, *Paralbula casei*, and *Enchodus* sp.

Non-diagnostic crocodylomorph teeth and osteoderms occur in the sample, along with turtle shell fragments. Hadrosaurid dinosaur teeth are surprisingly common, with rare theropod teeth representing the only other dinosaurs recovered.

Mammals include a nearly complete M1 with a 5:6:?4 cusp count (2.0 mm long by 1.2 mm wide) and a partial P4 with a 2:?5 cusp count, both referable to the multituberculate *Filikomys* sp. Metatherians include a fragmentary LM1 as well as a partial M1 referable to Alphadontidae.

To better understand the taphonomy of the site, a sample of 52 shark teeth was measured and scored for abrasion state. Shark teeth were chosen because of their easy identification and well-defined unworn anatomy. Maximum tooth lengths span 2–18 mm (mean = 8.4 mm), 50% of the teeth have little to no wear, and 27% show moderate to heavy wear, suggesting transport for some specimens before burial. These results indicate that Oyster Gulch preserves a potentially partially reworked and time-averaged fossil assemblage, as for many similar localities.

Although the mix of marine and terrestrial taxa is notable, it is not unusual in Campanian marginal marine rocks of Laramidia. Models for the mode of accumulation and interpretation of the degree of time averaging are a ripe topic for future research. Comparison of taphonomic parameters for small and readily observed fossils, such as shark teeth, may be particularly useful.

Funding Sources: David B. Jones Foundation, Mary Stuart Rogers Foundation

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Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

A homogenous dinosaur community during the Late Campanian–Middle Maastrichtian of Alberta, with no preference of depositional environment

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The question of niche partitioning and distribution among dinosaurs has yet to be fully tackled. Any meaningful paleoecological study is often obstructed by the lack of samples. This is especially the case in vertebrate groups; fossil sites with good documentation and sample size are sparse, and well-excavated sites are even rarer. Previous studies have explored this topic using wider/different temporal or geographical scales or attempted to separate communities by lithologies. However, with recent collection efforts, nothing has been done on a finer scale in the extremely productive, age-equivalent Horseshoe Canyon and Wapiti Formations. Although both had a period of coexistence during the Late Cretaceous in Alberta, the two formations show differences. The former is closer to the equator and represents a near-coastal environment, whereas the latter represents a higher latitude, more inland Formation. This study examined the distribution of dinosaur families in the Horseshoe Canyon and coeval Wapiti formations, as determined by macrosite analyses across various lithologies.

Generally, sandstone units are assumed to represent fluvial/channel depositional environments, whereas mudstone units are generally associated with interfluve/floodplain settings. Minimum Number of Individuals (MNI) analyses were conducted on specimens from the Royal Tyrrell Museum of Palaeontology and the University of Alberta Laboratory of Vertebrate Palaeontology. After limiting the site selection to those with a minimum of two individuals and 50 elements, 26 localities were selected with an MNI of 211. The count number of individuals in each family at each site were put through Fisher's Exact Test and Chi-square residuals, revealing a moderate significance with an emphasis on Tyrannosauridae in sandstone ($p = 0.012$; $z = 2.910$, $p = 0.0036$). However, Non-Metric Multidimensional Scaling (NMDS) with Bray-Curtis distance measure and individual rarefaction revealed no significant community differences between lithologies and formations.

The outcome of this study supports a homogeneous community of dinosaur faunas in the Late Cretaceous Western Interior of North America at finer lithological, temporal, and geographical scales than previous studies. This study further expands the understanding of the overall faunal makeup of the Horseshoe Canyon and Upper Wapiti Formations.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Systematics and paleoecology of a late Paleocene (Tiffanian) herpetofauna from the Bison Basin (Saddle Locality), Fremont County, Wyoming

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A minimum of 19 lower vertebrate species has been identified from the late Paleocene (Ti2) Bison Basin (Saddle Locality), Fort Union Formation, Fremont County, Wyoming. The fauna includes two bony fishes representing Holostei and Teleostei; six amphibian species representing five families (Batrachosauroididae, Sirenidae, Discoglossidae, Rhinophrynidae, and Pelobatidae); and eight lizard species representing six families (Xantusiidae, Scincidae, Oligodontosauridae, Anguidae, Xenosauridae, and Necrosauridae). Notably, *Eorhinophrynus septentrionalis* (Rhinophrynidae) makes its earliest known appearance in this fauna. Two trionychid turtles and the crocodilian *Allognathosuchus* are also present. Comparisons with regional Paleocene lower vertebrate faunas indicate the strongest similarity to the Torrejonian Medicine Rocks fauna (Tongue River Member, Fort Union Formation, southeastern Montana), yielding a Faunal Resemblance Index (FRI) of 83. Comparisons with five Late Cretaceous localities produced lower FRI values ranging from 36 to 50. The amphibian assemblage shows strong ecological similarity to modern Gulf Coast faunas of North America, whereas the terrestrial lizard fauna most closely resembles extant subtropical and tropical communities of Central and South America. These groups followed markedly different evolutionary trajectories across the Cretaceous–Paleocene transition. Amphibian lineages largely persisted through the transition, with both caudates and anurans remaining relatively unchanged since the

mid-Campanian and many Cretaceous anuran lineages continuing into the early Paleogene. In contrast, terrestrial lizards underwent more substantial evolutionary and ecological change in response to shifting early Cenozoic climates and environments. The transition from the Mesozoic to the Cenozoic is marked by the extinction of rarer, more archaic Lancian taxa and their replacement by more derived Paleocene forms. This faunal turnover reflects the widespread diversification of Anguidae during the early Paleocene and the appearance of Xantusiidae and Oligodontosauridae (Amphisbaenia) during the middle Paleocene. Sedimentological, paleobotanical, and faunal evidence from the Bison Basin (Saddle Locality) indicates a poorly drained, wooded swamp environment characterized by slow-moving water and restricted access to open aquatic habitats.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Comparative vertebrate diversity between the Mongolian Eastern Gobi Basin and North America Western Interior Basin in the aftermath of the Cretaceous Thermal Maximum

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The Cretaceous Thermal Maximum (KTM) was a global hyperthermal event associated with significant faunal turnover; however, the terrestrial impact is poorly understood. To assess biodiversity trends and macroevolutionary dynamics associated with the KTM and between marine-influenced and intracontinental systems, we generated a dataset comprising published and novel (unpublished) vertebrate macro- and microfossil records from the Western Interior Basin (WIB), North America, and Eastern Gobi Basin (EGB), Mongolia, just after the peak of the KTM (Turonian–early Coniacian). Novel records derive largely from bulk microvertebrate sampling and facies analyses conducted within the Moreno Hill and Straight Cliffs formations (WIB) and the Bayanshiree Formation (EGB). Testudine diversity is broadly comparable, preserving representatives of Adocidae and Trionychidae. Amphibians are rare components in both systems, with new material referable to *Gobiates* from the EGB. Crocodylian diversity is higher in the WIB, with only Paralligatorids reported from the EGB. Shed teeth indicate ankylosaurians, ceratopsians, and hadrosauroids occur in both regions, whereas small-bodied neornithischians are absent in the EGB. Among theropods, tyrannosauroids and dromaeosaurids occur in both regions; whereas, numerous tooth morphotypes suggest a taxonomically diverse suite of small-bodied maniraptorans in both systems, perhaps reflecting sub-basin isolation. Allosauroids and sauropods disappear in the WIB but are represented by isolated teeth in the EGB, suggesting a predator–prey relationship that persisted in East Asia. Therizinosaurids are present in both systems and, although well documented by macrofossils, are not yet recovered in microfossil samples, potentially due to low tooth replacement rates. The underrepresentation of some clades suggests persistent sampling/taphonomic biases within WIB and EGB samples. However, the differential response to the KTM observed across inland and coastal ecosystems was undoubtedly influenced by varying degrees of marine subsidization within trophic networks, rates of floral change associated with paleoenvironmentally specific angiosperm radiation and dispersal, and possibly by habitat tracking, although the latter needs further sampling and analysis. Together, these intercontinental comparisons underscore the value of microfossil datasets for resolving the timing, selectivity, and broader patterns of faunal turnover in response to the KTM.

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Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

Late Pleistocene vertebrate burrow complexes in the Jurassic Todilto Formation, White Mesa, Ojito Wilderness, north-central New Mexico

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Modern burrowing rodents often produce distinctive and exquisite, complex burrow systems. Tilted Mesozoic strata truncated by the San Ysidro erosional surface, capped by Pleistocene fluvial and eolian deposits, producing a spectacular angular unconformity at White Mesa in the Ojito Wilderness of north-central New Mexico. Modern erosion of the Pleistocene sediment exposed one large and two smaller ichnological sites developed in the Jurassic Todilto Formation gypsum consisting of a complex vertebrate burrow system capped by fossil elephant tracks. The complex burrow system is a potential new ichnogenus. Within the complex, all features were infilled with a reddish silt matrix and gypsum clasts up to 3 cm in diameter. Tunnels are 9–15 cm in diameter, most are near-horizontal with rare vertical shafts, tunnel bifurcations, blind tunnels, turnaround chambers, and ramp-like features. Entrances to the paleosurface were not definitively identified. Tunnels have widened areas, knobs that permitted passage of the trace maker in both directions. Chambers encompass diverse geometries, including: 1) tunnel exiting at 90° from a larger tunnel that terminates in a small chamber, ~20–30 cm in diameter, 2) large ovoid chambers, ~50 cm in diameter, with multiple tunnel entrances all around the periphery, and 3) crude triangular shapes with the merging of the three tunnels. The size and complexity of the exposed structures are consistent with communal rodents, such as those found today in prairie dog (*Cynomys* sp.) colonies. Cross-cutting the burrow complex are large, round to sub-round tracks of a large quadruped that preserve both pes (30 cm in diameter) and manus (up to 20 cm) impressions and are composed of pulverized gypsum. The spacing and geometry are consistent with fossil elephant tracks found elsewhere in New Mexico. A date of approximately 13,000 years was derived from collagen found in fossil ungulate remains from a nearby fissure fill in the gypsum. These Pleistocene rodent burrows may be of similar age.

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Evolution of body size and life history in uintatheres (Dinocerata)

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The successful diversification of eutherian mammals following the end-Cretaceous extinction may have been influenced by their life history traits, which are not well understood. Uintatheres (Order Dinocerata) are an enigmatic Paleogene group of stem placental large-bodied herbivores best known for their six cranial horn-like protuberances, and sabertooth canine tusks of the larger Eocene forms. Uintatheres represent one of the earliest lineages of eutherian mammals to evolve large body sizes and were the largest land animals of the Middle Eocene. The developmental mechanisms underlying such major shifts in mammalian body size are understudied. We estimate the body size of a large sample of dinoceratans (N = 266) using stylopodial measurements examining their body size evolution from the late Paleocene to the Middle Eocene of North America and Asia. We also histologically sampled long bones, ribs, and teeth of *Probathyopsis*, a small early diverging form, and two large-derived forms, *Uintatherium* and *Eobasileus*, to estimate growth strategy and longevity. *Probathyopsis* (250 kg in body mass) took approximately four years to reach sexual and somatic maturity, while the larger Eocene forms (>2,000 kg in body mass) underwent extended

growth resulting in prolonged deposition of fast-growing bone tissues for six to eight years, and reached maturity around age seven. To achieve their larger body sizes, the derived uintatheres grew both more quickly and longer than their smaller predecessors. Early and late uintatheres matured at the rate expected of similarly sized extant placental taxa, suggesting that the growth strategies observed in today's placentals were already present during the Paleogene.

Preliminary data suggests uintatheres and some other Paleogene eutherians lacked the longevity of extant taxa. The shorter longevity of Paleogene eutherians may reflect constraints resultant from higher rates of dental erosion than observed in living herbivores, or inheritance of lifespans from earlier smaller short-lived taxa. These findings indicate that the initial rise of large-bodied placental mammals in the early Cenozoic was underpinned by life-history strategies that combined features shared with modern analogues with traits distinct from them. This provides new insight into how placentals occupied their first large herbivorous niches, an ecology that would become a defining feature of the clade.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Of rodents and rocks: reviewing biostratigraphic patterns in the Turtle Cove and Kimberly Members of the John Day Formation, Oregon, USA

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The John Day Formation, which spans roughly 20 million years, has been studied by paleontologists and geologists for more than 160 years. The Turtle Cove and Kimberly Members of this formation are of particular paleontological importance as they are exceptionally fossiliferous and span 7 million years, roughly half of the Arikareean North American Land Mammal Age. The biostratigraphy of the John Day Formation has been of interest to other scientists since the early 1900s. Individual rodent taxa (e.g., *Entoptychus*, *Meniscomys*) have been used as biostratigraphic markers, but subsequent whole-fauna biostratigraphic studies have come to differing conclusions about the biostratigraphy within the unit. However, recent systematic studies and geochronologic work have suggested a need for biostratigraphic revisions of the John Day Formation, particularly within the Turtle Cove and Kimberly Members. In order to examine the biostratigraphy in light of recent work, rodent occurrence data was obtained from four collection databases (UOMNH, UCMP, JODA, and UWBM). Occurrences were then placed into one of four stratigraphic bins based on three well-dated marker ash beds: (1) below the Picture Gorge Ignimbrite (29.0 Ma), (2) between the Picture Gorge Ignimbrite and the Deep Creek Tuff (28.3 Ma), (3) between the Deep Creek Tuff and the Tin Roof Tuff (26.6 Ma), and (4) above the Tin Roof Tuff. Occurrences not identified to the genus or species level (e.g., Rodentia, Geomyidae) were removed before analysis. The four stratigraphic bins were then compared using the Bray-Curtis dissimilarity index. Each bin comparison was found to have an index greater than 0.65, indicating substantial faunal change at each of these boundaries. A stratigraphically uncertain locality, Lonerock, was also compared to the binned data in an effort to determine its stratigraphic position. The Lonerock comparisons also had an index greater than 0.7. This could be due to the difference in collection methods, as this site is the only one that has been screenwashed successfully in the John Day Formation. Another possible factor impacting dissimilarity of the Lonerock assemblage is the geographic distance (~40 miles) from the other localities included in this study because rodents adapt rapidly to their local environment. This study will help to clarify biostratigraphy and faunal turnover within these two members of the John Day Formation and build on our knowledge of the Arikareean in the montane West.

Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

Reexamining osteological variation in the Chamaeleonidae (Squamata: Iguania) in light of novel phylogenomic data and revised historical biogeography

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Chameleons are a distinct lizard radiation and possess several morphological novelties, such as their projectile tongues and zygodactyly. Their high degree of intraspecific variation and the scarcity of published skeletal anatomy have made assessing fossil chamaeoleonids extremely challenging. Since the 1990s, molecular sequencing data have revealed several genetically distinct, deep lineages within living species, but the main osteological characters used to inform chameleon interrelationships predate these new findings and have not been updated to encompass intraspecific variation and rare, relatively depauperate lineages such as *Archaius* (1 sp.), *Palleon* (2 spp.), or *Nadzikambia* (6 spp.). We briefly present novel whole-genome molecular systematics for 95 individuals across all genera for the group. We use this as a framework for new osteological data derived from CT scans of more than 100 individual chameleons from all 12 extant described chameleon genera and one possible undescribed new genus. We find that fossil chameleons need to be reexamined in light of new morphological observations of previously undersampled species that they were historically not compared to. In particular, we find that *Calumma benovskyi* may be a fossil representative of the African genus *Kinyongia* or an early-diverging African chameleon, due to 1) comparisons with *Kinyongia vosseleri* and *adolfifriderici*, and 2) our novel molecular topology and historical biogeographic analyses, which find an African origin for *Calumma* is extremely unlikely. Finally, we present novel hypotheses for the macroevolution of chameleons, which are supported by our molecular phylogeny and which could be interrogated with future fossil evidence.

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Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

Crescent rising: humeral head morphology and the evolution of underwater flight in penguins

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Penguins are the most aquatically adapted birds, with their unique underwater flight stroke resulting from highly derived postcranial anatomy, especially in the forelimb. The humeri of fossil penguins are often well-preserved and provide an opportunity to examine this key portion of the flight apparatus through their evolution. The humeral head undergoes a striking transformation from the plesiomorphic avian condition to the crescent-shaped proximal articular surface characteristic of modern penguins, which accommodates stroke-critical musculature. To explore the emergence of modern penguin functional biomechanics, we used 3D geometric morphometrics to quantify proximal humeral shape variation across 35 penguin taxa spanning their full evolutionary history, with *Gavia stellata* and *Phoebastria nigripes* as outgroups. Five fixed landmarks and four curve semilandmarks capturing the outline curvature of the humeral head in proximal view were superimposed using Generalized Procrustes Analysis, followed by Principal Components Analysis on the Procrustes shape coordinates. PC1 explained 47.8% of total shape variation and PC2 13.7%, together accounting for 61.5% of variation in proximal humeral shape. PC1 primarily reflects mediolateral breadth of the humeral head, while PC2 captures asymmetry in apex position relative to the anterior and posterior margins. Our results reflect the biomechanical evolution of the penguin underwater flight stroke, suggesting that shifts in proximal humeral morphology correspond to changes in muscle attachment volume, power, and range of motion that ultimately gave rise to the highly derived swimming function seen in modern penguins.

Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

The biomechanical impact of external mandibular fenestral integument on mandibular performance in *Majungasaurus crenatissimus* (Theropoda: Abelisauridae)

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Many groups of extinct and extant archosaurs navigate the challenge of feeding using a jaw with an external mandibular fenestra (EMF) between the surangular, angular, and dentary. A large EMF likely concentrates strains within and around the mandible's constituent intramandibular articulations, weakening the mandible's overall structural integrity. Previous biomechanical research on the mandible of *Majungasaurus crenatissimus* (Theropoda: Abelisauridae)—which possesses a large EMF—has shown pathologically high ligament and bone strains near the EMF. Crucially, in life, the EMF would be spanned by a layer of integument, as seen in extant archosaurs like alligators, that may have absorbed and redistributed feeding-induced strains in a manner unappreciated by previous modeling approaches. To address the biomechanical role of EMF integumentary tissues in feeding behaviors, we built 3D finite element models of the mandible of the abelisaurid *Majungasaurus* with and without soft tissues spanning its EMF. We quantified intramandibular joint (IMJ) flexibility, IMJ ligament strain, and bone strain for each model in order to determine the effect of fenestra-spanning soft tissues on mandibular performance. We find that IMJ ligament and bone strains are reduced to levels within the physiological limits of extant taxa when the EMF of *Majungasaurus* is modeled with a thin (= 2.0 mm) layer of integument. Additionally, reductions in ligament and bone strain, as well as reductions in IMJ flexion, are greatest during unilateral caudal bites when the mandible experiences the most asymmetrical loads. Our results show that the integument covering the EMF is a biomechanically important feature for modulating joint strains in taxa with limited or delicate intramandibular articulations such as *Majungasaurus*. Thus, EMF-spanning integument may play a crucial—and underappreciated—biomechanical role on the feeding performance of many archosaurs. Future biomechanical analyses should properly model all relevant soft tissues, including the integument, to accurately simulate in vivo feeding performance and elucidate macroevolutionary patterns in skull morphology through deep time.

Technical Session XIX: Carnivora (Saturday, November 14, 2026, 1:45 PM)

A Late Pleistocene red fox (*Vulpes vulpes*) from a cave in the Uinta Mountains of northeastern Utah

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A nearly complete skeleton of *Vulpes vulpes* (red fox) was collected from the back of a cave in the Uinta Mountains, Uintah County, Utah, in 2024. Whiterocks Cave is at approximately 2600 m elevation and is in Mississippian-age Madison Limestone; some of the speleothems in this wet cave indicate an age of the features of more than 600,000 years. The cave appears to have been wet during Pleistocene interglacials but dry during cold periods when the land above was covered in permafrost. The terrain inside the cave is complex in spots, and, carrying gear, the crew of nine that collected the skeleton took three hours to traverse the ~800 m back to the skeleton; it is unclear if the animal ended up in the cave by accident such as a fall from some other (possibly karst) access point or if it accessed the back of the cave intentionally from the main entrance. The fox skeleton was found near the back of the approximately 800 m long cave. The skeleton (FHPR 20000) consists of nearly all vertebrae, ribs, and limb elements, and only the skull is missing most elements, preserving only the left dentary, fragments of a maxilla and several teeth, the auditory bullae, and many fragments of the braincase(?). The skeleton even preserves fore- and hindfoot claws. Given the completeness of the skeleton otherwise, the lack of

a baculum indicates that the fox could be a female, but future DNA analysis will clarify this. The animal was lying on its left side and the bones of the skeleton, although in parts coated in a thin layer of calcium carbonate, were neither buried deeply in mud nor scattered by surface flow; most were simply lying on the surface in approximate skeletal position. The surrounding cave floor was wet and muddy. The skeleton was mostly articulated in the limbs and associated with the skull, vertebrae, ribs, and girdles. ^{14}C dates on two of the ribs of the skeleton indicate that the animal is approximately 25,310 +/-280 RP yr BP, living shortly before the last glacial maximum during the Pinedale glaciation. Red foxes are common in the Pleistocene of the USA, but most specimens in Utah are not as complete as is FHPR 20000, and none that we are aware of are from as high in elevation.

Funding Sources: David B. Jones Foundation, Friends of Utah Field House

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Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

Isotopic evidence for non-analog ecosystems during the Early and Middle Miocene in eastern Africa

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Carbon isotopic data and plant microfossil assemblages indicate C_4 grasses comprised a moderate amount of plant biomass at different times and places during the Early Miocene (ca. 21–16 Ma) in eastern Africa. However, interpretations of $\delta^{13}C$ values of fossil tooth enamel of herbivorous mammals from the region suggest ungulates only consumed C_3 plants (trees, shrubs, cool-growing season grasses) during the Early and Middle Miocene with no indication of isotopically distinct C_4 grasses in diets until the Late Miocene. Here, we reinterpret the tooth enamel carbon isotope record from these localities quantitatively using a global compilation of >15,000 published modern plant $\delta^{13}C$ values and a Monte Carlo method for estimating the fraction C_4 grass in diet (f_{C4}) from measured $\delta^{13}C$ values. The MC method applies linear mixing between C_3 and C_4 plant $\delta^{13}C$ values and accounts for natural variation and/or uncertainties in $\delta^{13}C$ values of plants, ages of localities, carbon isotopic enrichment of tooth enamel relative to diet, and the partial pressure and $\delta^{13}C$ of atmospheric CO_2 in the past. For a single measured $\delta^{13}C$ value, the method generates 10,000 f_{C4} values, and if the fifth percentile of those f_{C4} values is >0, then the measured $\delta^{13}C$ value statistically requires consumption of C_4 grasses. Results for published data from modern African mammals vary by ecosystem. Almost all measured $\delta^{13}C$ values from tropical wet forests have fifth percentiles <0.0, and the distributions of median f_{C4} values are unimodal with modes <0.0 (diets with $\delta^{13}C$ less than the global mean for C_3 plants and no C_4 grass). In mixed woodland-grasslands, >70% of mammals have fifth percentiles >0.0 and the distributions of median f_{C4} values are wide and multimodal with modes <0.25 (C_3-dominated diets), ca. 0.5 (mixed C_3–C_4 diets), and >0.95 (C_4-dominated diets). All individuals in grasslands consume C_4 grass and distributions of median f_{C4} are strongly left skewed and unimodal with modes >0.95. In Early and Middle Miocene faunas, 11–54% of specimens in faunas have fifth percentiles >0.0 and distributions of median f_{C4} are unimodal with modes that range from 0.19–0.28. Our results provide statistical evidence that Early and Middle Miocene mammals in eastern Africa were eating substantial fractions of C_4 grass and that the isotopic patterns of diet within faunas are not represented in well-sampled modern ecosystems, suggesting Early and Middle Miocene ecosystems do not have analogs in the region today.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Comparing bone weathering across environments through the lens of optical profilometry

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Semiquantitative assessments of bone weathering (e.g., "weathering stages") have long been used to describe the decay state of bones. However, some bone weathering features vary with large-scale environmental settings (e.g., temperate vs. semiarid). For example, in semiarid environments bones often develop a splintered fabric, while in temperate settings bones exhibit more tabular flaking. Previous work has established the utility of using quantitative metrics of surface roughness (via 3D optical profilometry) to characterize bone weathering but has not evaluated whether weathering stages have similar or distinct quantitative roughness characteristics in different environments. To compare surface roughness of weathered bones in different settings, we evaluated bones from Amboseli National Park, Kenya (semiarid), and Yellowstone National Park, USA (temperate). Skeletal elements from both settings (30 wildebeest [*Connochaetes taurinus*] bones from Amboseli; 24 elk [*Cervus canadensis*] humeri from Yellowstone) spanned the full spectrum of weathering stages (0 through 5). We evaluated the average surface roughness (Sa) of each bone using a Keyence VR-6000 3D optical profilometer, scanning at 40x magnification. Instead of using a summary weathering stage for individual skeletal elements, we recorded the weathering stage at each evaluated location (up to 17 locations on elk humeri and up to four on Amboseli bones, as preserved). We found that average surface roughness was consistent (statistically indistinguishable) among bones in the same weathering stages from both the semiarid and temperate environments. This consistency suggests that direct quantitative comparison of bone weathering across widely different latitudes and environmental conditions is possible, and that large-scale environmental setting does not necessarily complicate these comparisons; at least not at microscopic scales. Although bones weather at different rates in temperate versus tropical environments, physical expression of the weathering stages is remarkably consistent. Our results further highlight the utility of using 3D optical profilometry to quantitatively analyze bone weathering, opening additional opportunities to evaluate this key taphonomic indicator.

Funding Sources: NSF (award #DEB-2135479), Sigma Xi (University of Cincinnati chapter), University of Cincinnati

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Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

A new rhinocerotid from the High Arctic and biogeographic implications

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Extant rhinocerotids comprise only five species and are presently limited to Southern Asia and Africa. During the Cenozoic, however, they achieved a near global distribution. Their past biodiversity hints at a complex evolutionary and biogeographic history. Herein, we report a new Early Miocene rhinocerotid species from the Canadian High Arctic (Devon Island, Nunavut). A nearly complete skeleton of one individual was collected in an area measuring 5–7 m^2. The bones occurred both as surface lag and within the active layer, above the permafrost. The specimen preserves portions of the skull, the left and right mandibulae, and most of the postcrania. It is definitively a rhinocerotid based on possession of a tusk-like i2 as well as apparent absence of i3 and lower canine. The preserved right nasal bone lacks rugosity, suggesting the absence of a horn. The specimen from Devon Island therefore represents the highest latitude occurrence of a rhinocerotid, to date, and the first occurrence in the Canadian Arctic Archipelago. Anatomical comparisons suggest the specimen is a member of the genus *Epiaceratherium* Abel (1910), a genus otherwise restricted to Europe and southern Asia. The Devon Island specimen is, however, differentiated from the four other members of the genus by characteristics of the P3, M1-2, mandible, and lower premolars necessitating the erection of a

new species. In collaboration with an Inuit elder, Jarloo Kiguktak, the new species was named *Epiaceratherium itjilik* sp. nov. “Itjilik” is an Inuktitut word meaning frost or frosty. We also compiled morphological character matrices from published sources and scored morphological characters for additional North American species. To simultaneously infer tree topology and divergence dates, we performed a combined evidence analysis for stratigraphic range data using a fossilized birth-death (FBD) model. Our phylogenetic hypothesis places *E. itjilik* as sister to a species of *Epiaceratherium* found in Europe, suggesting a Europe to North America dispersal during the latest Eocene. Global-scale biogeographic analyses further reveal a high number of dispersals between Europe and North America, in both directions, until the Miocene, suggesting that dispersal directly between Europe and North America may have been possible for mammals for at least 20 Ma longer than previously considered. Our findings underscore the pivotal role of the Arctic has played in mammalian evolution.

Funding Sources: Natural Sciences and Engineering Research Council of Canada Grant to D.F., a W. Garfield Weston Foundation grant to N.R., and a National Geographic grant to M.R.D.

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Unified osteohistological framework provides insights into the life history and ecophysiology of Therizinosauria

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Life history is an important determinant of many organismal traits and is commonly studied in the fossil record through the lens of osteohistology. Despite decades of research demonstrating links between bone microstructural features and life-history traits, foundational questions remain about the impact of ecomorphological evolution on life-history parameters and drivers of developmental variability over macroevolutionary timescales. Exceptional samples across the herbivorous maniraptoran clade Therizinosauria help to fill these gaps. Two population-level bonebeds of sister taxa *Falcarius utahensis* and *Falcarius suarezarum* provide a large histological dataset (n = 31 femora), and a clade-wide therizinosaurian dataset captures an inferred body-size range of 67–3712 kg across ~80 million years of evolutionary time. Using the observable circumferential growth marks (n = 220) through each *Falcarius* growth series, I synthesized a nomenclatural framework representing a continuum from incomplete to multiple cessations of bone apposition in hypothesized growth cycles. I also quantified variability in growth zone thicknesses through different archosaur populations, refining a common proxy for developmental plasticity. I assessed growth rates by quantifying vascular densities and modeling growth trajectories using fixed-effects regression.

My results have implications for life history evolution in the *Falcarius* populations, across Therizinosauria, and for archosaur populations in deep time. By tracking histological features alongside individual growth trajectories, I formulated a generalized life history model for *Falcarius*. The progression of endosteal lamellar bone deposition co-occurs with a shift in growth mark types prior to asymptotic growth; these changes are hypothesized as the onset of sexual maturity and align with known reproductively active theropods (egg-bearing, brooding). Throughout therizinosaurian evolution, humeral growth rates mirror shifts in ecomorphology and body sizes. Metrics of growth variability are statistically similar between the *Falcarius* populations and early theropods but differ from extant Alligator. This suggests high developmental variability was maintained through at least the base of Maniraptora, yet these developmental patterns are canalized relative to representative outgroups. This updated histovariability framework holds potential to refine skeletochronological and ecophysiological processes in extant and extinct tetrapods.

Funding Sources: National Science Foundation (2448142), National Geographic Society (NGS-100601R-23), Jurassic Foundation, Paleontological Society, Systematics Association, PRI, SVP

Technical Session IX: Archosaur paleobiology & pterosaurs (Thursday, November 12, 2026, 1:45 PM)

3D imaging reveals early divergence in the developing archosaur brain

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Archosaurs evolved remarkably disparate sensory systems during their radiation into a wide range of ecological niches, a pattern reflected in the substantial variation present in their brain morphology. The developmental and evolutionary origins of this neurological disparity could provide key insights into the exceptional diversification of Mesozoic archosaurs. However, reconstructing the brain morphology of the ancestral archosaur is hindered by a sparse fossil record of braincase endocasts. Developmental sequences, which often retain conserved evolutionary patterns, offer an alternative perspective on the mechanisms underlying sensory evolution at the origin of Archosauria. Previous studies have documented substantial divergence in brain morphology among extant archosaurs during late embryonic and postnatal development, but the earliest stages of brain formation remain poorly understood. Here, we investigate the onset of morphological divergence in extant archosaurs to identify developmental processes that may have contributed to the evolution of their remarkable brain disparity. We generated three-dimensional datasets of early embryonic brains from chickens, ducks, and American alligators using contrast-enhanced μCT and visualized early neurodevelopment in immunohistochemically stained specimens using 3D light-sheet fluorescence microscopy. Three-dimensional geometric morphometric analyses of these datasets constitute the earliest developmental morphometric comparison of archosaur brains to date. Our results show that bird and alligator brain morphologies differ initially and remain distinct during early development before converging toward a shared morphological bottleneck at approximately 20% of relative embryonic development (embryonic stages HH22 in chicken, F12 in alligator). Following this bottleneck, alligators exhibit rapid expansion of the optic lobes and transiently parallel avian developmental trajectories before elongation of the forebrain toward the adult crocodilian condition. These patterns indicate substantial morphological flexibility during early brain development while also supporting the presence of a conserved archosaurian phylotypic stage. By capturing the embryonic origins of archosaur brain divergence, our findings provide new insight into the developmental foundations of archosaur sensory evolution and highlight the importance of including developmental data in approaching deep-time evolutionary questions.

Funding Sources: Yale Institute for Biospheric Studies Early Grant; B.-A.S.B. CAREER (NSF DEB-2046868); Phillips Foundation

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Abundant and diverse three-dimensional lizard skin impressions from a volcanic ash horizon in the Eocene Green River Formation of Lake Uintah, Utah, USA

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Skin impressions and carbonized bodies of lepidosaurs have long been known from the lacustrine Eocene-age Green River Formation, but they are rare and isolated. Here, we report on multiple tuff horizons in the Parachute Creek Member of the Green River Formation in the Uintah Basin of Utah that contain molds of lizards preserved in varying bas-reliefs up to 10 mm, preserving three-dimensional scale detail. Specimens range from a small, nearly complete 70 mm individual sans tail (BYU 53562) to individuals

with 120-mm-long arms. Most specimens consist of portions of carcasses, including limbs, tails, and even a head. As is typical of lizards from Lake Uintah, bones are not preserved.

The external molds are preserved on top of tuffs bounded above and below by organic-rich marlstone (oil shale). The tufts are fine- to very fine-grained, well-indurated volcanic ashes consisting mainly of sideromelane glass with phenocrysts of biotite and sparse Fe-Ti oxides. Minor alteration is evident, but ~2% of the deposit consists of relatively large, unaltered glass shards.

Because most lizards shed skin in small flakes that preserve little scale relief, most of these fossils are interpreted as body impressions rather than shed skins; the frequent preservation of three-dimensional claws supports this interpretation. These impressions represent multiple species from diverse squamate groups. BYU 53562 exhibits a short head, a short, distinct neck, proportionally long limbs, and small, non-overlapping granular scales along the dorsum, consistent with a pleurodont iguanian, likely an iguanid or dactyloid. BYU 53560 and many of the tail impressions are consistent with Teiidae or Gymnophthalmidae, exhibiting small granular scales on the dorsal surface of the upper hind limb, larger rectangular scales ventrally, and tails bearing longitudinal rows of rectangular spinose scales. Larger body and tail impressions may represent Varanidae, characterized by small, non-overlapping polygonal dorsal scales and enlarged rectangular ventral scales. Hindfoot impressions show enlarged lamellae on the ventral surfaces of the toes, a feature shared by iguanids and teiids.

This assemblage offers a unique opportunity to assess squamate diversity in the western interior of North America during the Eocene Climatic Optimum and to evaluate the taphonomic impact of volcanic ash falls.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Investigating the Presence of *Haringtonhippus francisci* in the American Falls Formation of the Snake River Plain, Idaho, USA

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The phylogenetic relationships and distribution of Pleistocene North American stilt-legged horses have been the subject of paleontological debate. Ancient DNA analyses allowed for this group to be placed in a monophyletic clade that diverged from *Equus* in the Pliocene, with specimens assigned to *Hargintonhippus francisci*. Since its discovery, *H. francisci* has been found across the interior of western North America, from the Yukon, Canada, to Chiapas, México. All localities where *H. francisci* has been found have also contained *Equus*. Currently, this genus has not been recognized in Idaho, despite the abundance of Plio–Pleistocene horse fossils and the fact that *H. francisci* is well represented at nearby Natural Trap Cave, Wyoming (NTC). Due to its cryptic morphology and history of being synonymized with *Equus*, it is likely that unidentified *H. francisci* specimens exist in Idaho museum collections.

This study aims to refine the knowledge of the range of *H. francisci* and *Equus*. Here, we use linear morphometric methods to quantify subtle differences in equid metacarpal and metatarsal shape (N = 65) at the Idaho Museum of Natural History (IMNH). Principal component analysis and linear discriminant analysis were performed, incorporating a priori data from published records.

All measured IMNH specimens are grouped in *Equus* morphospace. None of the metapodials can be confidently assigned to *H. francisci*. Of the thousands of horse specimens from NTC, ~17 individuals have been IDed to either *H. francisci* or *Equus* based on molecular data, at a ratio of 3.5 to 1.0. Though more work remains at both American Falls and NTC, given this ratio, the apparent absence of *H. francisci* from Idaho is striking. The next phase of this research will use cheek teeth to test the hypothesis that *H. francisci* is indeed missing from American Falls with the benefit of a larger sample size (est. N = 171).

The morphological similarity of these clades reflects the similar evolutionary pressures acting

on these populations. If Idaho has evidence for only *Equus*, this would make it a unique region in western North America where *H. francisci* is not sympatric with *Equus*. Notably, significant topography lies to the east of American Falls and may have prevented *H. francisci* from moving into Idaho. This difference in distribution points to how two morphologically similar populations still respond to their environment in different ways.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Description and phylogenetic analysis of a well-preserved Miocene camelid from western Colorado

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The early Miocene marked an important period in the evolution of the Camelidae, when the family is thought to have split into the two modern groups—the Camelini, which includes all camelids more closely related to modern *Camelus* than to modern *Lama*, and the Lamini, which includes llamas, alpacas, vicuñas and their extinct relatives. However, relatively complete fossil camelids from this interval are rare. UCM 27325, found in 1964 near Vail, Colorado, includes the skull, jaws, and several skeletal elements of an early Miocene camelid, one of only a few relatively complete camelids from Colorado. Other fossil mammals from the same locality, specifically the heteromyid rodent *Peridiomys* and the carnivore *Amphicyon*, suggest an age of late Hemingfordian or early Barstovian, approximately 17.5–14.8 Ma. UCM 27325 is identified as *"Aepycamelus" priscus* based on multiple dental characters as well as: presence of dorsally arched nasal bones, a large lacrimal vacuity bordered by four bones with a reduced lacrimal margin and elongate nasal margin, a small-pocketed maxillary fossa, and multiple mandibular characters. UCM 27325 represents a geographic range extension of *"Aepycamelus" priscus,* which was previously known only from the early Miocene Box Butte and Sheep Creek Formations of Nebraska. To evaluate the relationship between *"Aepycamelus" priscus* and other camelids we scored this species into a taxon-character matrix of others that included 29 taxa and 49 cranial and dental characters. In our phylogenetic analysis, *"Aepycamelus" priscus* did not form a clade with species of *Aepycamelus*, which is consistent with findings of a prior study. Importantly, our analysis finds *"Aepycamelus" priscus* to be in the Lamini, in contrast with a previous study, which placed *"Aepycamelus" priscus* outside of both the Lamini and Camelini. Additionally, our analysis suggests the genus *Aepycamelus* is polyphyletic. More broadly, our results suggest the split between the Camelini and Lamini predates the occurrence of *"Aepycamelus" priscus* and must have occurred in the earliest Miocene or even earlier. To understand the complexity of the split between the Camelini and Lamini, more research must be done examining fossils from the earliest Miocene.

Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

Assessing niche partitioning in Late Cretaceous eutyrannosaurs using geochemical diet proxies

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In recent years, there has been considerable interest in understanding niche partitioning in eutyrannosaurs, both ontogenetically and interspecifically. Here, we use a combination of geochemical diet proxies (Sr/Ca, Ba/Ca, $\delta^{44/42}$Ca) to test hypotheses of ontogenetic niche shifts in *Albertosaurus* from the Horseshoe Canyon Formation and niche partitioning between *Nanotyrannus* and *Tyrannosaurus* from the Hell Creek Formation.

We analyzed radial transects across annual growth zones preserved in osteohistological sections of limb bones using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), alongside point samples analyzed via multi-collector inductively coupled plasma mass

spectrometry (MC-ICP-MS), permitting comparison both between individuals and through ontogeny. Given that the use of bone increases the risk of diagenetic overprinting, we performed a suite of tests to assess for alteration, including examinations of Ca/P ratios and rare-earth element (REE) compositions. The majority of our samples are only moderately altered, broadly consistent with comparative enamel samples. Where identified, more altered regions were removed from subsequent analyses. Younger growth stages of *Albertosaurus* consistently exhibit higher Sr/Ca and Ba/Ca ratios than more mature individuals. In *Tyrannosaurus* and *Nanotyrannus*, we find noticeable differences in Sr/Ca and Ba/Ca, with *Tyrannosaurus* exhibiting higher values. We also observe shifts through the bone cortex (i.e., across ontogenetic age) in *Tyrannosaurus* in $\delta^{44/42}Ca$, similar to the pattern in *Albertosaurus*.

These results indicate ontogenetic niche shifts in *Albertosaurus* and potential incorporation of high-trophic-level prey and/or increased osteophagy in larger individuals. In the Hell Creek Formation, results may initially appear paradoxical, as they suggest potentially higher trophic levels for *Nanotyrannus* vs. mature *Tyrannosaurus*. However, these results are consistent with mature *Tyrannosaurus* primarily consuming large herbivorous prey, and *Nanotyrannus* consuming a greater relative amount of smaller prey items of intermediate trophic level, including mammals and smaller theropods. This is supported by stomach-content data from similarly sized subadult *Gorgosaurus* containing remains of the caenagnathid *Citipes*. These data demonstrate clear shifts in diet ontogenetically in tyrannosaurs, in addition to providing initial insights into niche partitioning between *Tyrannosaurus* and *Nanotyrannus*.

Funding Sources: Auburn University is the main funding body for this project

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Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

Masticatory reconstructions using dental microwear overestimate occlusion in a living tribosphenic mammal: uniting evidence from XROMM and Occlusal Fingerprint Analysis

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Most existing work on masticatory function in fossil mammals has relied upon comparisons to the tooth morphology and occlusal wear of functionally analogous living mammals. Occlusal Fingerprint Analysis (OFA), a quantitative method for simulating occlusal movement from dental wear, has been used to estimate masticatory function associated with major evolutionary changes in the teeth of fossil mammals. OFA is a valuable and holistic in silico method for studying the evolution of mammalian chewing, but several assumptions underlie this approach—primary among them that dental wear corresponds to in vivo occlusion during feeding behavior. Given the complex and progressive nature of tooth wear through life, it is necessary to test this assumption using in vivo data. This is especially relevant to reconstructions of fossil taxa that lack extant morphological analogs or are represented by isolated teeth. Here, we present the first quantitative, empirical validation of OFA chewing simulations using comparison to X-ray Reconstruction of Moving Morphology (XROMM) workflows of feeding in *Didelphis virginiana* (five wild-caught adults). For each specimen, our XROMM workflow sampled an average of 18 feeding events (~3 chews each) across each hemimandible with two food types (cheese cubes, whole almonds), totaling 186 feeding events and >350 individual chew cycles. Postmortem micro-computed tomography scans were used to generate 3D surface models of *Didelphis* mandibles and crania. Rigid body transformation matrices were calculated from XROMM reconstructions and exported to OFA for simulation. We then inferred "idealized" occlusal pathways from the dental wear facets of the same *Didelphis* individuals for comparison to the

XROMM reconstructions. OFA simulations of XROMM reconstructions featured much lower overall occlusion (23% less surface area for almonds, 62% for cheese) than the idealized occlusal pathways during Phase I of chewing. Contrary to expectations, average occlusion during in vivo feeding sequences decreased with subsequent chews, such that little to no occlusion was ever recorded during the final chew. Most notably, grinding occlusion characteristic of Phase II chewing was almost never captured in vivo, likely due to the presence of a food bolus. Ongoing comparisons with in vivo data will continue to clarify how informative OFA simulations are for reconstructing dental occlusion and chewing trajectories in fossil mammals.

Funding Sources: National Science Foundation Graduate Research Fellowship Program, National Science Foundation Major Research Instrumentation Grants (grant nos MRI 1338036 and 1626552)

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Seeing bone in a new light: utilizing new methods to better understand the growth of *Einiosaurus procurvicornis*

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Einiosaurus procurvicornis is a centrosaurine ceratopsian dinosaur known from the Upper Cretaceous of North America. The species is known from one monospecific bonebed in the Two Medicine Formation of northwestern Montana, and *Einiosaurus* material is very scarce. Despite the paucity of material, paleohistological studies have been conducted previously on bones from *Einiosaurus procurvicornis*. These studies have mapped the lines of arrested growth (LAGs) on thin sections from multiple *Einiosaurus tibiae*, which show the age and skeletal maturity of each individual. Paleohistological studies have been used by paleontologists for decades to learn more information about dinosaurs, including growth rates, skeletal maturity, and metabolism. However, new methods call for a reevaluation of prior analysis. Dinosaur bone tissue is usually observed under a microscope in plane polarized light (PPL) or cross-polarized light (XPL). However, a new study has utilized circular polarized light (CPL) to identify additional LAGs in previously examined dinosaur bones. We employ this new CPL method to reexamine the tibiae of *Einiosaurus procurvicornis*, identifying more LAGs and lending further credit to this new method.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Late Pleistocene fishes from the Southern Black Hills, South Dakota, including a unique sinkhole taphonomic environment

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Fish are a ubiquitous and critical component of aquatic systems, both in the present day and in the geological past. However, their Pleistocene record is poorly documented relative to other vertebrate taxa, especially in the upper Great Plains of North America. This study examines previously undescribed late Pleistocene freshwater fish fossils from localities in the Black Hills of southwestern South Dakota. Three sites were recently examined for their micro-vertebrate remains: 1) the Fall River Site (open-air fluvial locality), 2) Parker's Pit (natural trap cave locality), and 3) the Mammoth Site (large sinkhole with a pond containing more than 50 mammoth skeletons). Paleoenvironmental and taphonomic conditions varied among the sites, resulting in heterogeneous specimen quantity and preservation quality. Of particular interest is the Mammoth Site, which shows an unusual dichotomy in preservation. Both articulated (two *Catostomus* sp. individuals) and completely disarticulated (~60 isolated ostariophysan bones) fish fossils occur within a relatively confined area. The hot spring-fed sinkhole demonstrates unique taphonomic conditions that allowed pristine preservation of articulated skeletons in a high-temperature environment. We suggest that microbial mats that

entombed the catostomids were responsible for their completeness, and provide an updated, colder estimate for water temperature in the sinkhole that would have supported a long-term fish population based on modern temperature tolerances of *Catostomus*. Disarticulated bone fragments from all three sites represent the families Catostomidae (suckers), Leuciscidae (minnows), and Ictaluridae (catfish). The presence of these generalist fish taxa and the apparent lack of specialized species likely reflect the diverse and unstable nature of the late Pleistocene glacial climate in the Black Hills.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Metamynodon (Mammalia, Perissodactyla) from the Oligocene of Alabama, USA, marks the easternmost record of Amynodontidae in North America

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An upper left second molar (M2) of *Metamynodon* sp. (MSC 56758) recovered from site AEs-5 in Escambia County, Alabama, USA, marks the easternmost occurrence of any amynodontid in North America to date, and the first record of *Metamynodon* from Alabama. MSC 56758 is likely derived from the Rupelian-age Glendon Limestone, which has been correlated elsewhere in Alabama to fall within Calcareous Nannoplankton Zone NP22 (33–32 Ma), coinciding with the Orellan North American Land Mammal Age and the known temporal range of *M. planifrons*. µCT-scanning and comparisons with other rhinocerotoid material clarify variation in *Metamynodon* occlusal morphology, where features including a crista and bifurcated crochet on M2 are suggested to distinguish *Metamynodon* from other members of the tribe, potentially the family. Additionally, enamel hypoplasia identified on MSC 56758 provides preliminary insights into regional paleoenvironmental conditions and into *Metamynodon* paleoecology. Our results expand the known geographic range of *Metamynodon* and add to the scarce record of the genus outside the type locality in South Dakota.

Funding Sources: Center for Excellence in Paleontology, Johnson City, TN, 37614

Technical Session VI: Dinosauria II: a “bird-hipped” bonanza (Thursday, November 12, 2026, 8:00 AM)

The *Ceratops* problem and the chasmosaur solution: from Ceratopsoidea and “ceratopsians” to Chasmosauroidea and chasmosaurs

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The name Ceratopsidae Marsh, 1888, has long been used for the derived lineage of horned coronosaurian euceratopsians, including centrosaurines and chasmosaurines. However, this traditional usage preserves a persistent nomenclatural and semantic problem: Ceratopsidae is based on *Ceratops*, whose type species, *Ceratops montanus*, is fragmentary and widely regarded as a nomen dubium of uncertain phylogenetic placement (incertae sedis), while the biologically operative radiation historically associated with “horned dinosaurs” is more consistently represented by taxa such as *Zuniceratops christopheri*, *Chasmosaurus belli*, *Centrosaurus apertus*, and *Triceratops horridus*. As a result, the meanings and designations of Ceratopsia Marsh, 1890, “ceratopsians”; “ceratopsoids”; “ceratopsids”; and the traditional concept of “horned dinosaurs” have often become conflated in both technical and informal usage.

The historical development and usage of the synonymous, overlapping, and related higher-level names applied to these dinosaurs are reviewed, including Ceratopsoidea Marsh, 1888 *sensu* Hay, 1902; Ceratopsidae Marsh, 1888; Agathaumidae Cope, 1889; Torosauridae Nopcsa, 1915; Ceratopsinae Marsh, 1888 *sensu* Abel, 1919; and Chasmosaurinae and Centrosaurinae Lambe,

1915 *sensu* Lehman, 1990. Particular attention is given to the Principle of Coordination (ICZN Article 36) and the implications of coordinated family-group names. Under this framework, Chasmosauroidea and Chasmosauridae, coordinated from Chasmosaurinae, represent historically available family-group names rather than newly proposed names.

The stability, historical continuity, and morphological applicability of these ranks are evaluated, with an emphasis on distinguishing the broad Ceratopsia from derived, horned coronosaurian euceratopsians. Morphological discussion is focused on plesiomorphic and derived characters relevant to clade recognition. We argue that a *Chasmosaurus*-based framework centered on Chasmosauroidea and Chasmosauridae, and anchored to *Chasmosaurus belli* Lambe, 1902, as transferred to *Chasmosaurus* by Lambe in 1914, more clearly aligns family-group nomenclature with the clade that is historically, etymologically, and biologically associated with "horned dinosaurs," while also preserving Ceratopsia Marsh, 1890. This framework provides a more precise vocabulary for the study of true horned dinosaurs.

Technical Session VI: Dinosauria II: a "bird-hipped" bonanza (Thursday, November 12, 2026, 8:00 AM)

Integumentary cellular anatomy in Dakota the *Edmontosaurus* mummy

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The Hell Creek Formation sports several remarkably well-preserved dinosaur specimens known as "dinosaur mummies." These specimens often preserve both an articulated skeleton and an extensive covering of fossilized integument. The hadrosaur *Edmontosaurus* is one of the most common dinosaurs preserved as "mummies," but little research has been conducted on cellular level preservation within the fossilized integument. Here, we describe cellular details in the remarkably well-preserved fossil skin from the *Edmontosaurus* mummy, Dakota (NDGS 2000). The integument is preserved in three different states: sediment mold, iron carbonate, and iron oxide. The iron carbonate skin appears as a light brown mold with no distinguishing features. However, some iron carbonate scales show flakey layered sheets in cross section, indicative of a stratum corneum. Iron oxide scales under cross section possess three differentiated layers of varying darkness. The thickness of the differentiated layers matches the layer thickness expected from typical epidermal anatomy, with a distinct "stratum corneum," "stratum spinosum," and "stratum basale." Scanning electron microscopy (SEM) of the iron carbonate skin revealed a carbon layer at the base of a dorsal feature scale, containing a cluster of small, ~1 µm microbodies similar in morphology to melanosomes. The differentiated layers of the iron oxide skin vary in texture under SEM: the "stratum corneum" and "stratum basale" are smooth whereas the "stratum spinosum" is rough with large pits. One area within the "stratum spinosum" under elemental mapping featured a collection of microbodies concentrated in carbon and also calcium phosphate, a common mineral associated with cellular preserved fossil integument. The hadrosauroid *Haolong* also preserves cellular detail of the epidermis as calcium phosphate. Unlike *Haolong*, individual keratinocytes with nuclei are not visible under plain light microscopy in Dakota. It is possible this is due to an abundance of iron coating the specimen, obscuring these details. The cellular preservation reported here in Dakota marks a significant advancement in our understanding of "dino mummies" from the Hell Creek Formation.

Funding Sources: NDGS Paleo Travel Grant

Technical Session XIX: Carnivora (Saturday, November 14, 2026, 1:45 PM)

Ecomorphology of Oligocene and early Miocene North American carnivores based on geometric morphometrics of the elbow and ankle joint

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The Oligocene–Miocene transition in North America was marked by a cooling and drying climate coinciding with an increase in grasses, as well as changes in herbivorous taxa (e.g., diversification and radiation of ungulates) and a turnover in large carnivores (i.e., the extinction of the Nimravidae and large hyaenodonts followed by the immigration of new amphicyonid taxa into North America). This study used geometric morphometric analysis of the elbow joint and calcaneum to determine if there were any differences in the locomotor ecomorphology of Oligocene carnivores and the carnivorous taxa that replaced them in the early Miocene. Geometric morphometric analysis was conducted using Canonical Variate Analysis (CVA) in R software on digitized landmark coordinates of the distal humeral epiphysis (elbow joint) and calcaneum (ankle joint), which have been correlated with locomotor and predation mode in modern carnivores (e.g., "ambush" vs. "pursuit," cursorial vs. non-cursorial). Fossil specimen shape data were compared to data from modern carnivores with known locomotor modes to infer the locomotor mode of extinct taxa. Oligocene and early Miocene taxa were found to have few similarities to modern cursorial (i.e., running-specialized) carnivores in terms of calcaneum shape, and only the Hyaenodontidae and early Miocene Canidae were grouped near modern pursuit or pounce predators based on elbow joint morphology. The results of this study indicate that early Miocene carnivores did not possess more cursorial morphologies than Oligocene carnivores, and that the locomotor and predation modes of Oligocene and early Miocene carnivores may not be fully represented in modern carnivores.

Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

The kinetics and kinematics of underwater walking

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Underwater walking is one of the most ancient forms of animal locomotion, and remains prevalent in modern taxa. In addition to serving as a crucial predecessor to terrestrial walking and the movement of life onto land, underwater walking is widely used in both purely aquatic and amphibious taxa as an alternative to nektonic swimming. The forces involved in underwater walking differ from both swimming and walking, combining both aquatic forces (buoyancy, hydrodynamic drag) and terrestrial forces (substrate reaction forces). However, the magnitudes, orientations, and directions of these forces are poorly understood, as are the downstream consequences for crucial aspects of locomotion such as energetics. This talk will review recent and ongoing work directly measuring the substrate reaction forces and kinematics of two underwater walkers, the axolotl (*Ambystoma mexicanum*) and spot prawn (*Pandalus platyceros*). Buoyant force supports 97% and 93% of the body weight, respectively, resulting in lower vertical substrate reaction forces, while hydrodynamic drag resulted in higher fore-aft forces with a pronounced bias towards propulsive force; this combination in turn resulted in a more anteriorly directed substrate reaction force than seen in terrestrial walking. While terrestrial walkers use an inverted pendulum mechanism to conserve energy, displaying synchronous, antiphase potential and kinetic energy fluctuations as energy is transferred between the two types, no such synchrony nor conservation was observed during underwater walking in either species. Preliminary results from single-foot forces in axolotls suggest substantial differences in joint torque and work compared to terrestrial loading, with most work being done by the hip and shoulder joints. These results have significant implications for the evolution of terrestrial locomotion. The force patterns are similar to those seen in extant belly-dragging tetrapods, suggesting that dynamic similarity to underwater walking may have facilitated the transition. However, the lack of inverted pendulum mechanics suggest that this mechanism evolved independently in both arthropods and tetrapods. Future work is discussed, including scaling effects, increased

taxon sampling, robotic models, and the effects of granular media.

Funding Sources: Funded by NSF BIO IOS 1929900 to HCA

Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

How good is the radiocarbon record of extinct North American megafauna?

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The loss of megafauna, or species weighing over 45 kg has been documented world over during the last 100,000 years. This extinction severely reduced the diversity of large mammals across many continents such as Australia and the Americas. North America lost 53 species of mammals, the majority of them megafauna, representing a loss of ~74%. Understanding the pattern, process, and causes of this extinction has been an area of intense research and debate for more than 50 years. Extinction is a spatio-temporal phenomenon where species decline in abundance across a landscape, resulting in range contraction until the species eventually goes extinct. In order to study this process, a well-resolved, directly dated chronology of the range contraction and extinction is necessary. However, previous work has shown that the number and distribution of radiocarbon dates available for extinct species is highly biased by geography, with directly dated specimens for some species coming from one or a handful of sites in a subset of their range. In this study, we aim to investigate the pervasiveness of this problem and answer the question of whether the radiocarbon record of extinct megafauna is spatially comprehensive so as to provide an accurate picture of the timing and pattern of extinction.

We assembled the most comprehensive compilation of late Quaternary extant and extinct mammal species dated using ^{14}C techniques from North America, resulting in a dataset of more than 4,400 dated specimens. Using this dataset, we show that of the 53 recorded extinct species, only 32 of them were directly dated, and 16 of these 32 species had fewer than 10 directly dated fossils. The distribution of directly dated specimens was also not uniform across the sampled range of these species as represented in the FAUNMAP II database. For example, *Smilodon fatalis* is known from Florida to California, but the 398 directly dated specimens came from 4 localities in southern California. Large parts of the continent such as the Southeast have produced few to no direct dates for megafauna severely biasing our understanding of this extinction on a seemingly well-studied continent. Lastly, we offer recommendation for future targeted sampling and research to close the gaps in the radiocarbon record of extinct North American megafauna.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A possible new plethodid bony fish (Actinopterygii: Tselfatiiformes) from the Upper Cretaceous Eagle Ford Shale of Texas, USA

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Tselfatiiformes is an extinct order of actinopterygian fish that are found in Albian–Maastrichtian marine deposits. The order belongs to the primitive group of Clupeocephala and comprises three families (Protobramidae, Eoplethodidae, and Plethodidae), which are characterized by elongated dorsal and anal fins, pectoral fins positioned relatively high on the body, and a deeply forked caudal tail. Here, we report our ongoing examination of a nearly complete anterior portion of a tselfatiiform from the lower Turonian portion of the Upper Cretaceous Eagle Ford Shale in Texas, USA, that has been cataloged as PMNS 2023-01-01 in the

paleontology collection of the Perot Museum of Nature and Science in Dallas, Texas. This specimen is laterally compressed but otherwise is preserved three-dimensionally and exhibits dorsally positioned pectoral fins, indicative of its tselfatiiform affinity. PMNS 2023-01-01 also possesses a robust pair of fused left and right premaxillae forming a rostrum, that suggests an affinity to a clade of plethodids containing genera with a massive rostrum, such as *Martinichthys*, *Thryptodus*, and *Plethodus*. However, the rostrum of PMNS 2023-01-01 is not as anteroposteriorly elongate as that of any previously described "snouted" plethodids made up of fused premaxillae, alluding to the possibility that PMNS 2023-01-01 may belong to a new taxon within Plethodidae. A detailed morphological analysis using micro-computer tomography scanning technology is currently underway to collect more osteological data to assess its systematic position, but its anteroposteriorly short rostrum suggests that it may be a basal-most member of a plethodid clade with fused premaxillae. If indeed PMNS 2023-01-01 is a new taxon, not only will it increase the taxonomic diversity of Plethodidae and Tslefatiiformes, but it will also add a new taxonomic component to the vertebrate fauna at the southern end of the Western Interior Seaway of North America during the early Turonian.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

The first occurrence of *Rivavipes* from the Chickaloon Formation: evidence for a large ground bird in Eocene Alaska

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Large ground-dwelling Eocene birds are known from a wide distribution of locations in the Northern Hemisphere. Specifically, material attributed to the genus *Gastornis* and other gastornithids range across Eurasia and North America, including the Canadian Arctic. However, a lack of either body or trace fossil evidence for this clade from high paleolatitudes in northwestern North America leaves an incomplete picture of their distribution in the Northern Hemisphere. Here we report a large (30.35 cm maximum length) tridactyl pes trace preserved as a natural cast from the Chickaloon Formation of southcentral Alaska. Photogrammetric data of the track were compared to similar penecontemporaneous large tridactyl tracks from the Paleocene–Eocene Chuckanut Formation in Washington state, USA, that have been assigned to the ichnotaxon *Rivavipes giganteus*. Overall morphology and dimensional data from the Chickaloon Formation track closely match that of *R. giganteus*, thereby establishing the first occurrence of this ichnotaxon in Alaska. Possible *Rivavipes* tracks have also recently been found in the Eocene to Miocene Kootznahoo Formation of southeastern Alaska. Collectively, these data suggest the presence of large gastornithid-like birds at high paleolatitudes (~60° N) in northwestern North America. Given the near absence of body fossils from this interval in Alaska, this new data expands our limited understanding of Eocene vertebrates from this region, which also includes an incompletely known assemblage of mammalian tracks.

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Revealing the developmental and evolutionary trajectories that may govern theropod beak growth and shape

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The evolution of diverse forms is influenced by the developmental processes that generate them during growth. Despite numerous studies finding that the evolution of theropod beak shape is linked to ecological functions and underlying developmental processes, these developmental processes have not yet been described. Here, I postulate that the power cascade is a mathematical model that describes the morphogenesis and evolutionary diversity of theropod beaks across growth stages and taxonomic groups. To test this, I compared the ontogenetic changes in beak shape among phylogenetically and morphologically diverse living bird taxa (Anatidae, Estrildidae, Palaeognathae,

Phasianidae, and Thraupidae, and Threskiornithidae) across embryonic, juvenile, subadult and adult stages. Bird species with power cascade beaks in adulthood (including the Australian zebra finch *Taeniopygia castanotis*; medium ground finch *Geospiza fortis*; red junglefowl *Gallus gallus*; and southern cassowary *Casuarius casuarius*) exhibited a consistent pattern of growth ($R^2 > 0.97$, $p < 0.001$). To determine the extent to which theropod beaks follow this rule of growth, I explored if all known instances of theropod beak evolution follow the power cascade model. I measured the adult rostrum (beak or snout) shape of 127 theropod species across 120 families of extant birds and extinct non-avian theropods and found that 95% of them followed the power cascade model ($R^2 > 0.90$). All extinct non-avian theropod species had rostrum shapes that significantly followed the power cascade model of growth ($0.927 < R^2 < 0.999$; $n = 21$). Given my findings on extant birds, I hypothesized that extinct theropod species with adult power cascade rostra may follow a power cascade growth trajectory. I therefore used the power cascade to predict the shape changes the rostra of extinct theropod taxa may have undergone during growth. These theoretical predictions were then tested against the ontogenetic fossil record of theropod taxa (*Confuciusornis, Archaeopteryx, Citipati*). The power cascade provides a new framework for studying the theropod beak fossil record and can reveal possible developmental trajectories in extinct species and sources of evolutionary diversification.

Funding Sources: Australia Government RTP Scholarship, Monash Graduate Excellence Scholarship, Robert Blackwood Partnership PhD Top-Up Scholarship and the ARC DP230100613

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Shark AI: Exploring fossil shark tooth classification through artificial intelligence—Insights from experiential learning in middle school classrooms

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Developed by the University of Florida Thompson Earth Systems Institute, College of Education, College of Engineering, and St. Mary's College of Maryland, the Shark AI Project integrates vertebrate paleontology and artificial intelligence to engage middle school students in authentic scientific inquiry using fossil shark teeth. The Shark AI curriculum includes five interdisciplinary modules focused on fossil shark tooth classification, data collection, and training and evaluating machine learning models using Google Teachable Machine. This study examines two questions: 1) how implementation impacts teacher confidence integrating AI, and 2) how participation influences student engagement and understanding of AI in scientific contexts. Grounded in experiential learning, educators participated in a week-long professional learning experience at the Florida Museum of Natural History building content knowledge, technological fluency, and confidence in integrating AI into middle school science classrooms. Participants engaged in hands-on investigations with fossil shark teeth, explored museum collections, interacted with scientists, and received critical training in AI concepts. Students used qualitative and quantitative observations from fossil specimens to practice classification and constructed image datasets to train computer vision models to classify unseen fossil shark teeth. Through evaluating model accuracy, bias, and data quality, students explored paleontological practices and core machine learning concepts while addressing misconceptions and deepening understanding of AI in scientific applications. Normalized gains were calculated from pre- and post-assessment means of Modules 1–4, which are 64.9%, 56.6%, 48.9%, and 45.5%. Student-generated final projects, reflections, and survey data indicated high levels of engagement and increased interest in science and AI-related applications. As teacher leader for the third teacher cohort, a total of 30 educators across Florida were mentored through modeling, resource sharing, troubleshooting, and ongoing support to adapt the curriculum across diverse classrooms while

fostering a collaborative community of practice. Findings highlight the value of experiential learning for improving teacher confidence and student outcomes, demonstrating a scalable model for STEM instruction bridging paleontology, AI, and inquiry-based learning.

Funding Sources: The Shark AI project is supported by the National Science Foundation under award DRL-2147625

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Newly described pan-chelonioid turtle specimens from the Late Cretaceous of Alabama, USA, and a reassessment of the *Toxochelys moorevillensis* holotype

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The North American fossil record of marine adapted cryptodiran turtles includes many taxa thought to represent some of the earliest total group chelonioids (Pan-Chelonioidea) but efforts to resolve their systematic placement are often hindered by incomplete holotypes, dubious specimen referrals, and a lack of formally described specimens. This pattern is exemplified by *Toxochelys*, a genus of near-shore marine adapted turtle. The most studied member of the genus, *Toxochelys lairemis*, has been recovered from Cenomanian–Campanian formations throughout central North America and is widely considered the be the earliest definitive stem chelonioid. The other historically recognized species of *Toxochelys*, *T. moorevillensis*, is known almost exclusively from the Santonian–Campanian of Alabama, USA. Although numerous nearly complete specimens of *T. moorevillensis* have been recovered, only a limited number of these specimens have ever been formally described, none of which possess associated cranial material. Previous attempts to describe the cranial features of *T. moorevillensis* were reliant upon isolated skulls referred to *T. moorevillensis* based on their relative proximity to sites which previously produced *T. moorevillensis* shells combined with the apparent similarity of these skulls to those of *Toxochelys latiremis*. With the exclusion of these referred skulls, the only established features that could be used to differentiate the two species of *Toxochelys* are characteristics of the carapace and plastron which are known to be ontogenetically variable in fossil and modern chelonioids such as the size of the fontanelles. The low number of described *Toxochelys* specimens possessing associated cranial and postcranial elements combined with the resulting lack of diagnostic characteristics for *Toxochelys* spp. has resulted in numerous phylogenetic studies combining features of both species into a chimeric operational taxonomic unit. Here, we describe several specimens of *Toxochelys moorevilensis* with associated cranial and postcranial material including the first reported juvenile for this species. These specimens, along with a reexamination of the type material for *Toxochelys moorevillensis*, collectively provide new insights into the anatomy and systematic position of this species.

Funding Sources: This work was supported by a Catherine D. Ireland Travel Grant, the University of Alabama at Birmingham, and the Alabama Geological Society

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Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

Complex vertebral structures among Cenozoic European snakes—a fascinating story of convergent evolution and homoplasy

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Certain snake taxa from across the Cenozoic of Europe, spanning from the early Eocene up to recent times, possess rather complex vertebral morphologies (usually confined in their caudal vertebral region), which consist of additional articulations and apophyses, and deviate radically from the "standard" morphologies observed in other taxa. These are the early Eocene "*Calamagras*" *gallicus*, the early–middle Eocene *Rageryx*, the middle–late Eocene *Cadurceryx*, the

Oligo–Miocene *Bransateryx*, the Miocene *Albaneryx*, and the Miocene–Quaternary *Eryx*. All of them have been traditionally considered as belonging to "erycines," a taxonomic concept that supposedly united the extant Old World Sand Boas (genus *Eryx*) and New World Rubber Boas (genus *Charina*) and Rosy Boas (genus *Lichanura*), all sharing, among other features, the presence of highly complex structures in their caudal vertebrae. However, most recent phylogenetic analyses, aided mainly by molecular data, have strongly challenged this topology, casting doubt on the very monophyly of this grouping: *Charina* and *Lichanura* comprise the family Charinaidae (being the sister group of Ungaliophiidae), while *Eryx* is much distantly related, forming the monotypic Erycidae. This complex topology leaves major questions on the affinities of the fossil European forms, as it is not clear whether some of these represent charinaids or erycids (or something else). *Rageryx* has been suggested to have affinities with charinaids, while various affinities have been proposed for *Albaneryx* and *Bransateryx*. The most peculiar of these extinct taxa, *Cadurceryx*, was recently revised and it was demonstrated that this form possessed complex vertebral structures not only in the tail region (as in erycids and charinaids), but throughout the entire vertebral column! Moreover, *Cadurceryx* was tentatively assigned to Tropidophiidae, thus aptly implying that the evolution of complex structures in vertebrae has also convergently evolved in European snakes outside Booidea. Accordingly, taxonomic identifications of isolated vertebrae with complex structures should be handled with caution, and even assignment to Erycidae or Charinaidae should not be taken for granted.

Funding Sources: Research project no. 2023/49/B/ST10/02631 financed by the National Science Center of Poland (Narodowe Centrum Nauki)

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A new and important reptile fauna assemblage from the Severn Formation in southern Prince George's County, Maryland, USA

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The Cretaceous Severn Formation of Prince George's County, Maryland, USA, is a Maastrichtian (77.2–66.0 Ma) geologic unit composed of transitional near shore to marine sediments preserving invertebrate and vertebrate taxa. Some of the most notable and abundant fossils from the Severn Formation are the wide variety of reptilian species found within the formation including mosasaurs, plesiosaurs, turtles, and crocodylomorphs such as *Deinosuchus schwimmeri.* These reptile fossils are often found as isolated remains or as occasional associated partial skeletons. Much of the published work regarding the vertebrate fauna of the Severn Formation is more than 20 years old and is in need of critical review. Recently, new material has been uncovered from established localities and a new submerged outcrop of the Severn Formation has been identified during construction and water management dredging projects within Piscataway Creek in southern Prince George's County. This review of new material recovered from the Severn Formation of Prince George's County includes a number of turtle shell segments, teeth of plesiosaurs, and the teeth, cranial fragments, and large postcranial elements from both crocodilians and mosasaurs. We compare this assemblage with other Mid-Atlantic Maastrichtian marine reptile faunas for a broader context of the biodiversity and paleoecology of the end-Cretaceous reptiles in this region. This report has only scratched the surface for the potential of new information the Severn Formation can provide on Mid-Atlantic Upper Cretaceous reptiles, and it has yielded a flood of new data worthy of further study.

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

New array of early cetacean remains from the Eocene of Peru offers insights into the disparity of basilosaurids across time and space

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Basilosaurid whales are extremely important animals to understand the early evolution of marine food webs during the Cenozoic. Being one of the most important mid- to high-tier predators during the Eocene, their morphological disparity is an exemplar metric to get an insight into the complexity of developing marine ecosystems during the aftermath of the end-Cretaceous mass extinction. Basilosaurid remains are already well-known from Egypt and southeastern United States. However, and despite a recent surge of interesting material from Peru, the true range of shapes and sizes that were obtained by these animals in the southeast Pacific has yet to be documented. Here we present the first morphological report of several new Peruvian basilosaurid skulls. We compiled the most relevant cranial metrics and visualize their distribution in morphospace using PCA. Additionally, we employ the same methodology on the published material from other basilosaurid-yielding localities and compare the assemblages for both the Bartonian and Priabonian. We notice that overall, the morphospace seems to be occupied throughout, but size and shape do not tend to plot in a normal distribution, being instead more akin to a bimodal arrangement. The spreads, however, change when specific faunas are compared, some being more saturated and others being more partitioned. Recognition of such patterns aids in the study of early Cenozoic oceanic megafauna niche partitioning and the composition of precursory marine cetacean-dominated communities.

Funding Sources: George Mason University

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

A spectacular new *Stegomastodon* skull and the origin of American brevirostrine gomphotheres

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The evolution of North American gomphotheres has been hindered by historical taxonomic inflation and subsequent compression into an unrealistically small number of species. Broadly, two kinds of taxa are recognized in the record, longirostrine forms that range from the Middle to Late Miocene and brevirostrine forms that range from the Late Miocene to the Early Pleistocene. The relationships between these brevirostrine groups and their origin within the longirostrines remain murky. Here, we describe a new, remarkably well-preserved skull of the brevirostrine gomphothere *Stegomastodon* and an assemblage of other remains from Holyoke, Colorado. Using a new phylogenetic framework, we place this specimen within the larger evolutionary tree of gomphotheres and test the hypothesis of a single origin for brevirostrine gomphotheres.

The skull, DMNS EPV 63867, belongs to a very large mature adult. The basicranial region and the right side of the skull are very weathered, but the left lateral side and the entire dorsal surface of the skull are complete and undistorted. DMNS EPV 63867 is much larger than other known *Stegomastodon* skulls, i.e., AMNH FM 10622 and UNSM 10707, but is otherwise morphologically similar. Body mass regressions using the breadth of the occipital condyle to estimate long bone dimensions suggest that in life, DMNS EPV 63867 may have weighed between 7 and 9 metric tons, comparable in mass to the largest African Savannah Elephants. The skull of *Stegomastodon* is strikingly different from those of other American brevirostrine gomphotheres such as *Rhynchotherium, Cuvieronius*, and *Notiomastodon* (Cuvieroniinae). DMNS EPV 63867 and other *Stegomastodon* crania have posteriorly inclined occipital surfaces and strongly ventrally stretched premaxillae with tusk alveoli that are parallel to distally divergent with no subnasal fossa.

Our new phylogeny recovers *Stegomastodon* nested among a different lineage of longirostrine gomphotheres than the *Cuvieronius-Notiomastodon* clade. *Stegomastodon* thus

represents a second independent acquisition of the brevirostrine mandible among gomphotheres in North America during the Late Miocene, allowing us to reject the hypothesis of a single origin for this group of late surviving gomphotheres.

Funding Sources: Richard Gilder Graduate School, Society of Systematic Biologists Graduate Research Award

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Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

Marine vertebrate faunal turnover within the Campanian Cliff House Sandstone at Tsaya Canyon, New Mexico, USA

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The Cliff House Sandstone preserves remnants of a Campanian nearshore marine environment that has undergone numerous transgressive-regressive cycles, evident by complex interbedding with lagoonal and terrestrial, coal-bearing horizons reminiscent of the underlying Menefee Formation. Tsaya Canyon, located in the San Juan Basin of northwestern New Mexico, exposes two units of the Cliff House Sandstone, separated by a Menefee-type tongue. Recent fieldwork has revealed rich vertebrate faunal assemblages from both Cliff House Sandstone units that were previously unexplored in detail. In both units, the most abundant vertebrates recovered include lamniform selachians *Scapanorhynchus* and *Carcharias*. Other co-occurring taxa include lamniforms *Archaeolamna*, *Squalicorax*, and basal *Serratolamna*, the batoid *Ischyrhiza*, hybodont *Meristodonoides*, amiid actinopterygians, russellosaurine mosasaurs, and indeterminate marine tetrapods from Plesiosauria and Testudines. The most striking difference between the upper and lower Cliff House Sandstone units is the stark lack of durophagous taxa typical of the former. In the lower unit, a diverse array of taxa exhibit crushing or grinding tooth morphologies, such as batoids *Pseudohypolophus* and *Protoplatyrhina*, elopomorphs *Albula* and *Paralbula*, and mosasaur *Globidens*. In the upper unit, no durophagous taxa have been recovered thus far. Additionally, typically offshore taxa such as the pachycormiform *Protosphyraena* have been recovered in conjunction with predominantly nearshore taxa such as lepisosteids, providing mixed signals regarding depositional environment; neither such taxa have been recovered from the lower unit. The aulopiform *Enchodus* is far more abundant in the lower unit than in the upper. Differences in faunal composition suggest a localized extinction of the durophagous niche between the upper and lower Cliff House Sandstone units, though taphonomic biases cannot be presently ruled out. Lower unit fossils were typically recovered from sandstone, either from talus or in situ, whereas upper unit fossils were primarily found loose in float within a relatively confined lens, with small material located in anthills. This loss of niche diversity between the upper and lower Cliff House Sandstone units may suggest localized extinctionary events of lower tropic level organisms within the Middle Campanian, though further investigation is warranted.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Uniting vertebrate paleontology, AI, and climate change: A productive avenue for multifaceted undergraduate training and mentorship

Caleb M. Gordon[1], Jonathan I. Bloch[1], Arthur Porto[1], Natasha S. Vitek[2], Paul E. Morse[3]
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Vertebrate paleontology is a well-known “gateway science”; artificial intelligence (AI) offers transferable skills in today’s job market, and climate change research remains vital for understanding how Earth’s ecosystems will respond to human activity over the next few centuries. When united, these three subjects form a powerful pathway to interdisciplinary scientific

training and career development for undergraduates. Here, we describe a new program for productive undergraduate involvement associated with a multi-disciplinary, decades-long paleontology project. This project leverages a vast fossil record from the Bighorn Basin, Wyoming, using deep-learning approaches to automate segmentation and extraction of morphometric data in order to study how mammalian communities responded to climate change across the Paleocene–Eocene Thermal Maximum (56 Ma). For this project, undergraduates have been recruited at University of Florida (UF) and Stonybrook University (SBU) utilizing the Florida Museum Undergraduate Internship Program (FMUIP), the Florida Museum of Natural History Volunteer Program, the UF and SBU Federal Work-Study programs, and undergraduate Honors Projects. Undergraduate volunteers and interns have received scientific and professional training in a range of foundational museum skills, many of which have applications to broader research and academic careers. These include participation in grant-funded paleontology fieldwork, specimen curation and other collections-based work, 3D printing, digital landmarking of Paleogene mammal fossils, and pilot implementation of AI pipelines. FMUIP interns additionally received training in scientific writing and conference-style presentation, as well as weekly mentorship meetings on career development. The FMUIP program seeks undergraduates who have had no prior scientific research experience, and exit interviews collected from FMUIP interns indicate that these first research experiences were valuable and, in some cases, even "formative" for their early careers, despite their diverse career aspirations. The FMUIP internship, and this ongoing project as a whole, thus provide a useful framework for hands-on research training and career development at the undergraduate level.

Funding Sources: NSF-EAR Award # 2422838, University of Colorado Anschutz Medical Campus School of Medicine, 2422839, Florida Museum of Natural History, 2422840, Stony Brook University

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Using phylogenetic Receiver Operating Characteristic (ROC) analysis to evaluate cryptic phenotype predictions in extinct vertebrates

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Receiver Operating Characteristic (ROC) analysis has a >80-year history as a common approach for comparing model performance in a variety of military, biomedical, and machine-learning contexts. However, despite its far-reaching applicability, it has been used sparsely in evolutionary biology and paleontology research, where the primary data are often phylogenetically structured, and the machine learning models of interest may vary in performance unpredictably across tree space. Here, we discuss how ROC analysis can be broadly and rigorously applied to investigate competing phylogenetic machine learning models and reconstruct cryptic phenotypes in fossil taxa. We then consider how the approach can be expanded to assess and compare model performances comprehensively across tree space, and present preliminary work on an R package that will facilitate the application of this method to diverse fossil datasets.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

First prehistoric record of penguins from the Falkland Islands

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The Falkland Islands (Islas Malvinas) currently host five breeding species of penguin—King, Gentoo, Magellanic, Macaroni, and Southern Rockhopper—and there are historic records of at

least seven additional species that occur there as vagrants, but to date, nothing has been documented regarding the prehistoric diversity of penguins on the islands. In the course of field research investigating the deep-time geologic history of the Falklands, we encountered a dense accumulation of several thousand isolated mainly bird bones, including abundant penguin elements which constitute ca. 85% of the assemblage. Other marine/aquatic birds (e.g., cormorants and geese), and much rarer pinniped bones and teeth, were also present. The bones were scattered over an area of approximately half a square kilometer just above a long stretch of open beach on Bleaker Island, which is situated along the southern edge of East Falkland. Most of the bones were lying loose on the sandy surface, with some weathering out of a slightly crusty layer of sand (we did not locate a distinct source horizon). Accounts from residents on the island indicate that the distribution of the bones, and the extent to which they are covered by sand, varies considerably over time based on fluctuating weather and ocean conditions. Accelerator Mass Spectrometry Carbon 14 dating indicates an age of 2,090 +/- 30 BP (Late Holocene) for the penguins, well before the earliest record of human habitation on the islands, making this the only reported prehistoric record of Falklands penguins. Based on size and morphology, there were at least two and possibly three penguin species present. Of particular note is that the largest of the subfossil penguins in the sample is intermediate in size between Gentoos (*Pygoscelis papua*) and Kings (*Aptenodytes forsteri*), raising the possibility of a previously unrecognized taxon, or a population of unusually large Gentoo-like penguins, inhabiting the Falklands 2,000 years ago.

Funding Sources: Shackleton Scholarship Fund

Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

Ultraviolet and species-specific morphological signals in cassowary casques: Testing visual display hypotheses in archosaurs

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Elaborate cranial ornaments are common among archosaurs, particularly avian and non-avian dinosaurs, suggesting they serve important biological roles. Despite this, the organization, development, and function of these structures are poorly understood in both extant and extinct taxa. To better interpret ornament form and function, quantitative anatomical description is necessary. Cassowaries provide an excellent extant analog: large flightless ratites with osseous, ornamental casques amenable to both in vivo analysis and direct comparison with fossilized cranial ornaments. Cassowary casques have been speculated to play a biological role in visual display, and all three extant species have casques with superficially different sizes and shapes. Yet, whether such differences are significant has not been measured. In addition, the relatively dull casque surface has abated the casque's role as a visual indicator. Due to their excellent color vision in the human-detectable range, cassowaries possess violet-sensitive cone photoreceptors with peak sensitivity at 356–395 nm, pointing to the potential value of both geometric and ultraviolet (UV)-inclusive analyses to address variation. Here, we analyze 157 adult specimens across the genus to compare (1) casque shape using 2D geometric morphometrics, and (2) keratin UV reflectance differences using lab-controlled, spectrophotometric analyses and biofluorescence under UV excitation. We find that average casque shape differs significantly between species in lateral and rostral views. Our analysis of how UV light interacts with intact casque surfaces shows that casque keratin reflects UV wavelengths detectable by cassowary photoreceptors (356; 385–395 nm). Separately, biofluorescent emission patterns under UV excitation are species-specific. Quantifiable differences in casque signals are consistent with the hypothesis of a visual role in

species recognition and reinforcement of species boundaries. However, ecological validation of species-specific casque discrimination under rainforest canopy spectral filtering remains unconfirmed. Field studies should assess UV reflectance of casque keratin to determine whether a biological function is plausible. We discuss how shape differences in casque architecture directly translate to paleontological specimens and consider the extent to which keratinous sheaths in extant taxa may provide signals beyond gross morphology—contextualizing interpretive limits when applied to fossils.

Funding Sources: New York Institute of Technology COM (TLG, AW), The Company of Biologists (TLG), Western Interior Paleontological Society (TLG), American Association for Anatomy (TLG)

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Inferring the dispersal patterns of early dinosaurs using occurrence-based models

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Dinosaurs attained a global distribution by the end of the Triassic Period, but recent work has suggested that during their origin and earliest diversification, dinosaurs were restricted to southern Pangea, with a northward dispersal occurring later—potentially coincident with the Carnian Pluvial Episode (CPE, ~230 Ma). This pattern has been quantitatively reconstructed using comparative phylogenetic methods, and although these are powerful means of modeling evolutionary patterns, some information from the fossil record is inevitably lost or simplified when placed into this comparative context. Occurrences of individuals too incomplete to be identified to the generic level are almost always excluded from phylogenies, and species known from multiple occurrences are typically represented by a single data point. Because most phylogenetic matrices are constructed to explore questions related to evolutionary relationships, with biogeographic modeling often applied downstream, species known from highly fragmentary remains are usually excluded even if they might be biogeographically informative; e.g., the North American theropod *Lepidus praecisio*, one of the earliest known dinosaurs from northern Pangea (late Carnian–early Norian), is preserved as an isolated tarsus and is usually excluded from phylogenetic analyses and subsequent biogeographic models. Here, we use a phylogeny-free model of biogeographic range evolution, the dispersal–extinction–sampling (DES) model implemented in PyRate. This model uses both distributional and temporal information to infer rates of dispersal and extinction while accounting for incomplete sampling of the fossil record. To this end, we assembled an exhaustive, apomorphy-based dataset of every dinosauriform body fossil occurrence for the entire Triassic (> 450 occurrences). We inferred the largest Triassic dinosaurian dispersal rates to be from southern to northern Pangea at roughly 230 Ma, roughly coincident with or immediately following the CPE. This provides additional, independent evidence that the CPE influenced dinosaurian biogeographic patterns. The DES model in PyRate permits the statistical comparison of dispersal rates with covariates, and we will next explore how Triassic dinosaurian dispersal patterns correlate with environmental variables (e.g., atmospheric carbon dioxide concentration, sea level) and with subclade (e.g., if theropods disperse more readily than sauropodomorphs).

Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

Collection and dissemination of digital morphology from the Mahajanga Basin Project (Late Cretaceous, Madagascar)

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The digital representation of paleobiological shape underpins many comparative and morphometric studies in vertebrate paleontology. Data collection, aggregation, and dissemination have been the focus of many publicly funded initiatives responsible for the proliferation of access to such data in the last two decades, the results of which have benefited the research community, educators in both K-12 and higher education, and the general public. We summarize the results of a multiyear effort by home institutions and the National Science Foundation Division of Biological Infrastructure (DBI) to support ongoing efforts to collect, organize, archive, and disseminate 2D (field, preparation, curation, and research photography) and 3D (CT, μCT, structured light scans, and derivative polygon models) digital morphological data from more than three decades of vertebrate fossil collection from the Mahajanga Basin. Total efforts to date have resulted in excess of 90% of collected and cataloged specimens captured in 2D (mostly as preparation and curation photographs), along with more than 10% of cataloged specimens represented in 3D, the vast majority of this being CT and μCT data. DBI-awarded funds allowed for additional 3D data capture of more than 100 specimens or elements, all previously unscanned and most of which are scientifically critical representations of morphology. We effectively doubled the number of both completed 3D digital morphology archive records for collected field numbers and 3D media items available on MorphoSource. Combined with previous efforts, there are now >750 completed 3D archival records representing thousands of vertebrate elements available. 3D data for the project now exceeds 1,000 media items on MorphoSource, the vast majority of which are available for research or public use, including CT or laser scanning data of 16 holotypes representing archosaurs, mammals, turtles, snakes, and frogs from the Upper Cretaceous Maevarano Formation of the Mahajanga Basin. Efforts have enhanced combined and collaborative scientific study of Cretaceous biodiversity across Gondwana by utilizing straightforward and accountable mechanisms of responsible 3D digital morphological transfers and exchanges. The work also represents an important and critical step in fulfilling obligations to return fossils to home institutions while maintaining the availability of data when specimens may be relatively less accessible as a result.

Funding Sources: NSF DBI_2242717; Ohio University Heritage College of Osteopathic Medicine; Denver Museum of Nature and Science; NSF EAR 1525915; NSF EAR_1123642

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A phylogenetic analysis of the recently described Odontocete *Enigmatocetus posidoni,* from the Middle Miocene of Maryland and Virginia, USA, with comments on a possible new species

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The enigmatic odontocete (toothed whale) *Enigmatocetus posidoni* was recently described from the Miocene Chesapeake Group of Maryland and Virginia on the basis of one partially complete skull and postcrania with ear bones (USNM PAL 244524) and a referred isolated ear bone (USNM PAL 534007). At the time of its description, *E. posidoni* was not assigned a taxonomic rank higher than Odontoceti. A third specimen (CMM-V-13179) consisting of a partial skull, ear bone, and post crania was discovered after the description of *E. posidoni*, with similar enigmatic traits to the latter. Phylogenetic analysis of both the holotype of *E. posidioni* (USNM PAL 244524) and the new specimen (CMM-V-13179) was used to determine the relationship between *E. posidoni* and the new specimen (CMM-V-13179), as well as their placements within Odontoceti. The phylogeny

found that both *E. posidoni* and the new specimen (CMM-V-13179) are each other's sister taxa, and that clade is united with Physeteroidea (albeit with less support). Observed morphological differences between the specimens, including the concavity of the squamosal, slight differences in the periotic, and a significant size difference, provide evidence that the new specimen is a separate species of *Enigmatocetus*. As well as considerable stratographic separation, with the type of *E. posidoni* being from bed 10 of the Calvert Fm. and CMM-V-13179 being from bed 13 of the Calvert Fm. representing an approximately 1 Mya age difference. Though intriguing, the proposed close relationship with sperm whales is worth considering, but should be further tested, ideally with more complete specimens in the future. This also extends the temporal range of *Enigmatocetus* further into the Middle Miocene.

Funding Sources: Clarissa and Lincoln Dryden Endowment for Paleontology at the Calvert Marine Museum, and the County Board

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Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

Reexamining the evolution of the mandibular angular and pseudangular processes in mammals

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Extant mammals exhibit complex chewing cycles controlled by masticatory muscles that insert on the mandible. The mandibular angular process on the posteroventral margin of the jaw is especially important for mastication because it serves as the insertion site for two major jaw muscles, the superficial masseter and medial pterygoid. Although the angular process varies considerably in morphology among species, it is present in most mammals and their close relatives, including therians (placental-eutherian and marsupial-metatherian lineages), some monotremes, and non-mammalian cynodonts. However, there is debate as to whether the angular process of therians is homologous to the angular (or "pseudangular") process of non-therians, such as monotremes. Here, I argue that the therian angular process and non-therian pseudangular process are analogous, not homologous, and I support this conclusion using osteological, soft tissue, phylogenetic, and functional evidence from extant and extinct synapsids. For instance, at least two lines of evidence from the fossil record suggest that the angular and pseudangular processes are not homologous. First, three stem therian lineages—multituberculates, eutriconodontans, and spalacotherioids—lack an angular process, which suggests that therians or their close relatives independently evolved the angular process. Second, the pseudangular process of monotremes and non-mammalian cynodonts is located much more anteriorly on the jaw compared to the position of the therian angular process, suggesting that the pseudangular process served a different function, such as being the insertion site for jaw-opening muscles (analogous to the digastric muscle of therians) rather than jaw adductor muscles. The conclusion that the angular and pseudangular processes are analogous has important ramifications for fossil phylogenetic analyses because the two processes are often treated as homologous for character scorings; re-scoring these characters may alter the recovered relationships of early mammal groups in future phylogenetic studies. Further, this study sheds new light on the evolutionary origin of therians and their masticatory adaptations, which may have been a critical prerequisite for their ecological diversification.

Technical Session IX: Archosaur paleobiology & pterosaurs (Thursday, November 12, 2026, 1:45 PM)

Molecular convergence enabled multiple origins of eggshell mineralization in archosaurs

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Modern crocodiles and birds lay hard-shelled eggs. Their carbonate-mineralized shell layer precipitates onto a proteinaceous egg membrane and enhances mechanical stability, embryonic water

retention, and protection against microbial invasion. Although the extant phylogenetic bracket suggests a single evolutionary origin of calcified eggshell in archosaurs, recent discoveries of soft dinosaur eggs imply that eggshell mineralization may have evolved multiple times. The timing and mechanisms behind the evolvability of eggshell mineralization are obscured in the fossil record which rarely preserves biominerals accurately. We explore patterns of evolutionary convergence in n = 828 molecular fingerprints of a phylogenetically diverse set of Jurassic-to-Recent carbonaceous fossil and modern diapsid eggshells. We subsampled spectral regions from Near-Infrared Raman spectra containing organic features to explore modifications of the membranous template as a more reliable source of information on biomineralization than diagenetically unstable mineralogy. Spectral fingerprints show a robust separation of soft and calcified modern eggshells regardless of phylogenetic affinity, driven by the increased abundance of carbonate-binding carboxyl and amine groups in distinct biomolecular mineral templates bound by the shell membrane. Integration of fossils revealed, however, that chemical variance resulting from thermal alteration during fossilization overprints the biomineralization signature. To increase thermal comparability, we experimentally matured modern eggshell aliquots. Given that matured and fossil eggshells often fluoresce when excited with visible lasers, we pioneered a novel Deep-UV Raman spectroscopy protocol. Resulting organic spectral fingerprints yielded a robust separation of soft and mineralized eggshell: Projection of debated fossils onto this dataset identified eggshells of the sauropodomorph *Massospondylus* as soft-shelled, solidifying the phylogenetic inference of an ancestrally soft archosaur egg. Eggshell mineralization evolved multiple times independently in archosaurs, enabled through the same carbonate-binding functionalization of independently co-opted template molecules. Evolution of calcified eggshell in the archosaurs explains their distinct microstructures and suggests that temporal and phylogenetic gaps in the egg fossil record result from the decreased fossilization potential of soft eggs in oviparous and ovoviviparous archosaurs.

Funding Sources: The David & Lucile Packard Foundation and the NASA ICAR grant 80NSSC26M0025

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Assessing diagenesis using portable x-ray fluorescence and Fourier transform infrared spectroscopy in modern and fossil bioapatite preservation

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Assessing bioapatite preservation before destructive geochemical analyses is critical, as diagenesis can alter original chemical compositions and isotopic signals. Current approaches to evaluate preservation can be time-intensive or undesirably destructive, like thin sectioning. We explore the utility of portable x-ray fluorescence (pXRF) and Fourier transform infrared spectroscopy (FTIR) as a rapid and non-destructive or minimally destructive presample screening method. To evaluate suitability of pXRF in assessing preservation, pXRF analyses was conducted on silica blanks (N = 36), standards; USGS (N = 35), NIST (N = 36), bone (N = 59), modern white-tailed deer (*Odocoileus virginianus*) bone (N = 118) and enamel (N = 93), and fossil bone (N = 28) and enamel (N = 303) from the Early Miocene Runningwater Formation of Nebraska (total N = 708). Calcium-to-phosphorus (Ca/P) ratios were used as a proxy for diagenetic bioapatite alteration. We performed 118 FTIR analyses on surficial enamel (N = 37), internal enamel (N = 37), dentine (N = 37), and bone (N = 7) of the same fossils to investigate the presence of exogenous materials like consolidants and permineralization. Analyses of standards indicate that collected pXRF atomic concentrations are reproducible despite systematic offsets from expected values. Modern bone and enamel generally produced Ca/P values consistent with the published ranges of unaltered bioapatite (1.3–2.3), although fossil specimens exhibit greater variability. Fossil enamel shows right-skewed distribution, with many measurements clustering

near modern values and some yielding elevated Ca/P ratios. Fossil bone consistently produced higher Ca/P values than modern bone, with fossil teeth often displaying variations across the tooth. FTIR analyses of surficial enamel identified specimens with consolidants or residue that may affect pXRF or isotope results. Internal fossil enamel qualitatively matches modern enamel bioapatite spectra, while fossil dentine and bone spectra differ from modern dentine and bone, suggesting the influence of permineralization of dentine and bone among Runningwater fossils. These results indicate pXRF and FTIR are sensitive to preservation-related geochemical variability and can identify potentially altered areas within fossil specimens. Future FTIR and isotopic analyses will independently validate preservation status. As rapid or minimally destructive techniques, pXRF and FTIR show potential as screening tools to guide destructive sampling.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Two decades of (paleo)biological science in video games: AAA gaming as educational engagement?

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In paleontological and biological education, engagement in the digital age is a difficult hurdle to surmount. When coupled with students that are nearing their secondary school graduation or are early in their higher education career, more digital options for engaging students with abstract scientific topics are welcome. As educators, we also now live in a timeframe where video games are omnipresent and pervasive among students and have been for more than a decade. Here, we provide a survey of evolving biological and paleontological concepts that appear in the *Fallout* franchise from Bethesda Softworks and link scientific breakthroughs to educational opportunities for early biology students. In this preliminary exploration, the authors explored *Fallout: New Vegas* for opportunities that can be used in engaging students in a premade virtual space. After accounting for coding that boosts gameplay rather than hard science, students are tasked with tracking behaviors or patterns among characters or enemies and relating them back to biological principles or behavioral evidence in the fossil record. As an example, a task was set for tracking “deathclaws,” a large-bodied reptilian in-game enemy, and describe the behavior surrounding parental, reproductive, and social behavior. Instructors can provide questions such as: “How many offspring do you see?”, “How does the presence of young individuals change behavior in your subject?”, “What evidence do we have for similar behaviors from extinct taxa?”, and “How does the behavior you see in game compare with biological concepts that are covered in class?”. Students found that by the end of the exercise, they could apply sexual dimorphism, R-selected vs. K-selected reproductive strategies, and social hierarchies among these in-game groups. Considering the depth of *Fallout* titles over the past 20 years, findings made by students can contrast how science is reflected in new and old titles. These observations must then be written up to link behavioral patterns with (palaeo)biological concepts in a scientific report. In breaking with more traditional educational routes and utilizing video games for pattern recognition and critical thinking of scientific concepts, this method offers a cost effective, near ubiquitous opportunities for students to engage in abstract ideas where more traditional education may not work in early higher education.

Technical Session XVIII: Education & Outreach (Saturday, November 14, 2026, 1:45 PM)

Intentional recruitment of underrepresented students, incorporation of research, and emphasis on transferable job skills increases participation in scientific fieldwork and geoscience course enrollment

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Participation in a field-based geoscience activity has been shown to positively affect student

learning and engagement, as do undergraduate internships and research experiences. However, there is a paucity of information about how these activities, when combined with transferable job skills training, impact student engagement. The Immersive Connections in Geosciences Program, funded via the NSF GEOPAths grant program, examined whether these activities, combined with intentional recruitment of underrepresented students, increased participation in geoscience programs. Outcomes assessment was completed by the Magnolia Consulting group using quantitative and qualitative data collection and analysis. Each student participated in a three-week field experience centered around the excavation of a Jurassic (150 million years) sauropod dinosaur skeleton from the Two Sisters Quarries in the Morrison Formation, Bighorn County, Wyoming. Students also participated in half-day prospecting trips and museum and national park visits. The excavation was co-led by a team from the Virginia Museum of Natural History (VMNH), where the fossils are housed. Following the field experiences, students participated in fall semester experiential internships with VMNH staff mentors, ending in conference or outreach presentations. Students also had a variety of career-building activities built into the class, such as networking events, resume building, and elevator pitch creation.

Over the course of three cohorts, 14 students were enrolled in the GEOPAths program, increasing enrollment by traditionally underrepresented and low-income students from 0% to 100% in the last cohort. This is attributed to increased outreach to campus affinity groups and collaboration with offices supporting diversity and financial aid and the intentionality of transferable job skill training. Financial support was frequently cited as critical to participation.

All students reported strengthened transferable job skills due to participation, in addition to gains in their geoscience-specific skills and knowledge. Students highlighted improved critical thinking, time management, collaboration, and the ability to reflect on their work. All program participants who had graduated by the end of the grant period were pursuing or employed in a STEM career, highlighting the project's success in improving students' ability to interface with STEM fieldwork and impacting their prospective job skills.

Funding Sources: Rise Award #2227897

Technical Session XIX: Carnivora (Saturday, November 14, 2026, 1:45 PM)

Ontogenetic study of *Smilodon fatalis* and *Crocuta crocuta spelaea* using micro-computed tomography (*μ*CT) data from the basioccipital-basiophenoid sutures, cementum annuli, and dental pulp cavity closure to compare to known age studies of *Vulpes vulpes*, *Phocoena phocoena*, and *Panthera leo*

Misty S. Haji-Sheikh[1]
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Understanding of the repeated cycles of extinction throughout prehistory focuses on the timing and manner of a species' life, behavior, and death in the environment in which it lived. This comparative knowledge requires an in-depth study of each species. This type of study using extant animals in paleontological studies is enhanced by the latest technologies. Recent radiocarbon dating indicates that the last *Smilodon fatalis* in the La Brea collection died at 13,021 ybp; however, this study did not determine the ages at which each individual became encased in asphalt.

The ontogenetic determination of *S. fatalis* (sabertooth cat) and *Crocuta crocuta spelaea* (cave hyena) can be developed from computed tomography (CT) based on known-age *Vulpes vulpes* (red fox) and *Phocoena phocoena* (harbor porpoise). This method follows studies of dental records of *Homo sapiens* (humans).

Here, the objective was to demonstrate that the age of a fossilized mammalian specimen at the time of death could be inferred by combining micro-computed tomography (*μ*CT) data from the basioccipital-basiophenoid sutures, cementum annuli, and dental pulp cavity closure. The basioccipital-basiophenoid sutures close as the individual ages, becoming obliterated in an adult. The cementum annuli are light and dark bands that can be counted like tree rings. During ontogeny,

the pulp chamber in the apical root closes. When combined, these three independent methods could allow us to confirm the specimen's age at death. Previous cementum annuli studies required thin cross-sectional slices to be cut from a valuable fossil specimen. μCT scans do not damage specimens and are emerging as a preferred method for studying internal structures.

Comparison of ontogenetic data for *S. fatalis* and *C. crocuta* sp. with methods outlined in studies of *P. leo*, *V. vulpes*, and *P. phocoena* indicates that *S. fatalis* became an adult in approximately four years and lived ten-plus years. *C. crocuta* sp. matured at three years of age and lived twenty-plus years.

Ontogenetic data from different age specimens form the basis for studies of parental care duration and offspring maturation rates. These data can be used to study population structure, community dynamics, hunting patterns, prey choice, and the impact on local food web interactions.

These techniques can be applied in analyses of different faunal elements to gain insights into the age of specimens at the time of death.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Comparing models of stress and strain distribution in rodent skulls with different types of simulated dental attachment

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Finite Element Analysis (FEA) of skull stress and strain requires consideration of how teeth will be modeled and connected to the mandible and cranium. In life, teeth are connected by the periodontal ligament (PDL) which allows teeth to move in the sockets and absorb shock during chewing. Here, we investigate if biomechanical results differ when the teeth are modeled as continuous with the bone or separate but with contact surfaces simulating force transmission by the PDL in rodents.

Using Morphosource specimens *Rattus norvegicus* (ID: 55306), *Cavia porcellus* (ID: 55304), *Sciurus carolinensis* (ID: 55307), and *Aplodontia rufa* (ID: 49500 and 49501), we created two models of each specimen for FEA in Strand7, each with incisors, molars, and bone individually segmented to facilitate later material property testing. Models included: (1) alveolar space around the teeth filled in with bone to contact the dentition, or (2) unfilled alveolar space with PDL-like force transmission through Direct Attachment in Strand7. To isolate and test the effects of contact type, bone material properties (stiffness 17 GPa, Poisson's ratio 0.35) were applied to both bone and teeth. Forces from similar-sized specimens were applied to all adductor muscles. Constraints simulated a bilateral incisor bite and the start of a unilateral left-sided bite at the second molar. We sampled stress and strain at 17 homologous locations and applied the Wilcoxon Signed Rank test for repeated measures to assess for statistical differences.

Visually, the models are relatively similar, although when the teeth are modeled separate from the bone the FEA models appear to have areas of slightly higher stress or strain. In our empirical point testing of incisor and molar bites there was no significant difference in stress or strain between the different models. Researchers could use the model that requires the least time if not applying different material properties to the teeth. The next portion of this study will include a larger cross-section of Rodentia and apply material properties of dental tissue to the teeth.

Technical Session VI: Dinosauria II: a "bird-hipped" bonanza (Thursday, November 12, 2026, 8:00 AM)

A small-bodied ornithischian fossil assemblage provides support for high latitude faunal provincialism in Laramidia during the Campanian

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Over four decades of collecting efforts in the Campanian-aged Prince Creek Formation (PCF) have amassed an exceptional collection of rare polar vertebrate fossils from the North Slope of Alaska. PCF field activity has traditionally been concentrated along tall river-cut bluffs along the lower Colville River in an area called Ocean Point (OP), approximately 40.0 kilometers south of the Arctic Ocean. While the hadrosaurid-dominated (*Ugrunaaluk kuukpikensis*) Liscomb Bonebed was the first locality to produce dinosaur bones in Alaska, more recent work by the University of Alaska Museum of the North has focused on new microvertebrate assemblages in the formation that have helped to transform our perceptions of Late Cretaceous polar ecosystems. Small-bodied early diverging ornithischian dinosaurs (SBEDOs) are poorly sampled but constitute important components of Cretaceous ecosystems. New OP microvertebrate sites have produced a rich assortment of these rare SBEDOs, revealing at least one species of thescelosaurines, orodromines, leptoceratopsids, and pachycephalosaurids, like *Alaskacephale gangloffi*, were all living contemporaneously on the North Slope during the late Campanian (ca. 73.0 Ma). As such, OP exhibits a higher proportion of co-occurring SBEDOs than is observed anywhere else in the Late Cretaceous of North America. A distinctive polar faunal province (Paanaqtat Province) has been proposed to be present during the Campanian of Alaska. The unusually high SBEDO diversity in the PCF is distinct and may provide further support for Campanian faunal provincialism. Presently, evidence for endemic PCF SBEDO species is limited to Alaskacephale and a new leptoceratopsid. Interestingly, many of the OP SBEDOs are represented by perinatal materials; indeed, the OP microvertebrate assemblages have generated the largest perinatal thescelosaurid sample (= Thescelosaurinae + Orodrominae) thus documented and conclusively show these dinosaurs were reproducing at high latitudes. These OP fossils also record the temporally youngest occurrence of Orodrominae in the fossil record. Orodrominae originated in North America during the Albian and thrived during the Campanian but disappear from the fossil record following the encroachment of the Bearpaw Sea. Notably, this new discovery of orodromine material at OP reveals the persistence of this clade at high paleolatitudes for another two million years and the first co-occurrence of thescelosaurines and orodromines documented.

Funding Sources: NSF EAR 1226730; NSF EAR1736515

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

Expanding ecometric analysis of Miocene artiodactyls: regional differences and persistent phylogenetic signals from the Mojave and Great Plains

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Ecometric analysis of functional traits can reveal ecological patterns in fossil assemblages where taxonomic resolution is limited. The functional ratio (FR) of the artiodactyl astragalus describes the leverage of the hindlimb from astragalar proportions, with lower values indicative of more cursorial morphology adapted for sustained or efficient locomotion. When examined at a community level, the FR has utility as an indicator of habitat openness. Prior work on Middle- to Late-Miocene artiodactyl astragali from the Mojave Region suggests that antilocaprids consistently exhibited lower FR than camelids, and community-wide FR remained stable over time despite significant changes in vegetation. We expanded this analysis geographically to investigate whether functional signals are structured more by habitat or by clade across North America. We added 136 specimens from penecontemporaneous assemblages from the Great Plains (chiefly Nebraska, including Agate Fossil Beds National Monument), spanning Antilocapridae (n = 71), Camelidae (n = 37), Merycoidodontidae (n = 19), and Entelodontidae (n = 9). Antilocaprids across both regions cluster tightly in size with modest FR variation. Camelids in both regions exhibit wide size variation and a moderate positive size to FR relationship, and larger individuals typically have

higher FR indicative of low cursoriality. Merycoidodontids vary moderately in both size and FR but show no correlation between them. Entelodonts vary widely in size, with notably low FR variability. Regional separation is apparent in antilocaprids and camelids, with Mojave antilocaprids exhibiting lower FR and camelids showing higher FR than their Great Plains counterparts. While region structures the functional signal, the expected habitat-to-morphology relationship is weaker than predicted. Our results suggest that phylogenetic constraints and clade-specific locomotor strategies dominate over a shared environmental response in heterogeneous Miocene landscapes.

Funding Sources: Slippery Rock University, College of Engineering and Science

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Drone multispectral imaging for non-invasive fossil prospecting in the Las Vegas Formation, Ice Age Fossils State Park, Nevada

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Fossil surveys in rugged or access-limited terrain are constrained by visibility, ground access, and labor-intensive effort. We tested whether low-altitude multispectral imaging from a small, uncrewed aircraft could distinguish fossil bone from surrounding sediment without surface contact or disturbance. The Pleistocene Las Vegas Formation contains well-surveyed localities and offers a controlled validation setting. Fossil concentrations are documented by the park and known from field observation, providing ground-truth references against which spectral discrimination can be assessed. We flew transects at approximately 12 meters above ground over several localities of documented fossil occurrence, capturing imagery across multiple wavelength bands, including near-infrared (860 nm) and red-edge (760 nm) bands targeted for their reported sensitivity to differences in bone apatite and matrix. We combined overlapping images into a single map of each site and compared how fossil exposures and the surrounding sediment reflected light across the recorded wavelength bands. We report a validated, repeatable workflow that spans flight planning, low-altitude data capture, radiometric processing, and locality-scale comparison across fossil sites. Fossil exposures exhibit reflectance patterns distinct from surrounding sediments, and a ground sampling distance of just over 1 cm per pixel was fine enough to resolve individual bone fragments. These results indicate that drone-based multispectral imaging provides an efficient tool for paleontologists to reduce physical impacts and focus survey efforts in terrain where ground reconnaissance is slow, costly, or hazardous.

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

First documented discovery of *Megalonyx jeffersonii* in non-karstic sediments in West Virginia, with insights into possible geologic provenance and depositional setting

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Until recently, and as far back as the late 1700s, with the initial discovery of *Megalonyx*, all ground sloth remains from West Virginia (WV) had been found in karstic cave settings, primarily of the Greenbrier Valley Karst on the eastern side of the Allegheny Mountain Range. In 2022, while hunting for wild turkey after heavy rains, a skull was found packed in clay, having washed out of the hillslope into the bed of Isaac's Branch of Eightmile Creek, a tributary of the Kanawha River. The skull was positively identified as a superbly preserved specimen of the WV state fossil, *Megalonyx jeffersonii*. The skull was remitted to the landowning family, who subsequently donated the find in perpetuity to the WV Geological and Economic Survey. The exceptional preservation of the cranium and associated sediments suggests a low-energy depositional environment, possibly

lacustrine. This supposition is supported by evidence of an early Pleistocene glacial lake, Lake Tight. The short-lived lake formed due to an ice dam of the now-extinct Teays River that covered roughly 18,000 km^2 (~⅔ the size of modern Lake Erie) and is estimated to have been as deep as 270 m. This would make the specimen from around the Irvingtonian–Rancholabrean transition, much older than all previously discovered ground sloth material from the region.

The elevation of the discovery site (~195 m) would have been underwater during the lake's existence, but the surrounding hills are high enough that they should have been above the water line. It is not possible to say if the sloth fell into the lake pre- or post-mortem.

Unfortunately, resolution of the cause of death is not possible as return visits to the site, including ground-penetrating radar scans, have yielded no additional remains, nor further insights into the exact geologic provenance of the fossil. The excellent preservation, including both complete zygomatic arches, suggests minimal post-mortem transport. More work is needed, in general, to clarify the geology and stratigraphy of the site and determine where future fossil material may be found.

The discovery of a *Megalonyx* skull in a non-karst setting represents an important new piece in our understanding of the fossil history of Appalachia, and additional analyses will give us further insights into the life of the animal itself.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Hadrosaur tracks from a Late Cretaceous Pacific island may suggest island dwarfism

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In 2022, a dinosaur tracksite off the coast of Vancouver Island was reported to the Royal BC Museum. The tracks are dispersed across at least four layers and are most abundant in layer two, which contains approximately 125 tracks within 100 m^2. Most tracks have been assigned to the ichnogenus *Hadrosauropodus isp.*, but single occurrences of a theropod and a potential ankylosaur track were recorded. The tracks occur in the Protection Member of the Nanoose Formation, which represents the terrestrial and shallow marine depositional environments of the Nanoose High. The Nanoose High formed an island entirely independent from the mainland of Laramidia 83 Ma and drowned 77 Ma. These ichnites are not only the first autochthonous non-marine vertebrate fossils discovered in the Nanaimo Group, but also a unique example of a Pacific island dinosaur assemblage. To conduct a morphometric analysis, the *Hadrosauropodus* tracks were divided into three categories of preservation (strong, moderate, and poor). Outlines of strong tracks were generated from photogrammetric models using the R package *Objective Footprint Outline Tool v. 4*. From these outlines, the average length of strong tracks was determined to be 38 ± 8.6 cm. When including moderate tracks, this average did not change (SD = 9.9), making these tracks notably smaller than contemporary North American *Hadrosauropodus* tracks (mean length 65 ± 14 cm). While the observed size discrepancy may be attributable to ontogenetic variation, island dwarfism should be considered given the isolated nature of the Nanoose High.

Funding Sources: Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant RGPIN-2020-04012
NSERC Undergraduate Student Research Award

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Myological reconstruction of the appendicular musculature of the European titanosaurian *Lirainosaurus astibiae*

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Lirainosaurus astibiae is a small titanosaurian sauropod known from a monospecific bonebed in the Laño Quarry of northern Spain (Campanian–Maastrichian). Unlike most titanosaurians, multiple appendicular elements have been recovered from more than one individual. *Lirainosaurus* also offers an opportunity to explore paleobiological questions about titanosaurians as it is known to exhibit osteological features that suggest unique or biomechanically-important soft-tissue anatomy, such as the presence of a pronounced raised knob on the lateral side of the posterior face of the humerus at the level of the distal end of the deltopectoral crest (just proximal to midshaft) and absence of an acromial ridge on the scapula. Both of these features represent osteological correlates for muscle attachment, yet the expressions of these correlates differ in appearance among titanosaurians. We reconstructed the appendicular myology of *Lirainosaurus* by examining osteological correlates preserved in this taxon and applying Extant Phylogenetic Bracketing to identify the corresponding muscles. In comparison with other titanosaurians, the pronounced raised knob on the humerus described above in *Lirainosaurus* correlates to the attachment of the M. latissimus dorsi, and is also seen in *Neuquensaurus* and *Opistocoelocaudia*, whereas in *Diamantinasaurus* and *Rapetosaurus* this correlate presents as a dorsoventral ridge at the same location. These differences in appearance likely reflect contrasting stress regimes produced by the activities of the animals. Additionally, multiple correlates for muscles with the same function are differentially developed in *Lirainosaurus* compared to other titanosaurians. For example, both the Mm. brachialis inferior and humeroradialis flex the antebrachium; a faint ridge or striations are present on the lateral midshaft of the humerus which correspond to the M. humeroradialis, but no osteological correlate is observed for the M. brachialis inferior. This differential development suggests that the M. humeroradialis exerted more stress on the humerus than the M. brachialis inferior, and that it was thus possibly a more important flexor for *Lirainosaurus*. Such findings suggest that *Lirainosaurus* may have preferentially used different muscles to achieve similar limb functions compared to other titanosaurians. Continued comparisons of myological reconstructions of titanosaurians will help elucidate patterns of function and paleobiology for this enigmatic clade.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Large-bodied arthrodire placoderms preserved in coastal paleoenvironments of the upper Famennian northern Appalachian Basin: implications for salinity tolerance and paleohabitat affinities

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Recent prospecting at several fossiliferous sites in Bradford and Tioga counties of north-central Pennsylvania has revealed the presence of large-bodied arthrodire placoderms in upper Famennian siliciclastic strata of the Lock Haven and Catskill formations. Sedimentology, palynology, and ichnology at these sites indicate that the arthrodires were living in coastal fluvial, transitional fluvial–marine, and shallow marine paleoenvironments. Most of their disarticulated remains of isolated, fragmentary plates occur in shallow subtidal to intertidal deposits (channels and flats) formed by tides and modified by waves. However, well-preserved isolated and articulated plates have also been recovered including isolated partial nuchal, anterior lateral, and median dorsal plates with dunkleosteid and pachyosteomorph affinities from coastal fluvial, transitional, and nearshore marine strata. Abundant fragmentary and isolated partial nuchal, ventrolateral, and postero-dorsal lateral plates of *Holonema rugosa*, described by Cope in the late 19th century from a nearby site, were collected from transitional and nearshore marine strata. Additionally, an

articulated, three-dimensionally preserved posterior head shield of an unusually large arthrodire with dunkleosteid affinities that represents a new species of late Famennian arthrodire was recovered from shallow subtidal to intertidal facies. Our results expand the habitat ranges of large-bodied arthrodires in the northern Appalachian Basin during the upper Famennian. Large-bodied arthrodires commonly occurred in coastal areas and were therefore not confined to offshore marine paleohabitats such as those preserved in the Cleveland Shale of northeast Ohio and western Pennsylvania. Because coastal environments experience varying salinities, large-bodied arthrodires that lived in these environments were likely euryhaline in their salinity tolerances thus allowing them to occupy a variety of coastal environments. The occurrences of dunkleosteids and pachyosteomorphs in fluvial strata suggest that these arthrodires occupied brackish, tidally influenced, to freshwater fluvial environments for spawning or some other aspect of their life history during their lifespan.

Funding Sources: Lycoming College and the Delaware Valley Paleontological Society

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Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Of scales and timescales: reptiles of the Miocene Siwalik Group of Pakistan reveal the applications and limitations of a long continental fossil record for examining faunal responses to environmental change through deep time

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The Miocene Siwalik Group on the Potwar Plateau of Pakistan preserves a dense, nearly continuous reptile fossil record associated with faunal, isotopic, and lithologic proxies that record pronounced environmental change through time. Surface-collection and screenwashing from more than 100 localities spanning a temporal interval of approximately 18–6.5 Ma have produced a diverse record of squamates, turtles, and crocodilians which provides evidence for faunal responses to environmental transitions from equable, subtropical climates to increased seasonality through the middle to late Miocene. Squamates consist of acrodontan, scincid, varanid, and gekkonid lizards and snakes including pythonids, colubroideans, viperids, and *Acrochordus*. Turtles include trionychoids, geoemydids, and large-bodied testudinids. Crocodilians include tomistomines, *Gavialis*, and *Crocodylus*. Patterns of faunal change within the reptile record correspond with environmental transitions: body size maxima and relative abundance of obligately aquatic *Acrochordus* both decrease with the transition from large trunk river systems in the Chinji and Nagri formations to smaller rivers in the Dhok Pathan Formation, and the first isotopic evidence for the initiation of increased seasonality and environmental heterogeneity in the western Siwaliks is approximately coeval with increasing species richness in terrestrial and semiaquatic colubroidean snakes and the first appearance of giant tortoises. The composition of Siwalik reptile faunas additionally informs on the establishment of modern biogeographic realms, including an early establishment of modern South Asian endemics as well as representatives of the greater Indomalayan province and lineages that are currently restricted to insular Greater Sunda. The cosmopolitan composition of the Siwalik Group record thus suggests greater higher-order taxic diversity during the Middle Miocene than today and indicates that subsequent geographic portioning of reptile faunas occurred during the later Neogene, at earliest. These patterns are generally consistent with coeval records from North America and Europe, demonstrating the effects of past global climate transitions on the evolution of modern faunas.

Funding Sources: Natural Environment Research Council grant NE/W007576/1 to JJH

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Detrital zircon U-Pb geochronology provides a maximum depositional age of 220.06 ± 0.10 Ma for the base of the Blue Mesa Member of the

Chinle Formation (Upper Triassic: Adamanian) in the Blue Hills, Arizona, USA

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Upper Triassic strata of the American Southwest contain globally significant assemblages of nonmarine vertebrates that document the rise of archosaurs. On the Colorado Plateau these strata, principally the Chinle Formation and its equivalents, span almost 25 Myr, are relatively thin (sections often <500 m thick), and, while bentonitic, generally lack primary ash fall horizons to provide geochronological constraints. Although major projects in Petrified Forest National Park (PFNP) recently developed a robust Chinle chronology of sections exposed there, extending this chronology to other outcrop areas largely relies on lithostratigraphic correlations of nonmarine facies and/or tetrapod biostratigraphy. One such outcrop belt is the Blue Hills, Arizona, where historical and recent collections include a rich assemblage of tetrapods. This assemblage has long been correlated to that from stratigraphically low in the PFNP based on lithologic similarity and biostratigraphy but lacks numerical age constraints. Initial U-Pb ages from laser ablation-inductively coupled plasma mass spectrometry (LA-ICPMS) of detrital zircons recovered from a prominent white tuffaceous sandstone at the base of the Blue Mesa Member indicated an age of 219.7 ± ~3.0 Ma, but the analytical error associated with LA-ICPMS techniques overlaps with much of the published PFNP section. Chemical abrasion-isotope dilution-thermal ionization mass spectrometry (CA-ID TIMS) analyses of five of the youngest zircons from this unit yield a much more refined age of 220.16 ± 0.10 Ma. This serves as a maximum depositional age (MDA) for most fossils from the Blue Hills, including the type locality of “Machaeroprosopus” zunii Camp, C.L. Camp’s “meal pots” (microvertebrate) localities, the Krzyzanowski bonebed (KBB), and others. This age also corroborates correlation of the Blue Hills assemblage with the type Adamanian in the PFNP. Interestingly, this geochronology corresponds extremely well with previously published ages (220.0 ± 0.6 Ma and 218.1 ± 0.7) obtained from a similar horizon at the base of the Blue Mesa Member in Sixmile Canyon in New Mexico as well as published ages of ~220–221 Ma for the base of the Blue Mesa Member in the PFNP. The widespread prevalence of a tuffaceous horizon that yields similar ages hints that an increase in volcanic activity may have accompanied onset of Blue Mesa Member deposition on the southern Colorado Plateau.

Funding Sources: Boise State University Research Council and Patrons of DMNS Earth Sciences

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

New vertebrate material from the Campanian Woodbury Formation of New Jersey sheds light on Appalachian land fauna and theropod diversity.

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Although New Jersey’s Woodbury Formation is historic for producing the holotype of *Hadrosaurus foulkii*, the recovery of terrestrial vertebrates within this Campanian unit is rare compared to overlying, more deeply marine strata. Recent prospecting along a central New Jersey stream bed has yielded two new vertebrate limb elements, offering critical insights into the coastal plain’s terrestrial fauna and near-shore theropod diversity.

The first specimen (Specimen A) consists of a robust, columnar limb fragment, tentatively identified as a radius or ulna from a juvenile hadrosaurid. Its taxonomic affinity is supported by a subtriangular cross-section. The element exhibits a characteristically pockmarked surface indicative of an epiphyseal joint surface where a cartilage plate sat, rather than general cortical growth texture, confirming its juvenile status. The recovery of an immature individual provides significant ontogenetic data, aiding in reconstructing the growth stages of Appalachian hadrosaurids within

a formation where adult material predominantly occurs.

The second specimen (Specimen B) represents a slender long bone consisting of the proximal end of a tibia, assigned here as an indeterminate theropod bone with potential avian affinities. Morphologically, it resembles elements from contemporaneous Late Cretaceous aquatic birds, such as the Graculavidae. Although the articular surface of the tibial plateau is weathered, the specific flaring of the shaft strongly correlates with regional Late Cretaceous avian and theropod material.

The co-occurrence of a juvenile dinosaur and an early avian or theropod element within the same Woodbury Formation exposure underscores the importance of continued targeted prospecting in regional stream beds. These specimens contribute valuable pieces to the fragmented puzzle of Late Cretaceous East Coast biodiversity, demonstrating that even isolated lag deposits can significantly refine our understanding of Appalachian ecosystems.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A belated beaver: fossil preparation history obscures the timing of giant beaver (Castoridae: *Castoroides ohioensis*) extinction in northeastern North America

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Radiocarbon chronologies form the backbone of Late Quaternary palaeoecological analyses and represent the currency of extinction delimitation. However, many key megafaunal mammal specimens used in such studies were excavated decades ago, with little archival documentation present regarding the use of adhesives, stabilizers, and consolidants that might chemically alter ^{14}C and isotopic measurements (e.g., glue, shellac, acrylic). Here, we describe the process of troubleshooting the radiocarbon date of an apparently late surviving giant beaver (Castoridae: Castoroides) and place it within the larger context of the paleoecology of northeastern North America and the extinction timing of giant beavers across the continent. This nearly complete cranium of *C. ohioensis* from Clyde, New York, USA, has been curated by the New York State Museum since 1845 CE (specimen NYSM VP-47). While no information is available regarding historical preparation processes or chemical use, the skull's "shiny" or "varnished" physical appearance suggests the use of preservatives. A previously published radiocarbon date of 10,150 ± 50 ^{14}C yr BP (NOSAMS OS-73632; 11,764 ± 118 cal yr BP) on bone collagen would make it the last known giant beaver to persist across the Pleistocene–Holocene transition. We produced multiple new radiocarbon dates and assessed the impact of choice of bone sampling location (zygomatic, turbinates) and use of chemicals and analytic techniques (e.g., FTIR) in diagnosing and removing the likely contaminant, shellac. Shellac can polymerize over time, making it resistant to removal with traditional approaches (e.g., acetone, methanol). We found that the use of acidified methanol and XAD-2 resin produced a difference of approximately 1000 ^{14}C yrs and pushes back the age of this specimen conservatively to ~13,000 cal yr BP. This new date represents the most cautious age estimate for this specimen, which may no longer be the "last" giant beaver. Together with reevaluated existing dates from across the species' geographic range, this new date provides a more robust input for a revised species extinction model.

Funding Sources: New York State Museum and Middlebury College

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Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

New radiocarbon dates shed light on the extirpation timing of endemic echimyid rodents in southwestern Hispaniola

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At the end of the Pleistocene, at least nine endemic echimyid rodent species inhabited the island of Hispaniola, while today, there is just one extant species (*Plagiodontia aedium*, the Hispaniolan hutia). Little is known about the timing or drivers of this recent species loss, although the few published dates suggest larger species may have disappeared first. We report 67 new radiocarbon dates for extant *Plagiodontia aedium* and six extinct species (*Plagiodontia ipnaeum, Rhizoplagiodontia lemkei, Isolobodon portoricensis, Isolobodon montanus, Hexolobodon phenax,* and *Brotomys voratus*) from two montane paleontological sites on the Tiburon Peninsula of southern Haiti and combine these new dates with published dates (n = 29) from the Tiburon to model species' last appearance dates (LADs) and explore regional extirpation patterns. Modeled LADs for *Rhizoplagiodontia lemkei, Isolobodon montanus,* and *Hexolobodon phenax* imply extirpation during the mid-Holocene (respectively at 6468, 4940, and 4685 calendar years before present, or cal BP), while *Isolobodon portoricensis, Brotomys voratus,* and *Plagiodontia ipnaeum* persisted into the mid-late Holocene on the Tiburon (respectively at 1027, 449, and 444 cal BP). Very few published dates exist outside the Tiburon, but they suggest *Isolobodon portoricensis* was present when Europeans arrived, and *Brotomys voratus* persisted into the 19th century. We see no clear relationship between species' estimated body mass and LAD. *Rhizoplagiodontia lemkei,* which disappeared first, was comparable in size to extant *Plagiodontia aedium,* while the largest and smallest species (*Brotomys voratus* and *Plagiodontia ipnaeum*) disappeared most recently. There is also little alignment between modeled rodent LADs and reconstructed variability in paleoclimate. In contrast, modeled LADs for all analyzed species, including extant *Plagiodontia aedium*, roughly coincide with the commencement of regional human cultural periods, including the Lithic (ca. 6300 cal BP), Archaic (ca. 5000 cal BP), Ceramic (ca. 2500 cal BP), and Historic (arrival of Europeans in 1492 AD). These results strongly implicate humans in the demise of Hispaniolan rodents, while also highlighting the complexity of human-rodent relationships on the island. Finally, these data lay a foundation for future palaeoecological research on small mammals in the Caribbean.

Funding Sources: NSF grants EAR-2047818 to BEC and EAR-2047817 to SBC, and a University of Cincinnati Department of Geosciences award to AKH

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Exploration of intraspecific variation in leptosuchomorph phytosaur squamosals (Archosauriformes: Phytosauria) using 2D landmark-based geometric morphometrics

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Phytosaur squamosals possess taxonomically informative features useful for differentiating between basal and derived members of their clade; however, in-depth comparative morphological analyses of phytosaur squamosals are lacking, leading to unanswered questions about the extent of intraspecific variation in these elements. Fragmentary *Machaeroprosopus* material constitutes the majority of phytosaur specimens collected from the Martha's Butte beds (Chinle Formation: Upper Sonsela Member) in northeastern Arizona and housed in the SCSU-P collections. Previously, we described four morphotypes present among SCSU-P's fragmentary *Machaeroprosopus* squamosals; morphological overlap in the features of the posterior process prevented assignment to any one species based on qualitative comparisons alone. Here, we quantitatively explored the range of squamosal morphologies present in *Machaeroprosopus*, and leptosuchomorphs more broadly, using 2D landmark-based geometric morphometrics and a principal component analysis. With a dataset of twenty-six leptosuchomorph squamosals in lateral view,

preliminary results show division along the PC1 axis between derived mystriosuchinine phytosaurs and non-mystriosuchinine leptosuchomorphs with the exception of *Machaeroprosopus mccauleyi. Smilosuchus* occupies an extreme of PC1, which describes rounding of the posterior edge of the squamosal, dorsoventral broadening, and a shortened posterior process. This is contrasted by the opposite extreme which describes dorsoventral constriction and lengthening of the posterior process in *M. pristinus.* We included two SCSU-P specimens with articulated squamosals in the dataset to assess their positions in the morphospace. SCSU-P59 groups closely with *M. pristinus* while SCSU-P40 falls into the space with *M. mccauleyi.* Ongoing work aims to expand the size of this dataset, particularly for *M. buceros,* and to analyze additional 2D orientations (e.g. dorsal view). These efforts will further refine the positions of leptosuchomorph squamosals in the morphospace and expand our understanding of intraspecific variation within *Machaeroprosopus* spp. Such work broadens our understanding of morphological diversity among Late Triassic phytosaurs and establishes a necessary foundation for exploring other aspects of phytosaurian ecology and biomechanics.

Funding Sources: Connecticut State University Research Grants AUPA09 & AUP769

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Cooccurrence structure of diet guilds across Pleistocene–Holocene transition

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The transition from the Pleistocene to the Holocene coincided with an extinction event that selectively targeted large mammals and changed community structure in ways still not fully understood. One metric of community structure that can be measured is cooccurrence, where species pairs are associated with each other significantly more than expected by chance in either a positive (aggregations) or negative (segregations) sense. Previous studies have found that North American communities switched from a majority of significantly aggregated pairs to a majority significantly segregated pairs after the megafaunal extinction. Using the probabilistic species cooccurrence model in R on North American assemblages from the last 30,000 years, we find a similar pattern with the proportion of aggregations decreasing through the megafaunal extinction and into the modern, but unlike previous studies segregations never become more prominent than aggregations. We then classified the significant pairs by diet and analyzed how different diet pairs changed associations through time. We found that herbivore-herbivore aggregations decreased significantly across the extinction, potentially representing habitat fragmentation and the disappearance of multispecies herds. Predator–prey pairs, however, seem relatively stable across the extinction boundary with little decrease in aggregated pairs. These results provide an important perspective for how the loss of the megafauna impacted community structure in North America and provides a model for how modern extinctions could impact community structure.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Dental microwear texture analysis revealed intraspecific dietary variation of Japanese macaques (*Macaca fuscata*)

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When animal teeth contact food particles, they get scars on their enamel surfaces. The shape and depth of these scars (microwear) are strongly correlated to the physical properties of the ingested food, so it is possible to estimate the diet from the microwear. One of the methods of microwear analyses, DMTA (Dental Microwear Texture Analysis), has been widely applied to reconstruct the diets of extinct animals. This method allows objective, repeatable 3D measurements without

observer bias. However, there has been little research verifying whether each parameter is suitable to capture differences in dietary habits within species in primates. In the present study, we obtained the DMTA parameters of 215 individuals of Japanese macaques (*Macaca fuscata*) from nine regional wild populations (Shimokita, Kinkazan, Tochigi, Gunma, Boso, Kanagawa, Hakusan, Koshima, Yakushima) using a confocal laser microscope (VK-9700), and analyzed the correlations between DMTA parameters and their quantitative dietary data based on behavioral observations or stomach contents analysis.

As a result, we found that these regional populations are divided into three groups by DMTA: The Shimokita–Tochigi–Boso–Hakusan populations (Group A), the Gunma–Kanagawa populations (Group B), and the Kinkazan–Yakushima–Koshima populations (Group C). Group A showed relatively low scores in "height" and "volume" parameters, while Group C indicated relatively high scores. Group B showed intermediate characteristics between Groups A and C. The dietary behavior data showed that the Group A monkeys consumed leaves and stems rather than hard fruits and seeds, while the Group C monkeys consumed hard fruits and seeds rather than leaves and stems.

The present study suggests that DMTA parameters of wild Japanese macaques are well correlated with their dietary behaviors, distinguishing food items with "tough" physical properties, such as leaves and stems, from those with "hard" physical properties, such as nuts and fruits. These results indicate that DMTA is a powerful tool for estimating the diets of Japanese macaques. The accumulated DMTA data of the extant Japanese macaques may be able to estimate the diet not only of fossil macaques but also of other extinct animals.

Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

A new therizinosaur (Dinosauria, Theropoda, Therizinosauria) from the Early Cretaceous (late Aptian) of Prince George's County, Maryland, USA

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The Early Cretaceous (late Aptian) Arundel Clay facies of the Potomac Formation in Prince George's County, Maryland, has a rich history of vertebrate fossils first documented in the late 1850s. Collections made in the late 1880s to the early 20th century demonstrates a unique dinosaur assemblage from the Arundel Clays, but no new dinosaurian taxa have been described since 1998. Here, we present evidence of a new taxon of therizinosaur theropod based on two dentaries collected from the Arundel Clays exposed at the Maryland-National Capital Park and Planning Commission (M-NCPPC) Dinosaur Park in northern Prince George's County, Maryland. These specimens represent the first therizinosaur to be documented in eastern North America and bears various plesiomorphic traits such as a relatively straight lateral dorsolateral mandibular margin, dentary shelf absent, and less mediolaterally expanded U-shaped mandibular symphysis. However, the Arundel therizinosaur also has the derived therizinosaur traits of a beak-like, dorsally edentulous mandibular symphysis, dentition with enlarged teeth immediately behind the mandibular symphysis, progressively reducing in size caudally and the ventral margin of the dentary concave along with two diagnostic features: dentary dorsoventrally deep and tooth count of 20 alveoli. Cladistic analysis places the Arundel therizinosaur as a sister-taxon to *Falcarius utahensis* in an early-diverging clade of Therizinosauria. However, this placement may be an artifact of the lack of additional comparable traits. We present a hypothesis that the Arundel therizinosaur was evolving traits for a shorter and deeper cranium as an adaptation for a more anteriorly placed powerful bite force like those seen in macronarian sauropods and oviraptorosaurians, but additional

specimens will be needed to confirm or deny this hypothesis.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

The Mesozoic tetrapod burrow fossil record and abiotic correlates of fossorial behavior

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Fossoriality, defined as excavating substrate to create a burrow, is a key behavioral innovation that appeared in the Carboniferous and evolved independently in many tetrapod clades. Although tetrapod burrows are well-documented in the fossil record, the spatiotemporal, environmental, and evolutionary drivers of burrowing remain poorly understood and little focus has been placed on their trends in the Jurassic and Cretaceous (J-K). To unravel these drivers, we compiled a database of published tetrapod burrows containing 42 unique localities in the Triassic and 26 in the J-K. We documented tetrapod burrow size, complexity, abundance, depositional environment, and location, then examined the spatiotemporal distribution of burrows with environmental variables and major geologic and biotic events. We found that tetrapod burrows in the Triassic were large (>50 cm max diameter) and are mostly from floodplains of central Pangea. Throughout the rest of the Mesozoic, documented burrows retained their size but were less abundant compared to the Triassic. In the Jurassic, burrows were larger (>60 cm max diameter) and more common in North American eolian environments, with few isolated occurrences elsewhere. Cretaceous burrows were <40 cm max diameter, more common in floodplains, and documented only in North and South America and Australia.

Pangean tetrapods likely utilized burrows to escape extreme arid climates. After the breakup of Pangea, tetrapods may not have relied on fossoriality as much, since more tropical and equable climates reduced extreme temperature swings and selective pressures for burrowing behavior. This is analogous to modern tetrapods, where fewer fossorial tetrapods live in the tropics relative to deserts.

One outstanding question that is difficult to address with our current data is how fossoriality correlates with temperature. We ran a generalized additive model, recovering significant correlation between high temperatures and high burrow abundance, but disproportionate sample sizes make this correlation uncertain. Modern tetrapods utilize burrows for thermoregulation and water retention, suggesting burrowing would have been an effective strategy to cope with widespread aridity on Pangea and during the Cretaceous Thermal Maximum (KTM). If temperature is the dominant driver, we expect the same uptick in burrow abundance during the KTM as in the early Triassic and suspect this lack of data to be an artefact of sampling bias.

Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

Osteohistology of the early mammaliaform *Morganucodon* inferred from synchrotron tomography and thin sections

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Synchrotron X-radiation computed tomography (SRCT) has greatly expanded our ability to investigate histology in fossil mammaliaforms, which often cannot be destructively sampled. Here, we apply SRCT and traditional thin-section histology to examine osteohistology in the basally

diverging mammaliaform *Morganucodon*. The mouse-sized *Morganucodon* is one of the best-represented early mammaliaforms, known from thousands of cranial and postcranial remains from the Lower Jurassic Glamorgan (UK) fissure fillings. Despite this extensive fossil record, its osteohistology is poorly understood. Previous work was based on two heavily altered specimens, which limited histological description and interpretation of growth dynamics. We expand the histological sample by more than 10 humeri. This augmented sample enables us to characterize changes in bone histology through ontogeny. In addition to the bone histology, we also used linear measurements to track changes in morphology in a larger sample of humeri. Whereas some specimens were diagenetically altered, others preserve histological features in exceptional detail, revealing several patterns relevant to the life history of *Morganucodon*. The cortex is composed of periosteal and endosteal lamellar bone that truncates a more disorganized bone layer within the mid-cortex, likely corresponding to earlier ontogenetic bone deposition. The periosteal cortex of individual specimens preserves multiple (as many as six) lines of arrested growth. Extensive endosteal resorption of primary bone is present and is followed by repeated phases of endosteal lamellar bone deposition. Cortical vascularization is generally sparse. This incremental and consistent growth pattern is mirrored in the humeral morphology: length and width measurements of the humeri increase isometrically with midshaft circumference. Muscular attachment size, such as the width and length of the teres tuberosity, varies independently of midshaft circumference. These findings indicate that the growth of *Morganucodon* differed markedly from those of similarly sized extant mammals. Extant small-bodied mammals rarely exhibit multiple lines of arrested growth or repeated cycles of endosteal resorption and redeposition. The bone histology of *Morganucodon* is more consistent with the prolonged and slow growth patterns observed in extant reptiles and reinforces previous inferences from dental cementum increments that *Morganucodon* experienced relatively slow, multiyear growth.

Funding Sources: Ginko Investments Ltd. to PG

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Early paleobiogeography of Pan-Perissodactyla: review of current hypotheses

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The earliest perissodactyls appear at the beginning of the Eocene in North America, Europe, and Asia. The place of origin of perissodactyls has long been unclear. For much of the 20th century, the origin of perissodactyls was thought to be found among North American phenacodontids. However, little to no phylogenetic support has been found to link phenacodontids exclusively to perissodactyls.

In the past decade or so, other extinct groups have been allied with perissodactyls. These include anthracobunians, particularly cambaytheriids from the Early Eocene of India, and two lineages of South American native ungulates (SANUs). Anthracobunians are a monophyletic group that includes anthracobunids and possibly desmostylians in addition to cambaytheriids. Recent studies find Anthracobunia and Perissodactyla to be sister taxa, forming the clade Perissodactylamorpha. Among SANUs, molecular data from a Pleistocene litoptern and notoungulate position them as sister taxa most closely related to Perissodactyla among extant mammals (i.e., part of Pan-Perissodactyla).

The sister-taxon relationship of anthracobunians and perissodactyls suggests that perissodactyls originated outside of North America, either in mainland Asia or possibly on the Indian Plate prior to contact with Asia. However, the close relationship between perissodactyls and SANUs raises the question of how perissodactylamorphs and SANUs came to have such disparate distributions. The presence of anthracobunians on the Indian Plate and SANUs in South America could suggest a Gondwanan origin for Pan-Perissodactyla. However, this is unlikely given the apparent absence of therian mammals in the latest

Cretaceous of South America, long after the separation of the Indian Plate from the rest of Gondwana.

A more likely scenario is that the common ancestor of SANUs and perissodactylamorphs originated on a northern continent, SANUs evolved from North American ancestors that migrated to South America, and perissodactylamorphs arose from Eurasian ancestors. However, this raises other questions: What North American taxa establish the North American ancestry of SANUs? What taxa link SANUs and perissodactylamorphs across North America and Eurasia? Are all SANUs part of Pan-Perissodactyla? Answering these questions will require a more comprehensive phylogenetic analysis of perissodactylamorphs, SANUs, and other placental taxa, particularly Paleocene and Eocene "archaic ungulates."

Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

The last linkage: Epipterygoids, orbital processes, and palatoquadrate evolution in Mesozoic birds and the origin of avian cranial kinesis

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Avian cranial kinesis is one of the defining features of modern avian biology, facilitating dexterous and ecologically diverse feeding behaviors through correlated changes in the cranial musculoskeletal linkage system and shape of the rostrum. During avian evolution, the palate, its joints, and its musculature shifted from a brace, stiffening the cranium, to a propulsively loaded, mobile linkage system. While the roles of the palatobasal and otic joints in analyses of cranial kinesis are relatively well understood, less attention has been paid to the connection between the epipterygoid and orbital process of the quadrates, with the laterosphenoid of the braincase wall among theropods. Questions of homology between bones and joints of this palatoquadrate-braincase complex persist, obscuring clear understanding of character evolution along the line to modern birds. Here, we reevaluated the morphology of several key Mesozoic birds (e.g., Yuanchavis, Ichthyornis, Hesperornis) amongst the phylogenetic and ontogenetic tapestry of extant and extinct reptilian morphology. Embryology, 3D soft tissue reconstruction, and phylogenetic comparisons support the hypothesis that the orbital process of the avian quadrate, and epipterygoid of non-avian dinosaurs are both likely the ascending process of the palatoquadrate cartilage and are thus homologous to one another. We further demonstrate through linkage analysis that the retention of these ancestral connections would limit cranial mobility. Here, we propose that through avialan and ornithuromorph evolution, the epipterygoid/orbital process of the quadrate maintained connections with the laterosphenoid in *Ichthyornis* and *Hesperornis* and did not separate until within Aves, removing the last linkage of the braced palate. Together, the fossil record of birds, comparative soft tissue anatomy, and biomechanical analysis support the hypothesis that among known avialans, cranial kinesis is a uniquely Avian behavior.

Technical Session XVIII: Paleontological Practices: Education & Outreach (Saturday, November 14, 2026, 1:45 PM)

Mesozoic Mysteries: using paleontology to practice asking questions, supporting evidence, and drawing conclusions with grades 3–5

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The Science Museum of Minnesota (SMM) provides educational experiences to K–5 learners across the state in schools and libraries with programs like large-group assemblies and small-group classes. In 2024, we completed a dinosaurs assembly for 3rd–5th grade students focused on how scientists gather evidence and change their

ideas with that new evidence. Our post-programming surveys from teachers were very encouraging, mentioning that they appreciate our strategy of using paleontology to demonstrate Nature of Science learning goals. Based on this interest, our team began work in 2025 on a complementary class for the assembly. “Mesozoic Mysteries” features five case studies based on paleontological research. It begins with a class-wide investigation of an opening mystery featuring a fossilized nest with eggs and an *Oviraptor* skeleton. Together, the class reviews evidence to guide them to the conclusion that a carnivore was caring for its own eggs. Students then break into smaller groups, rotating through the next four mystery stations. Each mystery features a fossil “scene,” along with a variety of clues such as real fossils, casts, and even flip books. Students work together to look at two hypotheses, evaluate the clues, and decide as a group which of the hypotheses is best supported by evidence. The mystery stations are: “Mysterious Munchies,” about sauropod feeding envelopes; “Mysterious Movements,” featuring a scene with intersecting trackways; “Scraping up a Mystery,” about large scrape marks left in the ground by a theropod dinosaur; and “A Mysterious Gathering,” about fossils found around a possible watering hole. Feedback on the prototypes at SMM from students, teachers, and our colleagues has been positive, and we are continuing to implement the class this fall with support from our research and evaluation team. The development team’s goal is to promote public understanding of science and inoculate against mistrust in scientific institutions by having 3rd–5th grade learners participate in the scientific process of asking questions, drawing conclusions, explaining phenomena, evaluating evidence critically, and revising their interpretations when presented with new evidence. These are all critical benchmarks in the Minnesota State Science Standards, and they are valuable tools for our future Minnesotans. Using the kid-friendly perspective of dinosaurs and paleontology makes this an engaging way for students to practice those important scientific skills.

Funding Sources: The Minnesota Historical and Cultural Heritage Grants program

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Evolutionary patterns of pedomorphism in Temnospondyli

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Temnospondyls make up one of the most diverse and speciose group of early tetrapods. To date, some 300 species have been described, with an evolutionary history spanning more than ~220 million years, from the Carboniferous to the Early Cretaceous, thus forming one of the oldest tetrapod clades to exist. While most temnospondyls share a broadly conserved semiaquatic body plan, several distantly related clades (including dvinosaurians, dissorophoideans, and brachyopids) exhibit distinct pedomorphic skull morphologies characterized by broad proportions and reduced ossification. The phylogenetic separation of these groups suggests that pedomorphosis did not arise once but evolved repeatedly and independently during temnospondyl history.

Here, we test this hypothesis by quantifying cranial shape variation and evolutionary dynamics across pedomorphic temnospondyls using geometric morphometrics and phylogenetic comparative methods. Sixty-two two-dimensional cranial landmarks per taxa were placed along key sutures and regions of the skull. These data were analyzed through Bayesian phylogenetic comparative methods and used to quantify shape variation in assessing their morphospace structure, disparity, and principal axes of variation for the entire cranium. These data were also integrated with a time-calibrated phylogenetic framework to estimate lineage-specific rates of morphological evolution.

By comparing analyses performed with and without phylogenetic correction, we report on the extent to which pedomorphic skull morphology reflects convergence rather than shared ancestry. Finally, by partitioning the skull into anatomical regions, we test whether pedomorphism is associated with heterogeneous evolutionary rates across the cranium, providing insight into how developmental

processes have shaped repeated morphological outcomes in temnospondyl evolution.

Funding Sources: Lewis Holmes' PhD studentship is funded by the Leverhulme Trust (Research Project Grant RPG-2024-315) to Marcello Ruta

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Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Soft-shelled turtles (Trionychidae) from the middle Eocene Washakie and Uinta Formations of western USA

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Trionychids (soft-shelled turtles) are among the most water-dependent non-marine reptiles, and their distribution is highly dependent on both warm temperature and perennial bodies of water. For this reason, they are good indicators for related environmental parameters. However, their fossil record has been relatively understudied due to high levels of trait variation in extant populations that make fossil interpretation complex and few stratigraphically constrained studies. To address this latter issue, we have examined collections from the early middle Eocene rocks of the Washakie Fm. in Wyoming and Uinta Fm. in Utah, USA, which together span the late Bridgerian and Uintan North American Land Mammal ages during a period of global cooling and drying of a major continental lake system. Well-documented collections tied to detailed stratigraphy were examined to establish the temporal ranges and diversity of trionychids. We excluded early 20th century collections where locality data are poor and collecting biases undocumented.

We found that trionychids represent about one-third of fossil turtle occurrences in both formations, but diagnosable specimens are only 5% of the total. In both the Washakie and Uinta Fm. two previously recognized species co-occur through both formations: *Oliveremys uintaensis* and "*Platypeltis*" *postera*. They are similar in size but can be most easily identified by differences in the shape of the nuchal and fusion of the hyo-hypoplastral suture in "*P.*" *postera.*

Additionally, a third, rare, previously undocumented form is present in the Uinta Fm. It is distinguished from co-occurring taxa by a more reduced plastron, smaller size, and raised longitudinal ridges paralleling the neurals. Such ridges have evolved in multiple trionychid lineages (e.g., Striatochelys, Gilmoremys, extant *Amyda*). No comparable morphology was observed in Washakie Fm. assemblages.

Compared to older middle Eocene rocks in this region, as represented by the Bridger Fm., trionychid diversity dropped from 10 recognized taxa to 3. Additionally, the related soft-shelled plastomenids are absent in the Uinta and Washakie assemblages. This loss of taxic diversity suggests a major reduction in suitable habitat types as the regional lakes receded. Nonetheless, large persistent bodies of water were present throughout Uinta and Washakie Fm. time that were capable of sustaining large-bodied soft-shelled turtles.

Funding Sources: JSPS KAKENHI JP22KK0048, NSF-EAR 2011695, NSF-EAR 2011677, NSF-EAR 2011685, NSF-EAR 2011698

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Ontogenetic niche shift in Sauropsida is associated with hatchling vs. adult size and lack of extended parental care, not sympatric species richness or interspecific niche partitioning

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Abundant evidence (including morphological, biomechanical, tooth wear, isotopic, and ichnological data) support the hypothesis that many Mesozoic dinosaurs underwent feeding, locomotory, and ecological niche shifts during ontogeny. However, recent discoveries of

increased species diversity of Mesozoic terrestrial communities have led to questions of whether such ontogenetic niche shifts were significant. This appears to be a conflation of separate issues: the alpha-level species diversity within a community (determined by anatomical observations), the hypothesized significance of niche partitioning within communities, and the shift in niche occupation by individuals due to dramatic size transformation and lack of long-term parental care. Within Mammalia and Neornithes, the long-term parental care obviates the driving factors of such shifts. The phylogenetic distribution of parental care within Sauropsida supports a model where Archosauria ancestrally possessed months-long protection and provisioning of young. In the case of Neornithes, this duration coincides with almost the entire pre-adult life phase, but in Crocodylia, this results in juveniles independent of adult support for years. In extant communities, observations of multiple sympatric sauropsids with substantial differences of hatchling vs. adult sizes (e.g., within Crocodylia or Varanidae) show ontogenetic niche shifts as individuals even though there is substantial overlap in prey choice and habitat use. Fossil data suggest the same in Mesozoic dinosaur communities, showing that ontogenetic niche shifts are not predicated on interspecific niche partitioning, but on individual growth patterns. The factors that promoted ontogenetic niche shifts in Mesozoic dinosaurs were also present in larger-bodied Mesozoic pseudosuchians; examination of the record of these will likely reveal comparable transformations (as retained in their extant Cenozoic descendants). Similarly, in the marine realm, many Mesozoic marine reptiles also show substantial differences between neonate and adult body size, and thus their fossils may indicate different feeding and locomotory habits of independent young compared to those of adults. An exception to this is predicted for polycotylid plesiosaurs (and perhaps other members of Plesiosauria, once their reproductive strategies are better constrained), in that the extremely large young of these suggest a more mammalian long-term parental care than in typical sauropsids.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Exploring macropredator dynamics in Miocene-Pliocene oceans using stable calcium isotopes

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During the Miocene epoch, high ocean productivity supported the longest food chain to ever exist, and more than twice as many unique marine species lived in coastal oceans as is the case today. Productivity collapse, habitat loss, and climate change in the Pliocene led most of these species to go extinct. Miocene–Pliocene marine species are famous (e.g., *Otodus megalodon* and *Livyatan*) and well-studied in taphonomy and distribution, but almost no geochemical work has been done to assess trophic level (position on food chain) or niche breadth. This study investigates foraging ecology before (Miocene), during (Pliocene), and after (Pleistocene) the extinction event using calcium-, carbon-, and oxygen-stable isotopes. Preliminary data suggests that macropredatory marine mammals may have held higher trophic positions than contemporaneous megatooth sharks. This data also provides insights into the reliability of Ca isotope data from animals of differing physiology and depositional environments.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

An exceptionally complete and taxonomically ambiguous *Pteranodon* skeleton (Pterosauria: Pteranodontidae)

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Pteranodon was a large pterodactyloid pterosaur that was a prominent component of the Western Interior Seaway fauna of Late Cretaceous (Santonian–Campanian) North America. It is among the best-known pterosaurs, represented by well over 1,100 specimens recovered from the Niobrara and Pierre Shale formations in the central

Great Plains region of the United States. Although possessing a complicated taxonomic history, two species are generally recognized: *Pteranodon longiceps* and *Pteranodon sternbergi*. Despite the large number of known specimens, *Pteranodon* material is very incomplete at the individual level. Most specimens consist of isolated bones, single wings, or otherwise very partial skeletons. Few have even half the skeleton preserved, and even the more complete examples are frequently missing critical parts, such as intact crania. Here, we provide a preliminary description of CMNFV 41358, a small (~4 m wingspan), nearly complete specimen of *Pteranodon* that was purchased by the Canadian Museum of Nature in 1991 and now resides in the museum's Fossil Gallery. Although the majority of the skeleton is present, this specimen has only rarely been mentioned in the scientific literature and has never been formally described. The skeleton is osteologically mature, showing fused syncarpals, notarium, sacrum and pubicischial plate, cristospine to sternum, and more. The lobe-like cranial crest is low and consistent with other specimens attributed to female *P. longiceps*, but the specimen overall exhibits a mosaic of anatomical features that presents as a mix of characteristics supposedly diagnostic of either *P. sternbergi* or *P. longiceps*. The edentulous jaws are slightly upturned, and the lower jaw is 30% shorter than the cranium, in stark contrast to other specimens where the jaws are more nearly equal in length. The postexapopohyses, previously not illustrated in *Pteranodon*, are well developed and would have served to strengthen the neck in the dorsoventral axis. Conceivably, this might have been an adaptation for some type of specialized feeding at the surface of the ocean, although CMNFV 41358 exhibits none of the skeletal adaptations associated with highly specific behaviors such as skim feeding.

Funding Sources: Beaty Centre for Species Discovery and the Research and Collections Division of the Canadian Museum of Nature

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Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

How does hypsodonty affect patterns of intraspecific variation? A comparison of dental trait variability between *Allomys* and *Meniscomys* from the John Day Formation of Oregon

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Dental morphological traits in mammals are critical to both taxonomic and ecological inference among fossil species, and hence an understanding of the sources of their variation is key to our ability to describe the diversity represented by fossil mammal remains. The precise occlusion of mammalian teeth has been shown to constrain dental variation in the past, as natural selection against individuals with malocclusion reduces variation in regions of the teeth that occlude with one another. The converse is also true; areas of the teeth that are less constrained by contact with the rest of the dentition, such as the posterior end of the last molar or the end of a tooth next to a diastema, are more variable, presumably because that variation is less likely to cause malocclusion that could adversely affect food processing. Hypsodont dentitions may change these patterns of variation as the tooth surfaces wear against one another, erasing much of the variation in cusp morphology as the tooth crown wears down. Hypsodonty itself is also responsible for some variation in characters that change from the crown of the tooth to the base, depending on how characters are measured, as the value of a measurement taken at the occlusal surface will change as the tooth wears. This study examines the patterns of variation in taxonomically relevant morphological characters in two genera of fossil aplodontiid rodents, *Allomys* and *Meniscomys*, both of which are abundant and diverse in the John Day Formation of Oregon. *Allomys* is brachydont, while *Meniscomys* is mesodont to hypsodont and experiences significant lifetime tooth wear. Both are known from multiple species in the same formation, allowing an assessment of the differences in the patterns of intraspecific variation within each genus. Measurement data show that species of *Meniscomys* have higher rates of variation in several quantitative dental characteristics, and while some of these are a result of the variation in morphology from the root

to the crown of the tooth, others are not explainable in this way, and instead likely reflect the variation in cusp morphology enabled by the lack of precise dental occlusion in the molars of *Meniscomys*. Because these two species occur in the same habitats and are relatively close relatives, they allow insights into the role hypsodonty has played in shaping dental character variation in these rodents.

Funding Sources: National Science Foundation grant #EAR- 2322803

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Paleobiogeography of South American hadrosauroid dinosaurs analyzed using tip-dating Bayesian methods

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Hadrosauroid ornithopods were common during the Cretaceous in Laurasia but are rare in Gondwana. The recent discovery of several new hadrosauroid specimens from the latest Cretaceous of Patagonia has prompted questions regarding the paleobiogeographic origins of South American representatives of this clade. At present, there are two dominant hypotheses regarding the origin of South American hadrosauroids: the "North American immigrant (NAI)" hypothesis and the "South American Endemism" hypothesis. To test these hypotheses, a modified version of a recent phylogenetic data matrix was analyzed using tip-dating Bayesian methods with MrBayes to estimate divergence dates and assess paleobiogeographic patterns for these taxa. The recovered trees were used for a biogeographical analysis using the R package BioGeoBEARS to infer the probability of ancestral nodes. Resultant Bayesian analyses recovered a monophyletic clade of South American hadrosaurids as sister to the North American kritosaurin hadrosaurid clade nested within Kritosaurini. *Gonkoken nanoi* from the latest Cretaceous of southern Chile is not closely related to other South American hadrosauroids and is instead regarded as a proximal outgroup of Hadrosauridae. Parsimony analysis yielded congruent results regarding the topology of Kritosaurini and Austrokritosauria. Biogeographical analysis suggests that the South American clade has a North American ancestry, which supports some aspects of the NAI hypothesis. The earlier divergence times in both lineages (South American kritosaurins and *Gonkoken nanoi*) and multiple dispersal events support aspects of the SAE hypothesis. These results suggest that hadrosauroids may have arrived in South America substantially before the late Campanian, with multiple dispersal events from North to South America, involving multiple lineages of hadrosauroids, potentially utilizing ephemeral volcanic island arc chains as "stepping-stones."

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Craniofacial ontogeny of *Thrinaxodon liorhinus* and *Galesaurus planiceps* (Therapsida, Cynodonia)

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Basal cynodonts are important to studies of growth and evolution because they represent an intermediate between earlier synapsids and true mammals. Two taxa, *Thrinaxodon* and *Galesaurus*, have a large sample size, substantial amounts of literature, and a growth series. While previous growth studies of *Thrinaxodon* and *Galesaurus* have described a growth series, many of the growth categories and maturities of individual specimens are vague. The goal of this work is to solve this issue using numerical cladistic methods to objectively recover a growth series. In this study, a data matrix for each taxon was assembled from the literature and compiled in the software program Mesquite, and an analysis was done in the software program PAUP. A total of 7 specimens and 11 characters were included in the analysis for *Thrinaxodon*, and a total of 8 specimens and 16 characters were included for *Galesaurus*. Three trees were recovered with a consistency index (CI)

of 1.0 for *Thrinaxodon*, and 42 trees were recovered with a CI of 0.9231 for *Galesaurus*. One growth series was recovered for each taxon, each containing four growth stages. Evidence for the ancestral growth series was found: in both taxa, the sagittal crest is undeveloped in the juveniles, whereas it is developed in adults; the ventral process of the postorbital is short in juveniles and becomes subequal in length relative to the dorsal process in adults; the frontal-parietal suture is "M"-shaped in juveniles and intermediate in adults; and the occipital crest is absent in juveniles, whereas is present in adults. These results provide the foundation for recovering the ancestral growth patterns for Cynodontia as a whole through comparison of growth series with the sister species of *Thrinaxodon* and *Galesaurus*.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Evidence for crocodilians as paleoenvironmental proxies using tooth enamel stable isotopes from Miocene localities in the Turkana Basin, Kenya

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Crocodilians are ecologically distinctive vertebrates capable of recording both terrestrial and aquatic environmental conditions across their long fossil record. As such, they are uniquely positioned to record paleohydrological and paleoenvironmental conditions through stable isotope analysis of their tooth enamel. Concerns regarding a thin enamel layer and the influence of ectothermy on isotope fractionation have historically discouraged the use of crocodilian enamel in paleoenvironmental and paleoecological reconstructions; however, a growing body of literature suggests crocodilian enamel has substantial interpretative value in paleoenvironmental interpretations. Crocodilians, additionally, offer unique advantages over mammalian fauna: their polyphyodont dentition enables increased sampling across temporal bins, and—while mammalian lineages were subject to greater ecomorphological turnover over the past 66 Ma—crocodilians experienced ecomorphological conservatism through the Cenozoic, providing a stable comparative baseline for geochemical interpretations. Here, we present stable carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) isotope data from crocodilian enamel specimens, sampled from Miocene localities of the Turkana Basin of Kenya. Preliminary results indicate that crocodilian $\delta^{13}C$ values are enriched compared to co-occurring large-bodied herbivorous and carnivorous mammals, consistent with the integration of aquatic dissolved inorganic carbon (DIC) into their food web rather than a direct C3/C4 vegetation signal. Crocodilian $\delta^{18}O$ values are lower than those of terrestrial fauna, reflecting reduced evaporative enrichment in the water bodies crocodilians inhabited. Together, these signals accurately reflect crocodilian semiaquatic niche ecology and provide novel information about the aquatic landscape—including DIC dynamics of freshwater bodies and the isotopic influence of a fish-based diet—that complements and extends the terrestrial record. Preliminary results suggest that inter-site spread of crocodilian isotopic values reflects spatiotemporal differences in water body diversity across the basin, with implications for understanding regional hydrological heterogeneity during the early Miocene. Overall, our findings support that crocodilian enamel acts as a reliable, temporally consistent isotopic proxy, capable of bridging terrestrial and aquatic paleoenvironmental reconstructions in ways not feasible through analyses of mammalian records alone.

Funding Sources: NSF Graduate Research Fellowship Program, SBU Research Foundation, Columbia University E3B Undergraduate Research Grant

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

New mammal specimens and geochronological data from the School Well Locality (early Paleocene, ?Torrejonian) from the Ludlow Member of the Fort Union Formation, eastern Montana, USA

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The early Paleocene was a crucial interval in the evolutionary history of mammals that documents a radiation among the group following the extinction of non-avian dinosaurs 66 Ma. Although the broad strokes of this radiation are well understood, the more granular patterns and processes are hindered by the uneven distribution and sampling of mammal-bearing localities across time and space. The School Well Locality from the Ludlow Member of the Fort Union Formation near Glendive, Montana, documents a small mammalian assemblage that has been tentatively correlated to the Torrejonian North American Land Mammal "age" (NALMA). Previous workers described seven mammalian specimens from the School Well Locality that represent four distinct taxa, some of which first appear in the early Torrejonian (To1) NALMA interval zone. Accordingly, the School Well Locality possibly represents one of only a small number of occurrences of early Torrejonian local faunas north of Utah and southern Wyoming, but our understanding of its age and faunal composition has been hampered by uncertain chronostratigraphic constraints and a sparse number of fossils. Recent and ongoing geological and paleontological fieldwork efforts at the School Well Locality have yielded new age data and stratigraphic observations for the site and a new sample of mammalian dental and dentigerous dentary fossils including multituberculates, plesiadapiform primates, and archaic ungulates. Here, we report these new data and present an updated characterization of the faunal composition of the School Well Locality. Notably, we document the presence of as many as 10 distinct taxa, including a taeniolabidid multituberculate that we provisionally refer to *Catopsalis* sp., at least two species of the paromomyid plesiadapiform *Paromomys* (*Paromomys maturus* and *Paromomys* cf. *P. farrandi*), and certain enigmatic arctocyonid and hyopsodontid archaic ungulates. Our findings substantially improve the sample size of mammals known from the School Well Locality, demonstrate a higher level of mammalian taxonomic diversity in the local fauna than previously understood, and provide more precise constraints for its age.

Funding Sources: Hell Creek Project and NSF-EAR 2321341

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A comparison of rich sites from the Mussentuchit Member of the Cedar Mountain Formation, Utah

Mozes S. Hoy[1], Jonathan Mitchell[1]
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The Mussentuchit Member of the Cedar Mountain Formation (Cenomanian) has yielded a large number of well-characterized microsites. We describe the fauna of a new, highly fossiliferous site from the Mussentuchit and place it in the context of other, similar Mussentuchit sites. Taphonomically and in terms of fossil yield, the site closely resembles the geographically and stratigraphically close Cliffs of Insanity (COI) site. This new site has an extremely high density of unidentifiable, transported bone fragments and eggshell like COI. The matrix dissociates strongly, with more than 75% of the rock as fine clay that screens away, resulting in dozens of identifiable fossils per kilogram of sediment. This site lacks marine signatures and has extremely low mammal diversity. The most abundant fossils are from mesoeucrocodilians and actinopterygians. At least four tooth morphotypes of crocodilians are preserved, including a bernissartiid-like morph, along with numerous osteoderms. Actinopterygians are represented by abundant gar and pycnodont teeth as well as isolated scales and bone fragments. A single partial albanerpetonid jaw is the only amphibian record. Dinosaurs are represented by theropod teeth and a potentially digested *Eolambia* tooth. Terrestrial non-dinosaur tetrapods are represented by a few small lizard jaws and some indeterminate mammalian premolars. Most notably though, the site preserves abundant eggshell of multiple types.

We compared eggshell-bearing localities from the Mussentuchit to the non-eggshell bearing vertebrate microbonebeds with at least five taxa (suggesting intensive sampling). The relatively few eggshell-bearing sites have strong aquatic associations compared to heavily sampled sites without eggshell. Specifically, turtles, crocodilians, and amphibians all show strong co-associations with eggshell sites, while mammalian remains rarely co-occur with eggshells, even though mammals are quite diverse and abundant in eggshell-free Mussentuchit microbonebeds.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

The first specimen of *Barosaurus* (Sauropoda: Diplodocidae) from Montana: the northernmost occurrence of the genus

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A cervical vertebra from the Pryor Mountains of south-central Montana is the first referable specimen of the Morrison Formation diplodocine sauropod *Barosaurus lentus* from the state. Additionally, this specimen also represents the northernmost occurrence of the genus from the Morrison Formation to date. While localities in the northernmost extent of the Morrison Formation appear to slightly differ ecologically from classic Colorado Plateau counterparts, we can now definitively include *Barosaurus* within the dinosaur fauna from the northernmost extent of the formation.

Technical Session VI: Dinosauria II: a “bird-hipped” bonanza (Thursday, November 12, 2026, 8:00 AM)

Tooth wear in nestling and perinatal *Maiasaura* with comments on parental care and the nidicolous reproductive strategy

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Nestling *Maiasaura* show different proportions of dental wear types than adult saurolophine hadrosaurs. By analogy with living mammalian herbivores, we interpret wear as either “shearing,” linked to processing fibrous foods like mature leaves, or “crushing,” linked to softer, higher-protein foods such as fruits or nuts. In six nestling specimens, crushing wear makes up one-third to one-half of total wear, a significantly higher proportion than in adults. We compared these values to published data from 30 herbivorous mammal species grouped into low-fiber (omnivore/frugivore, folivore/frugivore) and high-fiber (grazer, browser, mixed feeder) diets. In 20 species with suitable data, the percentage of nonfibrous foods correlates directly with the proportion of crushing wear. Applying this relationship, nestling *Maiasaura* show wear patterns similar to mammals with low-fiber diets, whereas adults show almost exclusively shearing wear, matching mammals with high-fiber diets. Combined with evidence for parental provisioning in *Maiasaura*, these results suggest adults brought higher-protein foods to their young, similar to behaviors seen in nidicolous birds. Wear in a single perinatal lower dental battery provides a baseline for nestling wear development. The perinatal individual is smaller, has fewer erupted teeth, and shows wear limited to individual teeth rather than the full battery. Wear facets are mostly vertical, with flush lingual edges and slight labial excavations, interpreted as leading and trailing edges formed during normal occlusion. These features resemble prenatal tooth wear in some mammals, produced by tooth-on-tooth rather than tooth-on-food contact. Such wear is necessary to expose functional cutting edges in herbivorous mammals and in these dinosaurs. Near hatching, this *Maiasaura* already possessed a functional, worn-in dental battery. Although nidicolous birds lack teeth, they typically hatch with well-developed digestive systems that support rapid growth.

These findings reinforce the interpretation of *Maiasaura* as a nidicolous dinosaur. Rapid growth, parental care including provisioning of high-quality food, an altricial locomotor skeleton, and precocial

development of the digestive system—represented here by tooth function—support this view.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

At the boundary of art and science: Developing paleoart as an interdisciplinary course

Ian Hutchinson[1], Jason Moore[1]
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Art breathes life into extinct organisms. Generations of budding paleontologists are inspired by the latest artists' reconstructions of the organisms that they go on to study, be they Benjamin Waterhouse Hawkins' dinosaurs, commissioned in 1852 for the Great Exhibition; Jay Matternes' diverse murals of extinct ecosystems completed in the 1960s and 1970s for the Smithsonian Institution; or Stan Winston's animatronic/digital *T. rex* for 1993's *Jurassic Park* (and beyond). But transforming an organism from a frequently incomplete pile of fossilized remains into a representation of a living organism is fraught with difficulties. Paleoartists must keep up with the cutting edge of the science of the organisms they reconstruct, but must make educated and reasonable, yet compelling, inferences about the aspects of those organisms about which we know little or nothing.

For an undergraduate senior capstone project, we spent more than a year developing and teaching an upper-level college paleoart course using high-impact interdisciplinary honors education practices. As far as we know, this is the only university-taught, full-semester course dedicated to paleoart. The collaboration of art and science was the core of this project, with research-based analysis lending to the science aspects while creativity and curiosity aided in the artistic aspects. Each week was themed on a different aspect of paleoart (e.g., history of paleoart, comparative anatomy, misconceptions, behavior, speculative ideas, etc.), with relevant articles, journal entries, field trips, and projects apportioned throughout the semester, capped with a final project to produce art for display at the UNM Geology Museum. To track effectiveness of the course, anonymous feedback forms were gathered at the end of the semester along with regular targeted skills-based assessments. The course was cited by several students as the most impactful of their college career and provided unique insights into how students from broad academic backgrounds perceived and practiced science and art in a highly interdisciplinary manner.

Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

Insights into the terrestriality of microfossil assemblages from the Late Cretaceous based on a microsite from the Two Medicine Formation

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The Old Bean Coulee microsite represents a Late Campanian (~76–77 Ma) vertebrate assemblage in the Willow Creek Anticline, Montana, providing an important insight into the paleoecology of the Two Medicine Formation. This site has a distinct faunal composition in comparison to other regional microsites, with aquatic vertebrates and dinosaur eggshells being very rare. This study marks the first documentation of albanerpetontids in the formation, enhancing our understanding of Two Medicine vertebrate diversity and environmental conditions. The unusually high terrestriality of Old Bean Coulee raised the question of what is driving the relative abundance of terrestrial and aquatic organisms among similar spatiotemporal Late Cretaceous microsites in North America. Compositional and taphonomic data (grain size, element size, mesh size, proximity to mountain front, inferred depositional environment) for ~40 approximately coeval microsites was gathered from the literature. Taphonomic similarity of microsites was quantified using NMDS. The ordination pattern was then compared to degree of terrestriality (proportion of terrestrial individuals) to help interpret drivers of community composition. In addition, we compared Shannon-Wiener diversity

to degree of terrestriality. Preliminary results indicate Old Bean Coulee and two other Campanian microsites are outliers in terrestriality. Most other sites are dominated by fish, turtles, and crocodilians. Interpreting these results under a fluvial megafan model, this microsite may provide insight into megafan position and fluvial subenvironment of microvertebrate accumulation.

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

Hyperspecialized dentition in a new endemic pantylid from the Carboniferous–Permian of Utah sheds light on dietary and functional diversity among recumbirostran "microsaurs"

Adam K. Huttenlocker[1], Amy C. Henrici[2], Jared Heuck[3], Xavier Jenkins[4], B.J. Small[5], Stuart S. Sumida[6], Cullen Townsend[7], Yuen Ting Tse[8]
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Recumbirostran "microsaurs" play an essential role in understanding Carboniferous–Permian tetrapod evolution, revealing how total-group amniotes invaded early terrestrial ecosystems. As some of the earliest fossorial total-group amniotes, recumbirostrans document the initial widening of amniote ecospace and foraging strategies which include early examples of invertebrate durophagy, omnivory, and, possibly, herbivory. Here, we describe a nearly complete skull and mandible representing a new pantylid recumbirostran from the Halgaito Formation of Utah, and the third pantylid known from the Carboniferous–Permian Cutler Group of the southwestern USA. Excellent preservation of the specimen, along with high-resolution micro-CT scanning, permits a detailed characterization of the new taxon and Pantylidae in general. The specimen shares with other pantylids dermal sculpturing of the skull roofing bones, loss of the ectopterygoid, a step-like indentation or shelf on the posterior dentary, palatine as wide or wider than the pterygoid, and a complex palatal tooth battery. We further demonstrate that a centrally enlarged coronoid "tusk"—previously described in *Stegotretus agyrus* from New Mexico—is present in some form in most pantylid taxa (with the exception of *Trachystegos*) and is diagnostic at the family level. In both *S. agyrus* and the Halgaito taxon, the coronoid tusk is radically enlarged and fits into a unique palatal fenestra. A large upper palatal tooth is preserved, occluding against the labial surface of the coronoid tusk in the Utah specimen, suggesting complex oral processing likely for feeding on tough or hard-shelled prey. An updated phylogenetic analysis of 94 taxa and 405 characters resolves the Halgaito specimen as the sister to *S. agyrus* within a monophyletic Pantylidae. Our findings highlight: (1) a new, endemic southwestern pantylid group, (2) biostratigraphic connections between southern Utah and north-central New Mexico, and (3) increasing functional diversity of continental vertebrate communities during a major geological transition.

Funding Sources: National Science Foundation grant no. 2219902

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Preliminary insights into the regional patterning of the presacral series of sauropod dinosaurs

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Sauropods were the predominant herbivorous dinosaurs for much of the Mesozoic and evolved massive body sizes and elongate necks that greatly modified the architecture and function of the cervical series. The resulting complexities of sauropod vertebrae have been studied extensively, but methods that summarize morphological variability for the purpose of differentiating the complexity of sauropod vertebrae in comparison with other dinosaurian clades and exploring its

functional implications are seldom utilized. Regionalization analyses, which treat the vertebral series as a morphological gradient of similarity with breakpoints defining regions, provide a framework by which large-scale taxonomic and temporal comparisons can be made across Sauropoda. Variability in vertebral morphology can be quantified using geometric morphometric techniques to investigate patterns of regionalization in the axial series, providing insight into the differential adaptive pressures applied to different groupings of vertebrae in the column. We have tested these methods and applied landmarking schemes in *Ardea herodias*, an extant member of Aves, demonstrating the efficacy of this method. Here, we report our preliminary exploration of conducting regionalization analyses in the vertebral column of sauropods and our findings on the inclusion of taxa with incomplete, damaged, and/or distorted presacral series. We also investigate the degree by which morphological and functional regions overlap to make inferences about the selective pressures that lead to morphological differentiation of the sauropod presacral series and compare them to more traditional qualitative schemes used to categorize sauropod vertebrae. In future studies, we aim to investigate how patterns of regionalization vary across Sauropodomorpha to understand the evolution of the vertebral column in the clade. These results may have broad implications on phylogenetic, developmental, and ontogenetic studies and may aid in understanding the ecological and functional context behind the development of vertebral complexity and regionalization in sauropods.

Funding Sources: The University of Michigan Department of Earth and Environmental Sciences Golden Nebula Award (G032544)

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Expanding the fossil record of *Hippopotamodon* (Suidae, Artiodactyla) from the Hasnot Area, Siwalik, Pakistan

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The genus *Hippopotamodon* Lydekker, 1877 with its type species *H. sivalense*, is widely documented from the Late Miocene deposits in Eurasia. The taxonomic history, however, has been characterized by considerable instability, including early misassignments to genera such as *Sus* and *Potamochoerus*, and subsequent reclassifications involving *Propotamochoerus*, *Dicoryphochoerus*, and *Microstonyx*. This confusion primarily resulted from an overreliance on variable dental characters, particularly canine morphology. Subsequent systematic revisions attempted to resolve these issues by proposing synonymies among these taxa, although debate has continued regarding the relationship between *Hippopotamodon* and *Microstonyx*. Recent work supports the synonymy of these taxa based on shared diagnostic features across Eurasian specimens. The newly studied specimens comprise an isolated left I1, a left P4, a right P4, a left maxillary fragment with the posterior half of P3, complete P4-M1, and a right maxillary fragment preserving P3–M1. The cheek teeth exhibit large size, deep occlusal furrows, prominent accessory cusps, and moderately thick enamel, aligning it with large Siwalik suids, particularly *Hippopotamodon* and *Tetraconodon*. However, distinct premolar morphology, especially the non-bulbous P3–P4, differentiates it from *Tetraconodon* and supports its attribution to *Hippopotamodon*. Bivariate comparative analysis of premolars and molars indicate larger size than the previously recorded Siwalik representatives, while incisor dimensions closely resemble those of *H. sivalense*. The observed dimensions of P3–M1 do not correspond to any recognized species within the genus; hence, the material is provisionally ascribed as *Hippopotamodon* sp., pending further comparative and systematic evaluation.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Recovery of the type series of the Carboniferous chondrichthyan *Psephodus magnus* (Agassiz)

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Psephodus is a genus of Paleozoic chondrichthyan fish known mainly from isolated teeth and tooth plates. The genus has become something of a "wastebasket" taxon for convex, polygonal tooth plates that are not readily assignable to other genera, such as *Cochliodus* or *Deltodus.* For the sake of taxonomic stability, it is important to restrict the genus to species close to the type species *Psephodus magnus* (Agassiz). That species (originally *Cochliodus magnus*) was named but neither figured nor described by Louis Agassiz (1807–1873). Although numerous specimens referred to *P. magnus* are known, the specimens upon which Agassiz based his concept of the species, i.e., the type series, have been unknown. Recently, an unpublished watercolor attributed to Joseph Dinkel (1806–1891), an artist employed by Agassiz, was located in the library of the Geological Society of London that shows five tooth plates, all of which correspond to the current concept of *Psephodus magnus.* The watercolor was likely intended for a publication by Agassiz that would have included a description of *Cochliodus magnus.* The margins of the watercolor contain the handwritten notations "*Cochliodus magnus*" and "Collection of Capt. Jones." This leaves little doubt that the five tooth plates comprise the type series of *P. magnus*. The Captain Jones referred to is presumably Captain (later Admiral) Theobald Jones (1790–1868), a well-known Irish fossil collector. Five tooth plates from County Armagh, Northern Ireland, in the collections of the British Geological Society in Keyworth, England, match the five in the watercolor and are cataloged as being from the Jones Collection. One of the five tooth plates has been selected as a lectotype, the other four becoming paralectotypes. Knowledge of the type series and the designation of a lectotype serves to better define the species *Psephodus magnus* and, by extension, the genus *Psephodus.*

Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

Quaternary herpetofaunas from Wisconsin, USA, reveal non-analog small vertebrate communities at glacial and boreal boundaries

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Northern Quaternary fossil microvertebrate faunas are poorly documented in North America. This is especially true of herpetofaunas near the Great Lakes, where glaciers, changing coastlines, and collecting biases create barriers to interpreting past communities. Clarifying the detailed nature of environmental change in northern ecosystems from Pleistocene–Present, where many species exist near the periphery of their distributions in oft-disconnected microhabitats, is critical to the conservation of environmentally sensitive organisms and would provide a unique opportunity to explore the stability of herpetofaunas in dynamic paleoenvironments. Here, I apply community-level climate envelopes for temperature and precipitation in a novel way to predict biomes for previously undescribed microvertebrate herpetofaunal records in Wisconsin (WI), providing a window into Quaternary northern community-environmental dynamics over the past 17,000 years.

I have identified at least 8 taxa of reptiles and amphibians (>200 specimens) from the most notable microvertebrate-bearing localities in WI, including the Pleistocene Moscow Fissure (17,050 BP) and the Holocene Lost River Sink (3,970–2,720 BP) in the Driftless Area of southwestern WI, and the Holocene Brussels Hill Pit Cave (8,043–626 BP) from the karst of northeastern WI. Each site contains extant genera, primarily of snakes and anurans; however, both Moscow Fissure and Brussels Hill contain at least one taxon that is either extirpated from the area today (e.g., *Anaxyrus cognatus* and *Regina* sp., respectively), or in novel combinations relative to their present

microhabitats. This mirrors the small mammal communities of these localities, which preserve unique combinations of boreal and non-boreal taxa and records extirpations of taxa such as *Phenacomys*.

My climate envelope models compare this fossil data to present herpetofaunas using modern congeners, demonstrating a gradual but salient shift away from boreal and boreal-influenced biomes in the region, including areas of attempted boreal tree management in present-day WI. Altogether, these results highlight surprisingly complex shifts in small vertebrate faunas in concurrence with ongoing environmental change trajectories in the Great Lakes region since the Late Pleistocene and emphasize microhabitat management as an important but historically overlooked factor in the stewardship of functional diversity and ecosystem resilience at broad scales.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A unique troodontid (Theropoda: Troodontidae) from the Upper Cretaceous of the San Juan Basin, New Mexico, and its implications for troodontid systematics and Late Cretaceous theropod communities

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The San Juan Basin is important for our understanding of dinosaur communities and ecosystems in North America during the Late Cretaceous. An isolated left frontal from the upper Campanian Kirtland Formation (De-na-zin Member) of New Mexico was originally identified as a putative species of dromaeosaurid (Dromaeosauridae) theropod, "*Saurornitholestes*" *robustus*. Subsequent work found it to represent a troodontid (Troodontidae). A reassessment of the holotype specimen shows there are distinctions with its morphology compared to other troodontids, including its dimensions, as well as features of the suture surfaces, among others. The specimen represents a growing number of more robust troodontids in North America during the Late Cretaceous. It also represents the oldest member of a clade of these robust-skulled troodontids, with younger members found in Coahuila, Mexico, and Alberta, Canada. Gracile North American troodontids have thus far been recovered from older strata from Utah north to Alaska, although the Alaskan records potentially represent the youngest occurrence of these troodontids, and may have overlapped with robust forms in Alberta. While North American theropod communities during this time share many of the same groups (e.g., tyrannosaurids, ornithomimids, caenagnathids, dromaeosaurids, troodontids), the composition of these can vary, both in their diversity and disparity. Even faunas with robust-skulled troodontids show significant variation, resulting from complex movement/migration and evolutionary patterns between different groups, regions, and ecosystems. The recognition of a distinct, large robust-skulled troodontid also increases the known diversity of theropod dinosaurs from the southern United States and provides further evidence for dinosaurs that are unique to the Kirtlandian faunas of New Mexico during the Late Cretaceous.

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

The early evolution of the reptile ear revealed from the Permian stem reptile *Araeoscelis*

Kelsey Jenkins[1], Hans-Dieter Sues[1]
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Tympanic hearing evolved in the reptile stem lineage by at least the Middle to Late Permian. However, the incipient phases of tympanic hearing have not yet been supported by fossil evidence. To investigate the early phases of tympanic hearing, we used μCT on an undescribed specimen of the Early Permian stem reptile *Araeoscelis*. Our segmentations reveal new aspects of the braincase that may indicate the presence of an incipient tympanum in this taxon, supporting early hypotheses that tympanic hearing may have originated in the earlier phases of the Permian. Furthermore, we demonstrate that the jugal is a

triradiate structure, confirming that this species has diapsid ancestry. Our phylogenetic analyses of 182 OTUs and 698 fully illustrated characters recover Araeoscelidia as a clade, although it may or may not include *Spinoaequalis schultzei*. Our parsimony analyses also support a sister group relationship between Archosauria and Testudines, forming Archelosauria, indicating convergence between molecular and morphological phylogenetic datasets. Depending on the correct phylogenetic interpretation, this could signal an independent evolution of an incipient tympanum in the Permian or reveal the early anatomical phases of tympanic hearing along the reptile stem lineage leading to crown reptiles. Together, these results support the hypothesis that selective pressures favoring airborne sound detection influenced reptile ear evolution earlier in the Permian than previously recognized.

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

The stem reptile *Eunotosaurus africanus* (Sauropsida: Millerettidae) and the phylogenetic origin of turtles

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The evolutionary origins of turtles remain poorly understood due to their highly modified body plan, which includes a superficially primitive anapsid skull as well as shoulder and pelvic girdles that are integrated into a bony shell consisting of a carapace and plastron. Molecular systematics posit a sister relationship between turtles and archosaurs (forming Archelosauria), but morphological studies return conflicting hypotheses of turtle relationships both to other living reptiles and their closest fossil relatives. The middle Permian *Eunotosaurus africanus* of southern Africa had been recently regarded as the oldest stem turtle, making it instrumental in modern discussions of the origins of turtles and their highly transformed anatomy. Here, we use anatomical observations derived from X-ray macro-computed tomography (*μ*CT) of *Eunotosaurus*, candidate stem turtles, and some of the earliest known Pantestudines to evaluate phylogenetic hypotheses of turtle origins. Our data show that *Eunotosaurus* bears numerous plesiomorphies that are absent in Reptilia whereas the braincase of *Proganochelys* (Late Triassic, Germany) one of the oldest uncontentious stem turtles, shares similarities with other crown reptiles including archosauromorphs, especially in the endocranium. More crownward turtles such as *Kayenetachelys* (Early Jurassic, Arizona), however, lack many of these crown reptile and archosauromorph features, which we hypothesize to be related to the drastic reorganization of the adductor musculature and its insertion on the otic capsule, and the evolution of neck retraction. Furthermore, we show that *Eunotosaurus* shares with other millerettids the presence of T-shaped ribs and a secondary closure of an upper temporal opening during ontogeny. A comprehensive phylogenetic analysis, which incorporates all fossil reptile groups previously hypothesized to be stem turtles (including Captorhinidae, Procolophonidae, Pareiasauria, and Sauropterygia), recovers *Eunotosaurus* as a derived millerettid stem reptile, with little relevance to turtle origins. We find strong anatomical support for the molecular phylogenetic hypothesis of Archelosauria, providing new insights into the transformations involved in the origins of the distinct turtle body plan from a “protorosaur-like” ancestor.

Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

Multiple individuals of the giant theropod *Zhuchengtyrannus magnus* from Campanian

Shandong, China, support Asian origin of the *Tyrannosaurus* lineage

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Zhuchengtyrannus magnus is a giant tyrannosaurid from Shandong Province, China, near the transition between the Xingezhuang and Hongtuya Formations, and has been recovered as one of the closest Asian relatives of *Tyrannosaurus* together with *Tarbosaurus bataar*. *Zhuchengtyrannus* provides a rare giant Asian data point immediately relevant to the ancestry of *Tyrannosaurus*, bridging anatomical and biogeographic gaps between Asian and North American tyrannosaurines. However, *Zhuchengtyrannus magnus* was originally described only from an associated maxilla and dentary, limiting phylogenetic and evolutionary study.

Here, we report previously undescribed material referrable to *Zhuchengtyrannus*, including appendicular elements associated with the holotype and cranial, axial, and appendicular remains from the Zangjiazhuang and Kugou quarries. The combined sample represents a minimum of four individuals, both adult and juvenile, offering the first opportunity to study *Zhuchengtyrannus magnus* across multiple skeletal regions and ontogenetic stages. Preliminary parsimony and Bayesian analyses incorporating this material suggest close relationships between *Zhuchengtyrannus* and *Tyrannosaurus* (e.g., posterior probability = 0.81, Fossilized Birth-Death model).

Newly described elements include a dorsal centrum, proximal part of a femur, and a maxilla. Direct comparisons reveal that *Zhuchengtyrannus* elements from at least two individuals substantially exceed the size of any known *Tarbosaurus* material, and bracket linear dimensions of homologous elements in *Tyrannosaurus* adults. Scaling from allometric mass estimates of *Tyrannosaurus* yields masses of 8,000+ kg, 10,000+ kg from scale-calibrated and rearticulated 3D skeletal scans, and 0.8–0.9 times the mass of large *Tyrannosaurus* adults from all methods including scaling from rigorous 2D skeletal reconstructions.

The new material establishes *Zhuchengtyrannus magnus*' full size and supports proximate phylogenetic affinity with *Tyrannosaurus*, showing that extreme tyrannosaurine gigantism was already established in eastern Asia by the Campanian. Multiple *Tyrannosaurus*-sized individuals in the Wangshi Group strengthen the case that Asia was a major center in the evolution of late-diverging gigantic tyrannosaurines and are consistent with Asian roots for the *Tyrannosaurus* lineage before its final ecological dominance in Laramidia.

Technical Session XIV: Return of Reptile'O'Rama: Triassic time (Friday, November 13, 2026, 1:45 PM)

Stepwise establishment of the modern-type marine ecosystem after the end-Permian mass extinction

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Paleozoic marine ecosystems formed in the Cambrian are characterized by flourishing invertebrates. Arthropods, cephalopods, and fish occupied high trophic levels, and vertical nutrient flows from top to bottom were driven by physical turbidity and gravity flows. The end-Permian mass extinction, associated with drastic global

paleoenvironmental and paleoclimatic changes, caused the collapse of these Paleozoic ecosystems followed by the establishment of a more modern-type of ecosystem. In this new ecosystem, the terrestrial air-breathing tetrapods became the top predators both on land and in the marine communities, and there was a transition of fishes and invertebrates towards more modern groups. The Early Triassic Chaohu Fauna (248.81 Ma) yields the oldest fossil records and the most basal ichthyosauriforms, primitive ichthyopterygians, and eosauropterygians. The younger Nanzhang-Yuan'an Fauna (about 247.2 Ma) yields diversified ichthyosauromorph hupehsuchians and primitive ichthyopterygians. These two earlier faunas represent the beginning of the new ecosystem with the terrestrial tetrapods invading the seas. The Middle–Late Triassic Guizhou marine reptile faunas collectively document successive sequences of the modern-type marine ecosystem driven by reptiles becoming the predators. The initial phase of development is represented by the early Middle Triassic Panxian Fauna (244 Ma) with small-medium bodied predators and four trophic levels. The subsequent rapid radiation and expansion evidenced by the late Middle Triassic Xingyi Fauna (240 Ma) is characterized by five trophic levels and large bodied mega-apex predators present (large ichthyosaurs and pistasaurs) together with small to medium body-sized euichthyosaurs, nothosaurs, placodonts, thalattosaurs, thalattosaurs, sharks, and bony fish together with conodonts and abundant invertebrates and nannofossils. Some marine reptile clades had the capacity for oceanic cruising and deep diving. Finally, the early Late Triassic Guanling Biota (237–235 Ma) marks the stabilized oceanic and modern-type ecosystem which extended globally. This is a truly complex modern-type oceanic ecosystem, with five trophic levels and with large ichthyosaurs as mega-apex predators. Specific species of marine reptiles occupied at least two trophic levels. Nannofossils bloomed, and vertical nutrient flows were driven by a "bio-pump" whereas the earlier ecosystems, including that in Spitzbergen, probably were not.

Funding Sources: National Natural Science Foundation of China Grant 42572002 and 41920104001

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Neoteny in pygmy mammoth molars from the Pleistocene of the Channel Islands, California

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Neoteny consists of changes in developmental timing, where the features of juveniles are retained into reproductive adulthood. This has been documented in a number of examples of dwarfing in fossil mammals, such as the limb proportions of the Pleistocene dwarf hippos in islands such as Madagascar, Sicily, and Cyprus, or the dwarf rhinoceroses of the Miocene of the Texas Gulf Coastal Plain. However, these same hippos and rhinos reduce the size of their molars while maintaining the same cusp morphology and crown pattern without changing anything but size. We examined the third molars (M3/m3) of the pygmy mammoths, *Mammuthus exilis*, from the Pleistocene of the Channel Islands, south of Santa Barbara, California. Pygmy mammoth molars are not only much smaller in length and width but have thicker individual plates as well as statistically significant lower plate counts as they reduced their tooth size, resulting in a higher Lamellar Length Index (LLI) and higher Lamellar Frequency (LF). These variables are helpful in distinguishing mammoth species, with LLI helping to compare the number of lamellae present and the distance between them in a molar while taking into account the size of the molar. LF helps differentiate species from each other based on the number of lamella present in 100 mm across the crown. In most of these variables, they are statistically distinct compared to nearly all North American mammoths. The reduction in number of plates is neotenic, because the adult molars of *Mammuthus exilis* have the typical number of plates (typically 14, rather than 17–18) found in juvenile molars (dP4/dp4 or M1/m1) of the much larger Columbian mammoths, *M. columbi*. This is comparable to the Mediterranean dwarf mammoths of Crete and Cyprus (*Palaeoloxodon falconeri* and *P. cypriotes*),

which lose a few plates in their adult M3/m3. The dwarf woolly mammoths (*M. primigenius*) of Wrangel Island north of Siberia do not lose plates. Other examples of dwarfing in insular mammoths show no consistent pattern in molar change, so there is no requirement that the adult molars lose plates in response to getting smaller. Even though there is neotenic change in the molars of *Mammuthus exilis*, the changes in limb proportions of these same mammoths show simple isometric size reduction, not the allometrically thicker limbs that dwarfed hippos and rhinos develop.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Fossil identification as a diagnostic act: adapting clinical confidence-calibration assessment to a single-session smartphone 3D fossil workshop for high school students

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Paleontology outreach increasingly uses photogrammetric 3D fossil models but typically supplies premade specimens and measures only enjoyment or self-reported confidence. We instead treated fossil identification as a diagnostic act—reading anatomical features to commit to a determination—and asked whether a single three-hour workshop could teach it, and whether students' confidence was calibrated to their accuracy, a construct imported from medical diagnostic-reasoning education and not previously applied in paleontology outreach. Twelve high school students from a STEM club worked on-site at the Western Science Center (Hemet, California), which houses dinosaurs from the Upper Cretaceous (Campanian) Menefee Formation of New Mexico. Using free smartphone applications, each student captured overlapping imagery that was reconstructed into interactive 3D models on a shared open-access viewer. Each then identified the same three taxa—the tyrannosaurid *Dynamoterror dynastes*, the nodosaurid ankylosaur *Invictarx zephyri*, and the brachylophosaurin hadrosaur *Ornatops incantatus*—committing to an identification, justifying it by diagnostic features, and recording confidence (high/medium/low) before scoring against a key.

Across 36 identification attempts, 30 (83%) were correct, and the errors were doubly structured. Taxonomically, the theropod *Dynamoterror* was identified correctly by every student; all six errors instead involved discriminating the two herbivorous ornithischians—the armored *Invictarx* from the crested *Ornatops*. By confidence, low-confidence attempts were correct only 1 of 3 times, while all four high-confidence errors came from just two students—localizing overconfidence (high certainty, low accuracy) to specific individuals, the failure mode that calibration assessment is built to detect and enjoyment-only surveys miss. Overall, 9 of 12 students (75%) identified all three specimens correctly.

This recasts fossil identification as a teachable diagnostic skill, imports confidence calibration as an outcome measure new to paleontology outreach, and positions students as generators rather than consumers of 3D specimens. The single-session, smartphone-based design is low-cost and scalable—a reusable template for natural history museums and a model for porting diagnostic-reasoning pedagogy into geoscience education.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

A bat in marsupial clothing? Taxonomic reinterpretation of *Ghamidtherium dimaiensis* (Late Eocene, Egypt)

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Ghamidtherium dimaiensis, originally described from lower dentition as a marsupial from the late Eocene (~37 Ma) Birket Qarun Locality 2 (BQ-2) of Egypt's Fayum Depression, has remained taxonomically problematic since its discovery. We present morphological, geometric morphometric, and phylogenetic evidence demonstrating that *G. dimaiensis* is synonymous with *Aegyptonycteris*

knightae, an archaic bat described from upper dentition at the same locality. Detailed occlusal analysis confirms that the lower molars attributed to *Ghamidtherium* and upper molars of *Aegyptonycteris* represent complementary elements of a single chiropteran species. Geometric morphometric analysis of lower first molar shape places *G. dimaiensis* firmly within omnivore morphospace, clustering near the extant bat *Phyllostomus hastatus* and fossil mystacinids. Phylogenetic analysis of 284 dental and mandibular characters recovers *G. dimaiensis* in a basal polytomy with *Khonsunycteris aegypticus*, both diverging before all other sampled Eocene bat families including Philisidae, Necromantidae, and Palaeochiropterygidae. This position validates Aegyptonycteridae as a distinct family-level clade with no close relationship to other recognized bat families. The recognition of *G. dimaiensis* as a large-bodied omnivorous bat confirms that dietary diversification in Chiroptera was underway by the late Eocene, with omnivory evolving independently in this early-diverging African lineage. This revision not only resolves a long-standing taxonomic puzzle but also reveals greater ecological complexity in late Eocene bat communities of Afro-Arabia.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Craniocervical and hindlimb measurements distinguish feeding function in spinosaurids and other archosaurs

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Spinosaurid theropods have particularly low and narrow jaws, subconical teeth, long and strong manual unguals, and a marked S-curved neck in neutral pose. Spinosaurids have been compared to wading waterbirds that share many of these cranial and neck features. Recently craniocervical (head + neck) and hindlimb lengths were analyzed with principal cordinate analysis (PCA), positioning spinosaurids in proximity to semiaquatic wading and diving birds. Few studies, however, have attempted to discern a quantitative relationship between craniocervical form and feeding function.

The present study focuses on the form of the occipital region as key to infer craniocervical kinematics in relation to inferred feeding function. New measurements estimate the length of neck muscles from insertion sites to the occipital condyle (in-lever arms), which control head + neck movements. Other measurements capture out-levers from the condyle to the centers of mass of the head, and hindlimb length was also incorporated. A wider range of taxa were considered including non-spinosaurid theropods, crurotarsal archosaurs, phytosaurs, and several extant birds, crocodilians and varanids.

Craniocervical moment arms increase separation many subgroups in the study, suggesting that a correlation exists between skull form and craniocervical kinematics. Spinosaurids and long-necked water birds converge on having relatively narrow and gracile crania, elongate necks, and enhanced ventroflexor moment arms to facilitate ventral movement of head and neck. Brevirostrine taxa (tyrannosaurids, crurotarsal archosaurs, carnivorous avians) share morphospace with greater cranial height, transversely expanded occiput, and greater dorsiflexor and lateroflexor moment arms. Spinosaurids resemble longirostrine water birds that have longer necks relative to leg length, which is opposite brevirostrine taxa with relatively shorter necks and longer leg length.

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Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Investigation on how American institutions train volunteers in fossil preparation

Michael Jones[1]
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Fossil preparators are a crucial component in paleontological research, utilizing a unique skill set to expose fossils while minimizing damage. However, there is currently no standardized fossil preparation training program in the United States. Most individuals learn fossil preparation through active learning and informal instructions. Standardized training could professionalize fossil preparation, reduce conflicting instruction, and establish consistent ethical and technical expectations. This project investigated how institutions in the United States train volunteers in fossil preparation with the goal to identify common themes in the training process. Four aspects were examined: 1) specific training steps, 2) desirable qualities, 3) methods to assess performance, and 4) personal experience in fossil preparation training. The answers from institutions varied from one another, but there were common themes identified that can aid in developing a standardized training program for fossil preparation. Data were collected through a voluntary Google Forms survey distributed to fossil preparation labs in the United States. A total of 117 institutions were compiled, along with contact information for lab managers after online searching. The survey consists of four short-answer questions addressing the training steps, desirable qualities, performance assessment methods, and personal training experiences. The responses were compiled and categorized in Microsoft Excel to identify common themes. A total of 29 institutions responded to the survey. Although training methods varied widely, common themes emerged. The most frequently mentioned training step was learning manual and pneumatic tools usage. Patience was commonly mentioned as a desirable quality, suggesting successful volunteers can consistently perform careful, quality work for a long-term project. The two common assessment methods mentioned were direct observation of whether volunteers applied basic preparation skills correctly and evaluation of completed projects. Many respondents described receiving training independently through trial and error with limited formal guidance. The results demonstrate considerable variation in fossil preparation training across institutions while also revealing shared practices and expectations. These findings provide an initial overview of current training methods and may help support the future development of a standardized training framework for fossil preparation.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Taphonomic history of an 18th century landscape on the Southern High Plains

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Whiskey Flats is a mid-18th-century archaeological site located within Mustang Draw on the Southern High Plains of Texas. The site is composed of two areas. Area 1 is now a dry pond (historically known as Mustang Pond) and consists of a modern bison (*Bison bison*) and mustang (*Equus caballus*) bonebed dated to 194 ± 20 ^{14}C BP (~1756 AD). Area 2 is a terrace adjacent to the pond that represents a drier environment where bison and horse bone also were recovered. Historic objects from Area 2 indicate contemporaneous occupation with Area 1. Taxonomic assessment and taphonomic analysis have been used to interpret paleoecological conditions at the time of deposition and to reconstruct the taphonomic history that led to the accumulation of the vertebrate assemblage. A total of 2,167 vertebrate specimens have been identified and 2,697 were analyzed in terms of taphonomy. Results indicate that the deposit represented a typical historic grassland fauna that portrays a very different biotic community from that of today. Taphonomic agents that affected the assemblage have been identified that reflected differing environmental conditions in Areas 1 and 2. Ultimately, results indicate that the character of the draw and the pond have changed over time, directly impacting the composition of the modern biotic community. Broadly, analysis of the assemblage expands the understanding of the ecological community of the Southern High Plains during the 18th century and the landscape and fauna of the Southern High Plains during the latest Holocene.

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Land of giants: diversity and paleoecology of Eocene North African bats

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Middle and late Eocene bat faunas of North Africa are incredibly diverse, especially in light of the sparse bat fossil record on most other continents. Currently, at least seventeen genera are known from the Eocene of North Africa, representing nearly two dozen species. Although many of these species have been considered to be early representatives of crown bats, particularly members of the living superfamily Vespertilionoidea, recent analyses suggest that most African bats from the Eocene belong to stem lineages. These include the endemic African family Philisidae, represented by three or four genera spanning the Eocene and early Oligocene, and a *Vespertiliavus*-related clade which may have dispersed from Africa into Europe during the early middle Eocene. Particularly notable are the large sizes of many taxa—at least three lineages (i.e., Aegyptonycteridae, Necromantidae, Philisidae) attained body masses comparable to some of the largest living animalivorous bats. Molar areas of such taxa as *Ghamidtherium dimaiensis* (Aegyptonycteridae), *Witwatia schlosseri*, and *Witwatia* sp. nov. (Philisidae) are equal to or greater than that of the living spectral bat, *Vampyrum spectrum*, the largest extant bat that does not feed on fruits. Existing regression equations used to calculate bat body mass did not include representatives of giant animalivorous bats in their sample, however. This, together with a regression approach that renders larger species less influential during curve fitting, may have produced equations that consistently underestimate the sizes of these large Eocene species. To evaluate the dietary ecology of these North African bats, we used geometric morphometrics to compare their dentition with those of living bats with known diets. Our results suggest that bats had diversified into many of the dietary niches they exploit today by the middle Eocene. *Ghamidtherium dimaiensis* clusters with dedicated omnivorous bats in analyses of both upper (M1-2) and lower (m1) dentition, whereas species of *Witwatia* cluster with living piscivorous bats. Contrary to expectations, both *Necromantis* (Necromantidae) and *Saharaderma* (Megadermatidae) cluster with insectivorous bats rather than terrestrial vertebrate specialists. This suggests that dedicated carnivory may have been among the last dietary specializations to evolve in bats.

Funding Sources: Arizona State University School of Life Sciences

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Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

Brevirostry in tetralophodont gomphotheres from the Siwaliks with comments on the diversity of tetralophodonts in the region

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Tetralophodont gomphotheres, i.e., ones with intermediate cheek teeth (D/dp4, M/m1, M/m2) with four loph(id)s exhibiting no anancoidy are known from the Late Miocene of the Siwalik Group in South Asia. Three taxa have been named: *Paratetralophodon hasnotensis*, *Tetralophodon punjabiensis*, and *Tetralophodon falconeri*. These taxa are known from several dental remains and three referred crania. Two figured mandibular symphyses and a nearly complete but never before figured or described mandible from what is now Pakistan were originally referred to the derived brevirostrine gomphothere *Anancus perimensis* but were later transferred to *T. punjabiensis* by Lydekker. However, others have more recently reclassified all three as *Anancus.* Without associated dentition, though, any referral of these mandibular symphyses to a tetralophodont gomphothere or *Anancus* is tentative at best. The nearly complete mandible, GSI A84, preserves both left and right third molars, and a complete symphysis allowing us to make inferences about the taxonomic identity of this specimen. We

studied GSI A84 and other cranio-dental remains of Siwaliks tetralophodonts. The teeth of GSI A84 have six lophids with both pre- and posttrite trefoils, little cementum in between lophids, no anancoidy, and are relatively high-crowned. Dentally, it is most similar to the lectotype of *T. punjabiensis*, and to *P. hasnotensis*, strongly suggesting that it is a tetralophodont gomphothere and not *Anancus,* where even the most primitive members exhibit alternating dental loph(id)s. In contrast to other tetralophodont gomphotheres in Eurasia, the symphysis is short, with a deep spout, and lacks tusks. Remarkably, this Siwalik tetralophodont has achieved true brevirostry like derived elephantids and stegodontids. A third skull, YPM 19838, has a much higher cranial vault, antero-posteriorly compressed cranium, upper tusks without enamel bands, and massive tetralophodont upper second molars and a likely pentalophid third molar with thick enamel, and undifferentiated lophids. This morphology is markedly different from two other skulls referred to *P. hasnotensis*. It broadly resembles giant tetralophodont gomphotheres within the enigmatic "*Mastodon grandincisivus*" group. Therefore, it is clear that Siwalik tetralophodonts achieved brevirostry independently from *Anancus*, and South Asia during the Late Miocene was home to a diverse assemblage of elephantoids including multiple lineages of tetralophodonts.

Funding Sources: Florida Museum of Natural History and the University of Florida

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Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Identification of Dimorphism in the *Tenontosaurus tilletti* Hypodigm

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Tenontosaurus is a geographically widespread genus of ornithopod dinosaur from the Early Cretaceous (Aptian–Albian) of North America represented by an unusually large sample of well-preserved skeletal materials. More than 30 specimens attributed to *Tenontosaurus tilletti* have been collected from the Cloverly Fm of Montana and Wyoming and the Antlers Fm of Oklahoma. By contrast, a second species from the Twin Mountains Fm, *T. dossi*, is known only by two specimens from Texas. Prior authors noted morphological and spatiotemporal variation within *T. tilletti* specimens, but this variability has not yet been quantitatively assessed. We performed a pairwise dissimilarity analysis of discrete and continuous characters of the ilium, an element that suffers minimal distortion, is phylogenetically informative, and is commonly preserved. Our analyses comprise 11 specimens restricted to the Cloverly Formation of Montana for geographic and temporal control. Characters were sampled from published diagnoses of *T. tilletti* and *T. dossi*, phylogenetic character matrices, and personal observations of physical and 3D surface scan material. We accounted for size in continuous traits by standardizing measurements relative to iliac height above the acetabulum, rejecting ontogeny as a source of observed clustering. A principal coordinates analysis using the Gower Index recovered two morphotypes of this element clustering in the biplot of axes 1 and 2. Morphotype A is characterized by a low, slightly sinuous dorsal margin, with an anteriorly oriented preacetabular process. Morphotype B consists of a postacetabular process that prominently rises into a hump and corresponds with a more ventrally deflected preacetabular process. Both morphotypes are found within the upper Himes Member of the Cloverly Fm (~103–98 Ma), rejecting population-level morphological fluctuations or temporally distinct species. Instead, this may support either sexual dimorphism in *T. tilletti* or the presence of a cryptic contemporaneous species within the hypodigm. To further test these hypotheses, we will expand the dataset to include specimens from Oklahoma and test larger suites of skeletal characters. Nonetheless, our findings of morphological clustering within one of the most commonly recovered herbivorous dinosaurs of the Early Cretaceous of North America demonstrate the value of applying quantitative analyses to fossil-

rich hypodigms to test taxonomic frameworks and explore potential dimorphism.

Funding Sources: National Science Foundation (2448142) to LEZ and TAG, James and Dorothy Doss Foundation to TAG

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A pathological fossil dentary of *Crotaphytus bicinctores*: potential implications for behavior

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Pathological bone tissue represents an important source of intraspecific variation by preserving evidence of trauma, disease, and subsequent healing. These abnormalities can reveal aspects of survivorship, physiology, and behavior rarely preserved in the fossil record. Although paleopathological investigations have contributed substantially to our understanding of mammals and dinosaurs, comparable studies of fossil squamates (lizards) remain uncommon and therefore their potential to inform life history and behavior remains largely unexplored.

Squamate cranial pathologies are of particular interest as they may record evidence of mastication, prey manipulation, or intraspecific combat. Such abnormalities are frequently reported in the mandible because it is subjective to substantial mechanical strains. Here, we describe a pathological fossil dentary of the iguanian lizard *Crotaphytus bicinctores*, recovered from a late Pleistocene–Holocene assemblage in Tubafore Cave within the House Range, western Utah. The specimen preserves a nearly complete hemimandible with an irregular bony expansion on the ventrolabial surface of the anterior dentary. Macroscopic examination and micro-computed tomography (μCT) were used to characterize the lesion. Transverse μCT slices were used to evaluate internal morphology, and comparative μCT analyses using a non-pathological specimen of the same species were used to distinguish abnormal morphology from normal anatomical variation. A hypothesis-driven differential diagnosis was constructed based on comparisons with known pathologies. Hypotheses include traumatic injury with reactive periosteal deposition, osteomyelitis, enthesopathic remodeling, and benign osteogenic growth.

μCT analysis revealed complex internal architecture characterized by a honeycomb-to-swirl-like pattern that is inconsistent with non-pathologic trabecular organization. Cortical continuity is maintained, with no evidence of alveolar destruction or tooth displacement. Although the precise etiology is not definitive, the morphology is most consistent with healed chronic osteomyelitis or healed traumatic fracture. Extensive remodeling and structural preservation suggest prolonged survival following injury or disease development. Because extant *Crotaphytus* exhibit territorial displays and aggressive intraspecific behavior, traumatic injury associated with combat cannot be excluded as the origin of the pathology.

Funding Sources: National Geographic Society, Committee Research & Exploration grant (NGS-60955R-19); University of Utah Interdisciplinary Exchange, Utah Science (NEXUS) grant

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Technical Session IX: Archosaur paleobiology & pterosaurs (Thursday, November 12, 2026, 1:45 PM)

Pedal phalanges proportions in archosaurs are constrained by body size and reach adult proportions in the embryo

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Phalangeal size proportions in tetrapod digits universally vary from more equal-sized to a decreasing gradient. Birds are an exception due to the elongate distal phalanges found in some arboreal and raptorial taxa. This larger variational range suggests a relaxed constraint on phalangeal proportions novel to birds. To test this assumption in the ancestors of birds, we assessed the range of

variation exhibited in the fourth pedal digit of 19 non-avian theropod dinosaurs. From a clustering analysis, we found that pedal phalangeal proportions of non-avian dinosaurs fall almost exclusively within the range of ground dwelling, non-perching birds. However, some smaller theropods sampled fall within the range of perching birds. Our results suggest that while the developmental capacity to produce a wider range of proportions exists in non-avian dinosaurs, elongation of distal phalanges in terrestrial taxa is rare and found only in the smallest species. Body size strongly predicts phalangeal proportions in theropods, but not in ornithopod dinosaurs and birds. This association suggests that large body size constrains pedal phalangeal proportions and that the origin of flight played a key role in lifting these constraints, facilitating an expansion in the range of variation available to birds. Further, we report that in living archosaurs, phalangeal proportions are fixed early in development in the pre-hatch embryo, and proportions do not change as they grow. The lack of allometric change means that phalangeal proportions can be informative for interpreting dinosaur fossil identity and ecology.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Quartz ESR signal provinces for correlating Upper Cretaceous and Paleogene successions of the Gobi Desert, Mongolia

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Upper Cretaceous and Paleogene continental deposits of the Gobi Desert, Mongolia, have yielded exceptionally well-preserved vertebrate fossils, yet the stratigraphic relationships and spatiotemporal distribution of these fossil-bearing successions remain poorly constrained because they lack widely applicable chronostratigraphic markers. A more robust correlation framework is needed for evaluating the temporal and geographic structure of these vertebrate fossil assemblages. This study assesses whether quartz electron spin resonance (ESR) characteristics, particularly oxygen-vacancy and Al-center signals, can help correlate these discontinuous continental strata. Oxygen-vacancy and Al-center signals showed clear but different regional patterns. Oxygen-vacancy values were generally higher in Upper Cretaceous and Paleogene strata of the eastern Gobi region than in Upper Cretaceous successions of the southwestern and central regions, whereas Al-center signal intensities were generally higher in the southwestern Upper Cretaceous strata. Mixed-effects models and Tukey's honest significant difference (HSD) tests supported significant regional differences in these signals. On the basis of oxygen-vacancy values, the studied successions can be grouped into two ESR signal provinces: the Southwest-Central Gobi Province and the East Gobi Province. Al-center signatures further distinguish Southwest Gobi and Central Gobi subprovinces within the Southwest-Central Gobi Province. These patterns may primarily reflect differences in sediment provenance, although contributions from reworked quartz grains cannot yet be excluded. The resulting ESR signal framework does not directly correspond to the previously proposed formal lithostratigraphic or chronostratigraphic units, but it provides a practical basis for organizing discontinuous exposures by source-related quartz characteristics. Integrating these ESR signatures with independent U–Pb constraints from calcite and apatite in vertebrate bones, teeth, eggshells, and caliche should improve chronostratigraphic correlation across the Gobi Desert.

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Testing for habitat partitioning in dinosaurs from the Upper Jurassic Morrison Formation of western North America using the Paleobiology Database

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The Upper Jurassic Morrison Formation of western North America has produced a diverse dinosaur assemblage, containing many different species that are suspected to have coexisted by habitat partitioning. A previous study found family-level preferences in dinosaurs for fluvial channel vs. floodplain paleoenvironments in various formations from the Upper Cretaceous of western North America, but few studies have tested for this pattern in the Morrison Formation. In this study, I used $\chi 2$ tests on a large dataset (n = 288) of Morrison Formation dinosaur occurrences downloaded from the Paleobiology Database to investigate preferences for habitats associated with fluvial channels. Occurrences were divided into two broad paleoenvironmental categories within the Morrison Formation fluvio-lacustrine beds: "channel" and "floodplain." Assignments to each category were made using a combination of paleoenvironmental notes and lithology descriptions compared with known lithofacies. Only occurrences labeled as autochthonous or parautochthonous were included in the dataset to avoid errors induced by postmortem transport. Dinosaur occurrences were sorted into taxonomic bins down to the family or sub-family level, when sample size allowed. Preliminary results showed that among the taxonomic groups with sufficient sample size (≥5 per paleoenvironmental category), only diplodocine sauropods significantly preferred channels ($p = 0.04$), while apatosaurines and all other dinosaur groups had no significant preference. This pattern persisted after correcting for historical bias by removing occurrences that were collected before 1940 A.D., as well as after removing bonebeds (predominantly in channel facies). Previous paleobotanical studies of the Morrison Formation have suggested that riparian areas were forested while floodplains had open vegetation. The preference of diplodocines for channel facies thus may contradict previous suggestions of open-habitat, non-selective browsing based on skull morphology and dental microwear. The lack of channel vs. floodplain preferences in other dinosaur groups, despite vegetational differences between these habitats, is surprising, but corroborates previous field studies of Morrison Formation dinosaur distributions. Most Morrison Formation dinosaurs may have been ecologically flexible and occupied a range of habitats, or their patterns of niche partitioning may have been more complex than is detectable by broadscale lithofacies associations.

Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Industrial CT scanning the huge cranium of *Sarcosuchus imperator*

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A beautifully preserved adult cranium of the giant Early Cretaceous crocodyliform, *Sarcosuchus imperator*, was CT scanned at an industrial imaging facility to visualize its neuroanatomy, cranial airway, and other internal features. The cranium, weighing approximately 180 kg/400 lbs., is preserved in two parts, a main portion (~115 cm) and the snout end (~45 cm), separated by a natural fracture. During scanning, a turntable rotates and moves a maximum of ~76 cm vertically. The scanner, thus, accommodated the smaller snout end, but overlapping the images from two scan orientations was required for the larger main portion. The large cranial piece would need to be rotated 180°, or flipped, for a second scan for coverage of the entire specimen. To accomplish this safely, a two-part support shell was made using USG Hydrocal FGR95 with chopped fiberglass strand and burlap strips over a fitted polyethylene foam liner. Incorporated into this shell were braced plywood roller structures, which double as footplates at the wide posterior end of the skull to provide stable support in a vertical position during scanning. Roller structures at the anterior end of the skull shell double as bolting flanges to later reconnect to the snout section. The

shell flanges were bolted together, cocooning the cranial piece safely.

The shell was attached to, and surrounded by, a wooden rig that allowed flipping of the specimen using straps and a gantry crane chain hoist, the fossil, shell, and rig weighing 263 kg/580 lbs. (less than the 318 kg/700 lb. maximum for the turntable). Specialist riggers were hired to assist with the flipping of the skull during the scanning operation, which took more than eight hours. After the CT operation, the main and end sections of the cranium rest in their support shells that bolt together to juxtapose each in natural articulation.

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Large changes for small mammals: Biodiversity loss and climate shaped rodent ecology after the terminal Pleistocene extinction

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North American small mammal communities endured the terminal Pleistocene megafaunal extinction and post-glacial warming with minor taxonomic turnover. However, whether surviving rodents' ecological niches were conserved or shifted across these disturbances remains unclear. To characterize how small mammal communities persisted in situ, we examined fossils of ten micromammal taxa (*Geomys*, *Thomomys*, *Neotoma*, *Sigmodon*, *Microtus*, *Chaetodipus*, *Onychomys*, *Reithrodontomys*, and two *Peromyscus* morphotypes) throughout the 22,000-year record at Hall's Cave, Texas. Using a nested specimen-level design, we evaluated three niche axes from the same fossil record of micrommal mandibles and teeth: body size reconstructed from dental measurements (n = 5,667), bone-collagen $\delta^{13}C/\delta^{15}N$ isotopic niche (n = 2,792), and micro-CT-derived dental ecomorphology (n = 748). Thus, we tested whether niches were conserved through late Quaternary climate change and biodiversity loss or shifted in response to ecological disruption associated with the Pleistocene megafaunal extinction. Body size was the niche axis most consistently explained by climate, especially temperature, but body size changes for most taxa were better explained by models including extinction effects than by climate alone. Isotopic niches generally contracted from the Pleistocene to the Holocene, consistent with reduced habitat heterogeneity after megafaunal loss. However, isotopic niches were narrowest, and overlap lowest, during the post-extinction millennium, suggesting brief reduced potential competition before longer-term Holocene niche compression and greater overlap across taxa and within guilds. Dental ecomorphology revealed directional, taxon-specific shifts consistent with rapid adaptation, including opposing topographic relief/hypsodonty trajectories in *Sigmodon* and *Chaetodipus* and post-extinction increases in tooth "pointiness" in *Onychomys*. Micro-CT-derived identifications revealed multispecies coexistence and turnover within several genera, showing that dental shifts were not simply artifacts of genus-level species replacement. Together, our results show that apparent persistence of small mammals masked substantial ecological reorganization: megafaunal loss and the disappearance of mosaic habitats compressed niche space for surviving rodents, reshaping isotopic and dental ecomorphological niches in ways that illuminate the long-term consequences of modern defaunation in a warming world.

Funding Sources: UNM Gaudin and Grove scholarships, American Society of Mammalogists, Geological Society of America, Paleontological Society, & NSF DEB grant #1555525

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Vertebrate fossil diversity and faunal composition of the Late Cretaceous Coon Creek Formation

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The Late Cretaceous-aged Coon Creek Formation (CCF) of Tennessee is famous for its abundant and well-preserved mollusk-dominated invertebrate fossil assemblage. Vertebrate fossils have also

been reported from the formation since the early 20th century and are represented by specimens in museum collections across the eastern United States. However, scientific work on this material has largely been restricted to descriptive investigations of specific specimens or taxa. I compiled vertebrate occurrences from the CCF based on publications, museum catalog entries, collections visits, and online databases, comprising 65 discrete fossil occurrences spanning nine museum collections. In order to better understand how the vertebrate diversity and faunal composition of the CCF compares with contemporaneous formations, I aggregated records from Campanian and Maastrichtian localities across North America using the Paleobiology Database. This analysis reveals that the known CCF vertebrate fauna is dominated by reptiles including (in order of abundance) mosasaurs, turtles and crocodilians, and rare non-marine taxa such as dinosaurs and pterosaurs. Bony and cartilaginous fish are nearly as abundant as reptiles but often taxonomically indeterminate or identified only to course taxonomic level, obscuring a clear picture of fish diversity at the site. At the genus level, CCF records comprise only 13 taxa, substantially lower than most contemporaneous formations. It is unclear whether this depauperate diversity reflects genuine conditions or sampling biases. Future, systematic collecting of vertebrate fossils, including vertebrae microfossils, will likely be required to resolve this question. In terms of faunal composition, the CCF most closely resembles other regionally proximate formations from the Gulf Coastal Plain, including the Demopolis and Mooreville Formations. However, many CCF genera and families are shared with other Cretaceous marine formations of the Western Interior Seaway and the Atlantic Coastal Plain, suggesting a general pattern of biogeographic connectivity and cosmopolitanism across North American marine vertebrate faunas in the Late Cretaceous. These findings highlight the potential for future study of CCF vertebrate fossils, including abundant unpublished material and new fossil discoveries in the field, ideally supported with modern collection approaches and better contextual information than is generally available for historically collected material.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Don’t brush your teeth! A swab-based matrix removal technique for mammalian teeth from the Eocene Washakie and Bridger Formations

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The fossiliferous mudstone deposits of the Greater Green River Basin, including the Washakie Formation and Bridger Formation, are well known for yielding exceptionally preserved vertebrate fossils. While traditional mechanical preparation tools such as brushes, pin vises with carbide needles, and air scribes are effective for many preparation stages, they may be too aggressive for well-preserved dental surfaces where even minimal surface alteration can interfere with taxonomic identification and microwear analysis. This presentation introduces a swab-based matrix removal technique for delicate preparation of mammalian teeth. The technique employs various cotton applicators, including microblading swabs, pointed-tip swabs, and round-tip swabs, as precision tools for controlled matrix reduction under stereo microscope. Matrix removal is achieved by lightly moistening the swab tip with water and gently transferring softened matrix from the specimen surface onto cotton fibers through controlled contact. A subsequent pass using a dry swab tip can be applied to absorb excess surface moisture while collecting residual loosened matrix, maintaining fine control over hydration during preparation. By adjusting swab tip geometry, fiber density, and moisture level, preparators can optimize removal of softened mudstone while maintaining tactile feedback and visual control, reducing the risk of unintended surface damage during preparation. Using the same controlled swab-based approach, consolidants such as Paraloid® B-72 can also be selectively reduced or removed by applying solvents, such as acetone or ethanol, to the swab tip and gently contacting the treated surface, enabling localized cleaning without widespread solvent exposure. Case studies of Eocene mammalian specimens demonstrate that this technique is effective in revealing fine anatomical details, including dental morphology,

sutures, and surface microtextures that may be compromised by more aggressive mechanical methods. Cotton swabs of varying geometry and fiber density provide a low-cost, accessible supplement or alternative to conventional preparation tools.

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

From pixels to morphospace: interpretable deep learning reveals paleopopulation structure and evolutionary variation in Neogene horses (family Equidae)

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Quantifying morphological variation across space and time is central to paleontology, evolutionary biology, and systematics. This variation is inherently multidimensional, reflecting interactions among genetic, developmental, ecological, and functional constraints. It underlies both microevolutionary change within populations and macroevolutionary diversification across lineages. Species-level averages can obscure within-lineage variation. In contrast, analyzing paleopopulations preserves this signal. High-dimensional phenomic approaches can translate this variation into patterns that capture evolutionary signal while remaining biologically interpretable, provided they adequately represent the morphological complexity of the organism. The origin of *Equus* from *Dinohippus* remains a central and debated problem in vertebrate paleontology. Species-level analyses may mask population-level variation and transitional morphology critical to this transition. This study examines whether image-based, high-dimensional approaches better capture paleopopulation-level morphological variation over traditional landmark-based methods and whether they reveal structured transitions between *Dinohippus* and *Equus*. The study quantifies within and between group morphological variation in the occlusal surfaces of first and second upper molars in the basally branching *Equus simplicidens* and the closely related *Dinohippus mexicanus*, sampling distinct paleopopulations across multiple localities and stratigraphic intervals. Geometric morphometric analyses identify a suggestive transitional population of *D. mexicanus* from the Upper Bone Valley of Florida that overlap with an *E. simplicidens* population from the Hagerman Horse Quarry of Idaho. This same pattern is independently corroborated by both landmark-based and image-based machine learning approaches, supporting a true biological signal. Notably, the image-based model (~0.80) outperforms landmark-based GMM classification (~0.67) and exceeds the permutation-based null expectation (~0.38; $p < 0.0001$), indicating that CNNs capture morphological information beyond discrete landmarks. These results demonstrate that dental morphology reflects multidimensional variation. The resulting morphospace indicates continuous, structured overlap among groups, consistent with population-level variation and suggestive of a transition between *Dinohippus* and *Equus*, although convergence cannot be excluded.

Funding Sources: FLMNH (VP): Lucy Dickinson & Gapinski Fellowships, B. J. & Eve Wilder Endowment; UF Dept. of Geological Sciences Research Fund; & AMNH Theodore Roosevelt Memorial Fund

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Technical Session VIII: Fishes (Thursday, November 12, 2026, 1:45 PM)

Trace fossils attributed to fish from the Mesozoic of western Canada: the often-overlooked record of fossil vertebrates

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Trace fossils are valuable paleontological tools because they record animal behavior, preserve evidence of tracemakers in place, and may document animals rarely represented by body fossils. In comparison to tetrapod trackways, trace fossils of fish have received little attention and remain poorly reported from western Canada. This limited record may partly reflect the primarily nektonic habits of many fish, which reduce the likelihood of substrate interaction and trace production. Yet, fossilized evidence of fish feeding, swimming, and resting behaviors is increasingly

recognized in sedimentary deposits worldwide. Here, we summarize the various fish-generated trace fossils from different localities in western Canada.

Within the sparsely bioturbated silty, fine-grained sandstone of the Lower Triassic Sulphur Mountain Formation occur casts of circular pits with a slit running through the center. These are identified as *Osculichnus*, which represents substrate probing and feeding by a fish (likely coelacanth) tracemaker. Roughly parallel to overlapping sinuous grooves on sandstone bedding planes of the Middle Triassic Liard Formation record are assigned to *Undichna,* which is interpreted as the fin drag marks of a bottom-swimming osteichthyan fish. Among the fossil exhibits of the Royal Tyrrell Museum is a rock slab of the Jurassic–Cretaceous Mist Mountain Formation with casts of a trackway produced by a small bipedal ornithopod. The same slab contains several sets of four parallel ridges with sinuous courses assigned to *Undichna*. Co-occurrence of this trace constrains the dinosaur tracks to emplacement in a shallow subaqueous setting.

Finally, the upper Cretaceous Wapiti Formation is a fluvio-lacustrine unit with abundant exceptionally preserved trace fossils. In addition to *Osculichnus* and *Undichna*, the sandstone also bears paired impressions of fins (*Pisquiesichnus*), which record tracemakers resting on the substrate. Another interesting trace fossil includes relatively large sinuous burrows identifiable as *Cochlichnus*. Although *Cochlichnus* are usually interpreted to be produced by nematodes or arthropod larvae, we believe they could potentially be produced by small fish with elongate body plans such as loach or juvenile eels. Collectively, these occurrences highlight an overlooked vertebrate ichnological record in western Canada and demonstrate that fish trace fossils may provide an important complement to body fossils in reconstructing ancient aquatic ecosystems.

Funding Sources: NSERC Discovery Grant

Technical Session XIX: Carnivora (Saturday, November 14, 2026, 1:45 PM)

Small giant panda unexpectedly found from the Miocene of Japan

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The giant panda lineage (Ailuropodinae) experienced a complex history of dispersal and extinction across Europe, Asia, and North America. Yet, the extant genus *Ailuropoda* and its sister taxon *Ailurarctos* has been previously constrained to southwestern China and adjacent regions. *Ailurarctos* is currently known only from the upper Miocene of Yunnan Province. Here, we report two isolated molars of an ailuropodine bear from the Miocene of Japan.

The specimens were recovered from submarine landslide deposits composed of medium- to coarse-grained sandstone containing marine vertebrate remains, shark teeth, shell fragments, and corals. The two teeth were discovered at approximately the same stratigraphic level and likely derived from a single transport event. Despite the submarine channel depositional setting, molar morphology is well-preserved and identifies the specimens to be a derived ailuropodine bear based on the presence of a well-developed lingual cingulum with deep striae and a well-defined talon symmetric along the longitudinal axis of the tooth along with complex enamel crenulation. The first upper molar possesses a distinct fault-like structure leaving medial ridges of metacone and metaconule discontinuous.

Preliminary phylogenetic analyses along with dental morphological comparisons recover the Japanese taxon as a species of *Ailurarctos*, presumably intermediate between previously known species of the genus and characterized by small size. Body mass estimates based on molar dimensions suggest an adult body mass comparable in size to the more basal ailuropodine *Miomaci*. The diminutive size, combined with distinct geographic isolation, may suggest insular dwarfism in a paleo-island that once existed in the Miocene Japanese archipelago. This new occurrence of *Ailurarctos* demonstrates

unexpected dispersal capability in the *Ailurarctos-Ailuropoda* lineage.

Funding Sources: KAKENHI Grant-in-Aid for Transformative Research Areas (B) 25H01422

Technical Session VI: Dinosauria II: a "bird-hipped" bonanza (Thursday, November 12, 2026, 8:00 AM)

Distinguishing ontogenetic and phylogenetic neuroanatomical characteristics of Ceratopsia

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Members of Ceratopsia (Dinosauria: Ornithischia) displayed a wide array of morphological disparity across the Cretaceous with perhaps the most notable bauplan modifications being the drastic increase in body size and cranial ornamentation of derived ceratopsians. The ceratopsian fossil record also suggests that basal ceratopsians and more derived neoceratopsians displayed a wide array of complex social and parental behaviors across the clade's evolution. But how do ontogenetic and phylogenetic neuroanatomical traits compare across Ceratopsia? Here, a mostly complete series endocasts from the basal ceratopsian *Psittacosaurus lujiatunensis* allows for a partial comparison of ontogenetic and phylogenetic signals in the endocranial form of ceratopsians. Endocranial features that are variable with age in *P. lujiatunensis* include the flexure angles of the forebrain and hindbrain with the midbrain; a morphological shift of the cerebrum from pyramidal to a dorsoventral flat shape; the presence of, and then overgrowth of, optic lobes; and a reduction in floccular prominence in adults. Broadly, the changes displayed among these ontogenetically variable neuroanatomy characters of psittacosaurs most closely resemble those of more basal, non-dinosaur archosaurs (e.g., crocodilians). Ontogenetic neuroanatomical characters from the endocasts of ceratopsian adults at the clade level are distinct from ontogenetically variable traits of basal ceratopsians. Comparative neuroanatomical traits from across Ceratopsia include: the obfuscation of the flocculi among derived members of Neoceratopsia; the loss of a dorsal eminence on the dorsal margin of the posterior hindbrain in late-diverging ceratopsians; the "merging" of the olfactory bulbs between early-diverging ceratopsians and neoceratopsians; a mediolateral narrowing and dorsoventral deepening of the forebrain towards Neoceratopsia; and flexure angles that increase between early-diverging and later-diverging adults of ceratopsian taxa. To complete this study, much more data collection must be completed across Ceratopsia, especially among ontogenetically variable early and later-diverging Neoceratopsia. As is, this study allows for a baseline to be made in the identification and studying of phylogenetic and ontogenetic characters along ceratopsian endocrania, how ontogeny informs phylogeny in a neuroanatomical context, and further underscores the lack of neuroanatomical resolution that surrounds Ceratopsia at the clade level.

Funding Sources: National Natural Science Foundation of China (42072008, 42272020, and 42288201), and Strategic Priority Research Program of Chinese Academy of Sciences (XDB26000000)

Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

A giant marabou stork (*Leptoptilos* sp.) from the Early Plieistocene of Koobi Fora, Kenya: evidence from cranial remains

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The fossil record of marabou storks (*Leptoptilos*) is widespread across Africa and Asia; however, most fossil specimens are represented by isolated postcranial elements, limiting our understanding of cranial morphology and phylogenetic relationships within the genus. Here, we describe a partial cranium, KNM-ER 48100, from the Upper Burgi Member of the Koobi Fora Formation in northern Kenya. This Early Pleistocene specimen represents the earliest known cranial fossil attributable to *Leptoptilos* and the most complete fossil stork cranium reported from Africa. Preserved elements include the frontal, parietal, occipital, otic, and basicranial regions. We compared KNM-ER 48100 with extant *Leptoptilos crumenifer*, *Leptoptilos dubius*, and *Leptoptilos javanicus*, as well as the extinct *Leptoptilos lüi*. The specimen exhibits characteristics typical of *Leptoptilos*, including a dorsoventrally flattened cranial roof, a broad interorbital region, reduced temporal fossae, and a vertically oriented occipital region. However, it differs from all known extant and fossil species in its large size and distinctive combination of cranial features, including a broad dorsal cranial outline, a triangular, horizontally oriented lamina dorsalis, a robust paroccipital process, and a dorsoventrally compressed occipital condyle positioned high relative to the lamina parasphenoidalis. The discovery of a giant marabou-like stork in East Africa indicates that large body size had already evolved within the *Leptoptilos* lineage by the Early Pleistocene. The presence of such a large scavenging bird in the Turkana Basin provides valuable insights into the composition of Plio–Pleistocene scavenger communities associated with hominin-bearing deposits. Overall, KNM-ER 48100 contributes important new anatomical evidence relevant to the evolution, paleobiogeography, and paleoecology of Plio–Pleistocene ciconiids and provides the first detailed account of cranial morphology in an African fossil representative of *Leptoptilos*.

Funding Sources: Turkana Basin Institute

Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Archival clamshell support systems for large and fragile Pleistocene fossils at Turkana Basin Institute, Illeret, Kenya

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Large and fragile vertebrate fossils recovered from Plio–Pleistocene deposits present major challenges for handling, transport, and long-term storage, particularly in remote research stations exposed to harsh environmental conditions. At the Turkana Basin Institute (TBI) fossil laboratory in Illeret, northern Kenya, a conservation initiative was undertaken to improve the storage and accessibility of several exceptionally delicate and scientifically significant Pleistocene specimens through the construction of custom archival clamshell jackets and support cradles. This project focused on four oversized and fragile Pleistocene fossils housed at TBI Illeret: a highly delicate cranium of the giant suid *Metridiochoerus compactus*, a cranium of the broad-horned *Pelorovis turkanensis*, a black rhinoceros cranium, and a tortoise carapace with associated plastron. These specimens are heavy, structurally unstable, and vulnerable to vibration, handling stress, dust accumulation, and temperature fluctuations common within the arid Turkana environment. Previous storage methods limited safe handling and increased risk of damage during movement, study, teaching, exhibition preparation, and collections management activities. The development of these archival clamshell support systems was made possible through prior professional conservation training and mentorship received from international fossil conservators and collections specialists from the Los Angeles County Natural History Museum, Smithsonian Institution, and the University of Michigan Museum of Paleontology. To address the conservation challenges posed by these large specimens, customized archival clamshell jackets and support cradles were designed and fabricated using archival materials such as ethafoam and fiberglass immersed in high-grade dental plaster, tailored to each specimen's morphology, weight distribution,

and fragility. The supports were constructed to minimize direct handling, stabilize and protect weakened areas, distribute specimen weight evenly, and improve strong, relatively lightweight long-term storage conditions while maintaining accessibility. The resulting cradle systems significantly improved specimen stability, handling safety, and storage efficiency within the collection. Currently, Turkana Basin Institute represents one of the few paleontological repositories in Africa to fully adopt and implement archival clamshell jacket technology for large vertebrate fossils.

Funding Sources: Funding provided by Turkana Basin Institute, Kenya

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A new basal Cretaceous (Berriasian) polacanthid ankylosaur from the Doelling's Bowl bonebed, lower Yellow Cat Member of the Cedar Mountain Formation of eastern Utah, USA

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Although initially identified in 1991 from isolated teeth and small ossicles, the Doelling's Bowl Bonebed (DBB) was not recognized as older than other Cretaceous sites in the region until the 2005 correlation of distinct paleosol horizons into the type section of the Yellow Cat Member of the Cedar Mountain Formation to the west. Subsequent excavations by the Utah Geological Survey beginning in 2006 yielded significant skeletal remains, including the discovery of the dromaeosaur *Yurgovuchia doellingi* and a new polacanthid ankylosaur. The new ankylosaur, discovered in 2007, is represented by a minimum of three individuals of varying sizes. The holotype consists of an articulated pelvis, dorsal and caudal vertebrae, a humerus, an ulna, and distinctive osteoderms. Morphologically, this taxon exhibits a mosaic of characters shared with the Upper Jurassic *Mymoorapelta* and the younger Lower Cretaceous *Gastonia*, but it has a few autapomorphies not present in either. Unique among ankylosaurs in possessing rows of subrectangular (wider than long) dorsal osteoderms with a posterio-central erect spinose projection and a corresponding near centrally positioned, circular ventral excavation. Stratigraphically, the DBB occurs within the lower Yellow Cat Member (Berriasian) above a silicified histosol interval and well below a calcrete that marks the base of the upper Yellow Cat Member (Valanginian). The DBB is interpreted as an extensive fern-fen marsh covering a minimum of 35 acres. Skeletal remains are found disarticulated within discontinuous stratiform horizons emplaced by flood-induced debris flows that span approximately one meter stratigraphically. The diverse floral and faunal assemblage includes fern roots, flattened "Prototempskya" pseudo-trunks, tiny fish bones, two types of turtle shell, crocodilian teeth and bones. Dinosaur taxa are well-represented by the dromaeosaurid dromaeosaur *Yurgovuchia*, a relatively large therizinosaur, large allosauroid teeth and bones, a turiasaur sauropod *Mirasaurus bobyoungi*, jaw fragments of a hypsilophodont-grade ornithopod, growth series of at least two species of iguanodontid, and the new polacanthid ankylosaur species. Many years of excavation and research remain to be undertaken on this unique vertebrate locality, which currently is the oldest multigeneric bonebed in the Cretaceous of North America.

Funding Sources: Utah Geological Survey, Utah Friends of Paleontology

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Comparing relative vs. absolute predicted best fit evolution models for fossil sticklebacks traits

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Relative best fit evolution model predictions for time series of physiological traits have been made using simulations for about twenty years. These evolution models consist of one or more of the following simple models: stasis, unbiased random

walk, and directional. A key deficiency of the relative best fit approach is that it always predicts an evolution model even though none of the candidate evolution models may be a particularly good fit of the time series of trait data. More recently, absolute best fit evolution model predictions approaches have been developed for evolution model predictions. This is an important advance in that absolute approaches employ statistical tests to determine the suitability of the candidate evolution models. The absolute best fit evolution model approach can even determine that no models are a good fit of the time series trait data. This study compares the best fit evolution models that are predicted by both the relative and absolute approaches. Trait data associated with the fossil sticklebacks fish *Gasterosteus doryssu* that resided in a Miocene Lake was used as a basis for this comparison. Data from eight traits was included in this analysis. The chronological duration of the time series data was up to ~110,000 years.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Investigating Pleistocene bison horn development and allometry through time using geometric morphometrics

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The American Bison (*Bison bison*) is the largest extant land mammal in North America and descends from at least one population of steppe bison (*Bison priscus*) who migrated across the Bering Land Bridge during the late Pleistocene epoch. The first wave of migration occurred approximately 193–135 thousand years ago and was followed by several additional southward dispersals into central North America during the Pleistocene interglacial periods. The long-horned bison (*Bison latifrons*) was the first autochthonous North American bison species and is the largest species of bison known, with a horn-tip span of up to two meters. The other two described species of bison—*Bison occidentalis* and *Bison antiquus*—along with *B. bison*, comprise what is typically considered to be a single chronospecies, rather than three distinct species. Their gradual evolutionary decrease in body and horn size provides a compelling system to understand patterns of horn allometry in bovids, particularly in response to the rapidly fluctuating temperatures of the Pleistocene and successful settlement across many climatic zones. To quantify bison horn allometry across time, we collected three-dimensional blue-light scans of approximately 200 extinct and extant bison specimens comprising a variety of ages in all North American species from museum collections. Using a consistently transferable set of geometric morphometric landmarks, we analyzed trends of horn shape change through various stages of development. Based on preliminary estimates of morphological disparity, the two species at the ends of the North American bison evolutionary timeline, *B. bison* and *B. priscus*, display significant morphological disparity in several dimensions related to horn shape, but with extreme variation within species. This suggests a potential need for revision in species diagnostic criteria of North American bison.

Funding Sources: Arnold and Mabel Beckman Foundation

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

Forty-five years of research on tetrapod skeletal remains from the Upper Triassic Richmond Basin of Virginia: A rare window onto a Carnian tetrapod community from equatorial Pangea

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Since its discovery in 1981 and quarrying by teams led by Hans Sues, USNM locality 39981 (the "Tomahawk Locality") of the Tomahawk Creek Member of the Vinita Formation, Richmond Basin (Newark Supergroup), Virginia, USA, has represented the oldest microvertebrate assemblage from Late Triassic North America and the only well-sampled non-marine assemblage securely dated to the Carnian (Tuvalian).

Here, we synthesize recent work and present new anatomical data from X-ray microtomographic scanning to provide a revised understanding of paleocommunity composition. The assemblage includes *Lissodus* p. (Hybodontiformes), *Dictyopyge* sp. (Actinopterygii, Redfieldiiformes), *Boreogomphodon jeffersoni* (Traversodontidae), *Microconodon tenuirostris* (Prozostrodontia), *Gomphiosauridion baileyae* (Procolophonidae?), Drepanosauromorpha indet., *Idiosaura virginiensis* (Kuehneosauridae?), *Vinitasaura lizae* (Lepidosauromorpha), *Micromenodon pitti* (Sphenodontia), *Xenodiphyodon petraios* (Trilophosauridae), *Uatchitodon kroehleri* (Archosauriformes?), and *Euscolosuchus olseni* (Pseudosuchia). Previously reported lissamphibian material represents redfieldiiform fish jaws, likely *Dictyopyge*. Unidentified tooth morphotypes suggest additional cryptic reptile diversity.

The Tomahawk assemblage is unusual among Pangean tropical faunas in the abundance of traversodontid cynodont material, a feature shared with a few other Carnian and Early Norian equatorial sites in North Carolina. Six of 12 vertebrate genera are known only from this locality (*Gomphiosauridion*, *Idiosaura*, *Vinitasaura*, *Micromenodon*, *Xenodiphyodon*, and *Euscolosuchus*), suggesting either high endemism or undersampling of similar communities. At higher taxonomic levels, hybodontiformes, redfieldiiforms, prozostrodontians, drepanosauromorphs, lepidosauromorphs, trilophosaurids, and *Uatchitodon* are shared with Norian microvertebrate assemblages from southeastern and southwestern North America, demonstrating their presence in equatorial Pangea by at least the Late Carnian. Conspicuous absences, given the abundance of material, include dinosaurs, phytosaurs, aetosaurs, and metoposaurid temnospondyls, abundant in Norian low-latitude assemblages. When and how these groups first appear in equatorial Pangaea remains uncertain.

Funding Sources: Peter Buck Postdoctoral Fellowship; National Geographic Society (3952-88, 4232-89); NSF BSR-8717707; NSF EAR-9016677; Smithsonian Institution

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Technical Session VI: Dinosauria II: a "bird-hipped" bonanza (Thursday, November 12, 2026, 8:00 AM)

The ossified tendons and axial musculature of thescelosaurid dinosaurs (Ornithischia: Pyrodontia)

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Ossification of the tendons of the axial musculature occurs in some dinosaurs, particularly within Ornithischia. Since tendons are part of the muscular system, ossified tendons (OTs) are direct evidence of dinosaur musculature. Several studies have used OTs, interpreted with reference to modern birds and crocodilians, as a basis for detailed analysis of the epaxial musculature of various ornithischians within the clade Cerapoda. Here we extend this approach to Thescelosauridae, a non-cerapodan clade in the wider group Pyrodontia. Although they may retain more plesiomorphies than cerapodans, some thescelosaurids are also highly specialized for semi-fossorial locomotion. Therefore, examining the OT arrangement in thescelosaurids might reveal both ancestral features and semi-fossorial derived ones and help us understand the evolution of locomotion and epaxial muscular anatomy in Ornithischia. We examine specimens referred to *Parksosaurus* (UALVP 56885, ROM VP 00804), *Thescelosaurus* (CMN FV 08537), and Orodrominae indet (TMP 2008.045.0002). The trunk region of the orodromine and *Thescelosaurus* exhibits a three-layered, lattice-like arrangement of epaxial OTs, which run posterodorsally in the medial and lateral layers but posteroventrally in the middle layer. Moving from medial to lateral, the tendons might belong to *m. spinalis*, the medial part of *m. articulospinalis*, and the lateral part of *m. articulospinalis*, based on their attachment points and orientations. *Thescelosaurus* also has a series

of posterodorsally running OTs in the caudosacral region. This tendon series appears to represent a posterior continuation of the lateral part of *m. articulospinalis*. *Parksosaurus* exhibits a dense OT arrangement in the middle to distal caudal region, with posterodorsally running epaxial OTs and posteroventrally running hypaxial ones. The epaxial OTs may belong to the lateral part of *m. articulospinalis*, and the hypaxial OTs may belong to *m. ilio-ischio-caudalis*. The epaxial OTs of the precaudal region in *Thescelosaurus* and Orodrominae indet. are much less densely packed than those of the caudal region in *Parksosaurus*, suggesting these regions were subject to differing functional demands. Moreover, dromaeosaurids exhibit a similar OT arrangement in the caudal region, which may have arisen convergently in response to corresponding locomotor selection pressures.

Funding Sources: NSERC Discovery Grant

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

The gut microbiome and amino acid synthesis: new insights on how large herbivores build their bodies, with implications for megafaunal extinction

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Large herbivores consume food that is low in both protein and easily assimilable carbohydrate. Extensive work on mammalian herbivores has shown how gut symbionts convert inaccessible plant structural molecules (e.g., cellulose, lignin) into fatty acids that animals use for energy. The role of gut microbes in making amino acids that hosts use to build structural tissue is less understood. Recent studies on captive and wild small mammals reveal that gut microbes contribute to host protein balance by synthesizing essential amino acids (AAs), molecules that mammals largely cannot make. We use carbon isotope analysis of essential AAs in bone and dentin collagen from large mammals to explore how diet and digestive physiology affect gut microbe creation of AAs assimilated by hosts. We examine extant mammals from Amboseli National Park in Kenya, a savanna-woodland with both C_4 grass and C_3 trees/shrubs, as well as Pleistocene herbivores from North America that lived in entirely C_3 ecosystems (Alaska, Iowa, Great Lakes). In Kenya, we compare animals that differ in diet (C_4 grazers, C_3 browsers, mixed feeders) and digestive physiology (hindgut and foregut fermenters), while in the Pleistocene dataset, we examine digestive physiology against a purely C_3 diet, though these diets are still a mix of grass and woody plants.

As expected, gut microbiome AA synthesis is greater for foregut fermenters, which have an elaborate digestive system to facilitate microbial processing of dietary carbohydrates. Across both types of physiologies, gut microbe AA synthesis is higher in animals that consume high fiber, low N, C_4 grass (e.g., wildebeest, buffalo, zebra) than in those that eat low fiber, high N, C_3 browse (e.g., giraffe, black rhinoceros, elephant). Among Pleistocene herbivores from C_3 ecosystems, gut microbe AA synthesis occurs in foregut fermenters (e.g., caribou, bison, ground sloth) but is minimal in hindgut fermenters (e.g., horse, mammoth, mastodon) and does not correlate with grazing versus browsing. Thus, while diet quality (e.g., fiber and N content) has an impact on gut microbiome AA production, digestive physiology plays a more important role. Our results point to unrecognized ways that gut microbes help large herbivorous mammals meet the ecophysiological challenge of building protein-rich bodies on relatively low-quality plant resources, and they have implications for the decline of hindgut fermenters over the Neogene, especially with the rise of C_4 grasslands.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Through thick and thin: mold design and casting strategies for fragile ceratopsian skulls

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The molding and casting of ceratopsian skulls presents significant technical challenges due to their thin frills, complex undercuts, and fragile cranial elements, which are highly susceptible to deformation and breakage during molding and casting. In 2025, the American Museum of Natural History produced molds and casts of two well-preserved Mongolian ceratopsian specimens for exhibition: IGM 100/3502, a 35 cm cranium, and IGM 100/3658, a 22 cm cranium with an associated mandible. Conventional approaches for molding complex objects typically rely on low to medium durometer silicone (Shore A 20–30) in multipart molds with extensive seams to facilitate safe demolding and reduce stress on the original specimen, followed by seam line removal on the casts. While effective for handling fragile material, this strategy can conflict with the goal of producing exhibit-quality casts with minimal visible seams. To address this limitation, a modified molding and casting strategy was developed using a cavity-pour method with two-piece silicone molds in combination with multipart support shells, specifically designed to accommodate the specimens' complex morphology while minimizing reliance on extensive seam lines. The fossils were consolidated with Paraloid B-72 (10% w/v in acetone) to improve structural stability and sprayed with Butvar B-76 (5% w/v in acetone) as a separator. All foramina and cracks were filled with non-sulfur clay. Support shells were constructed first using a combination of lightweight epoxy putty (Smooth-On Free Form™ AIR) and high-strength gypsum cement (Hydrocal® FGR 95) to provide adequate structural support without excessive weight. A low-viscosity, low-Shore hardness silicone (Smooth-On Dragon Skin™ 10 NV) was selected to provide sufficient flexibility during demolding while reducing stress on delicate structures. The silicone was then poured into the space between the support shells and the skull. Casts were produced using polyester resin mixed with talc and fumed silica to balance strength, weight, and surface detail. Due to the extreme thinness of the frill, it was cast as a single layer, as multilayer buildup would have resulted in excessive thickness and distortion to the original morphology. Careful planning of mold design, materials, and casting methods demonstrates that even highly fragile ceratopsian skulls can be successfully molded and cast while preserving morphological detail and specimen integrity.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Description of a partially complete limb of *Haplocanthosaurus* sp. from the Poison Creek Quarry (Wyoming, USA)

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Haplocanthosaurus is considered one of the scarcer genera of sauropods from the Morrison Formation. Aside from the specimen described here, the only reported limb elements known for *Haplocanthosaurus* are a couple of tibiae and a femur. Most of the understanding of this animal is from other parts of its postcranial skeleton. In 1976, the Science Museum of Minnesota first started field work at the Poison Creek Quarry in Wyoming, within the Brushy Basin Member of the Morrison Formation, and continued working the site until 1990. In the late 1970s, the first *Haplocanthosaurus* sp. material was identified at the site. In 2014, Bruce Erickson published a monograph on the 24-year excavation, with an overview of the material that had been collected plus a few highlights. In this work, Erickson provided a brief description of SMM P 90.37.10, which is a mostly complete lower left hind limb and pes only missing the proximal phalanx I, which he attributed to *Haplocanthosaurus* sp. along with thirty articulated caudal vertebrae. This material has not yet received a thorough anatomical description. The specimen's limb is composed of a tibia and fibula along with the astragalus, calcaneum, and most of the pes including metatarsals I–V, three phalanges, and three unguals. The caudal vertebrae have a short centrum, low anterior neural spine, large prominent chevron facets, and chevrons that are open above the haemal canal, which combined were used to diagnose the specimen as *Haplocanthosaurus*.

The tibia, while incomplete, is 103 cm long and the incomplete fibula is 77 cm long. The astragalus for this specimen (33.5 cm long; 20.0 cm wide) is very

distinct, being tapered to a blunt medial end, and is not narrowed and pointed, as observed in *Camarasaurus*, and is much larger than many of the other astragali that were collected at the site. The calcaneum's dorsal-ventral measurement is 9.25 cm with the mediolateral measurement being 9.14 cm, and the anterior-posterior length is 5.77 cm. The pes is missing the proximal phalanx of digit I but seems to be mostly complete. Aside from an unpublished specimen mentioned in a conference abstract, this specimen represents the only record of a partially complete limb of *Haplocanthosaurus* and adds to the understanding of this enigmatic sauropod.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Rebuilding the memory of the West and Gunnell localities in the Bridger Formation of southwestern Wyoming

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The late Early Eocene to early Middle Eocene (50–45 mya) Bridger Formation in the Green River Basin of Wyoming is historically and scientifically significant for mammal paleontology. The first fossils were described by Joseph Leidy ~160 years ago. Historically, the Bridger Fm. was divided into five subsections (A through E). "Bridger B" has been the most productive, producing near-complete skeletons of many Eocene mammals, but Bridger A, C, D, and E are also fossiliferous and provide context for faunal change through the Bridgerian. Important fieldwork was performed by Robert "Mac" West of the Milwaukee Public Museum (MPM) in the 1970s. West established localities in uppermost Bridger B, as well as Bridger C and D (Twin Buttes Member). After West's collections were transferred from MPM to the University of Michigan Museum of Paleontology (UMMP), Gregg Gunnell (UMMP and later Duke University) used West's work as part of his larger field program from the 1990s to 2010s. Gunnell made a substantial effort to increase fossil collection in Bridger A, later working with Boyer to expand collection efforts throughout the formation. With Gunnell's sudden death in 2017, decades of institutional knowledge about these localities was lost. We sought to rebuild the knowledge of the West and Gunnell localities by digitizing the handwritten records and ground-truthing the precise locations. We visited upper Bridger localities in the southwestern part of the Green River Basin (Twin Buttes Wilderness Study Area) and A layer localities in the northwestern edge of the basin (South Pass, Honeycomb Buttes Wilderness Study Area). West localities described via township range and section were often difficult to precisely identify, though any outcropping of Bridger Formation tended to be productive with at least gar scales or croc scutes. Physically mapped Gunnell localities, many of which overlapped with West localities, were easily located, but those recorded as GPS points often did not directly align with productive outcrops. One Gunnell locality, SP102, led us near a productive microsite, which we are calling "Unnecessary Hike." We visited this locality in 2024 and 2025 and found new material on the surface including a *Thinocyon* mandible fragment, omomyid molar, and brontothere humerus. Our ongoing fieldwork will continue to relocate West and Gunnell localities, using these to explore the region for fossils that document the Bridgerian Crash and subsequent recovery.

Funding Sources: Michigan Society of Fellows, Duke Arts and Sciences Research Grant, Rich Kay and Blythe Williams

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Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Enamel anomaly: implications of enamel-less preservation in sauropsid teeth from the Late Triassic

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Microvertebrate fossil sites are filled with valuable ecological data that provide insight into extinct communities and the behavior of their members. Remains (e.g., teeth, bones) at these sites can be

altered by a mosaic of potentially co-occurring abiotic and biotic processes before and after deposition, but these effects are not easily differentiated. Here, we present an investigation of "enamel-less" teeth from the Green Layer microvertebrate site (early Revueltian, Late Triassic) located south of Petrified Forest National Park, Arizona. "Enamel-less" teeth lack serrations, roots, have a drab/dull exterior, and potmarks or pitting on the surface. We examine and compare the dental microstructures of "enamel-less" teeth to those with their original anatomy (= normal teeth) within the same locality to surmise how teeth lost or modified enamel. Eleven "enamel-less" and five normal teeth of various shapes were CT scanned and histologically sectioned along the transverse or coronal planes. Five "enamel-less" and six normal teeth were subjected to etching with a weak HCl solution. Using a scanning electron microscope, it was clear that one "enamel-less" tooth from each method still possesses enamel. Columnar enamel was visible on the edges of the teeth with a clear enamel-dentine junction, separating it from the dentine. However, the majority of the examined teeth were found to lack all enamel.

"Enamel-less" teeth make up 7.8% of the collected sauropsid teeth picked from the Green Layer and are found on the surface and within the bone bed, suggesting that the enamel was not weathered away on the surface, nor during screenwashing. Instead of an abiotic process, we hypothesize that these "enamel-less" teeth were decalcified, resulting in the loss of most or all of the enamel. A similar mode of preservation was previously found in Cretaceous mammal teeth which was hypothesized to be the consequence of digestion in a crocodylian gut; the same process appears the same in the Triassic, but through the gut of more distantly related taxa. These results expand the broader knowledge of the biotic processes affecting the preservation of teeth, the potential diet and behavior of Late Triassic carnivores, and the taphonomic processes that occurred prior to, during, and after deposition.

Funding Sources: National Science Foundation EAR 1943286

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Minium in review: The successful preservation of a Miocene mammal collection

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In 2022, Fort Hays State University's Sternberg Museum of Natural History was awarded a grant to address the long-term preservation of a Late Miocene mammal collection. These fossils come from an Ogallala Formation locality known as the Minium Quarry, located in Graham County, Kansas. This project built on paleontology collection improvement initiatives that started in 2016 to institute a relational database and advance digitization and data-sharing efforts by the Sternberg Museum. Many of the fossils from the Minium Quarry were poorly consolidated, which left them vulnerable to rapid degradation. This had been accelerated by improper storage of uncurated specimens and overcrowding of curated specimens in cabinet drawers. This project aimed to address these issues through cataloging, stabilizing, and digitizing this large collection, which consists of nearly 2,300 specimens. A new workflow was developed to coordinate efforts as team members worked asynchronously over multiple years. The initial part of the project focused on removing the specimens from their cramped, non-archival housing, documenting all available information, and cataloging. As part of the stabilization efforts, approximately 470 specimens were prepared, requiring a combination of matrix removal, reassembly, and consolidation. Additionally, approximately 230 cavity mounts and 40 cradles were fabricated. A new housing method was also developed to accommodate large rib bones, which did not fit in archival boxes and were prone to data dissociation. Proper housing necessitated the addition of several cabinets and the reorganization of the collection. More than 50% of the collection has been photographed, with the process projected to conclude in the next year. The final goal of the project includes establishing a virtual exhibit to provide greater public awareness of this collection and its importance in the evolution of grasslands in the Great Plains.

Funding Sources: Institute of Museum and Library Services Museums for America Grant number MA-251778-OMS-22 to L. Wilson and A. Baumgartner

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Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Unusual dinosaur trackways and problematic trace fossils from the Paluxy Riverbed (lower Cretaceous), Glen Rose, Texas

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Several hundred dinosaur tracks representing at least two types of theropods and an ornithopod have been recorded at the Taylor Site in the Paluxy Riverbed of Glen Rose, Texas. This report focuses on several previously unrecognized aspects of the trackways there and some problematic traces nearby. The longest trail, called the Lone Ranger Trail, was probably made by the large theropod *Acrocanthosaurus.* It consists of 135 deep tracks covering a distance of 160 meters—making it the longest existing dinosaur trail in North America. It also curves in several places and displays an unusual "left-footed" gait, where the distance from each left to right step is (in most cases) significantly longer than the right to left distance. This is likely due to an injury or pathology. Nearby are many tracks heavily infilled with an iron-rich ancient sediment that hardened into the track depressions. Such tracks often show dramatic color distinctions, ranging from bluish-gray to reddish-brown. Most show little or no topographic relief, or even positive relief. The latter occurs when the infilling surfaces oxidize and become harder than the surrounding limestone, so that the limestone erodes around the track infillings. Many infilled tracks show metatarsal (heel) segments, probably made by slender dinosaurs (possibly orithomimids) lowering their bodies when contending with soft mud or while foraging for small food items in the mud or shallow water. Some have questioned this and suggested that all metatarsal dinosaur prints are merely "penetrative tracks" due solely to deep impression. However, several lines of evidence from tracks, and observations of modern birds that lower their body postures and metatarsal angles while walking in very soft mud or while feeding, support the original interpretation, at least for some metatarsal tracks. Between two infilled ornthopod tracks is a collection of nine ovoid holes, about the size and shape of goose eggs. Their bottoms are well-rounded bottoms, so they are not likely due to any animal probing the sediment with a beak or claw. What they most seem to resemble is a troodon nest (without the eggs). The ornithopod tracks on either side of the holes are too large to represent the egg layer and indicate normal walking; however, some indications of smaller tracks around the whole might be from the egg layer, which we hope to confirm with future work.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Dinosaur tracks from Glen Rose, Texas (Lower Cretaceous) associated with unusual feeding and swimming behaviors

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Claw impressions made by swimming dinosaurs are relatively rare but are known from a number of tracksites. At most sites, such markings consist of three long, curved marks together, in alternating right-left sequences. In contrast, swim tracks in the Paluxy Riverbed of Glen Rose, Texas, show only two large, mostly straight double claw marks, with no sign of a third digit mark. Moreover, they are not in line with any similar marks, nor any footprints. Some are very large (more than 75 cm long and 23 cm wide). This is within the size range for two

digits of an adult *Acrocanthosaurus,* which evidently made most tridactyl tracks in the Paluxy, but the absence of third digit mark is perplexing. Perhaps the animal impressed its feet at an angle, but the marks appear to be oriented straight down. Alternatively, the trackmaker may have had two claws larger than the third. This occurs with the manus of megaraptors, therizinosaurs, and to a lesser extent spinosaurs (thought to be semiaquatic). Currently these groups are known only from Late Cretaceous strata (megaraptors in South America, therizinosaurs in Asia, and spinosaurs in Africa). However, perhaps similar dinosaurs existed in the Lower Cretaceous of North America. After all, some animals are only known from their tracks. Moreover, three sets of these double marks were found side by side, in a parallel arrangement, apparently indicating a floating dinosaur pushing off the bottom with two limbs at once. These too are not in line with any other footprints or swim traces. At one site we find a series of very large metatarsal tracks with a very irregular gait pattern, and at another nearby site, trails with extremely long pace lengths—even beyond those of running dinosaurs. In both cases the features might be explained by a dinosaur wading in water deep enough to affect its gait. Yet another tracksite (the "Ballroom") includes a sequence of small tracks whose digits are less splayed than typical *Acrocanthosaurus* tracks, possibly indicating a smaller theropod taxon rather than a juvenile *Acrocanthosaurus*. At the same site, a long "squiggle" trail of cog-like impressions shows some pointed projections toward the outside, similar to trails made by modern walking fish such as mud-skippers. What's more, the cog-like trail ends just where a theropod walking in a normal digitigrade fashion drops to its metatarsals, possibly indicating a lower body posture, and suggesting the gastronomic fate of the squiggle maker.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Recognition of two new skeletal features on the giant ground sloth *Megalonyx jeffersonii* (Pleistocene)

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Restudy of the 1896 mounted skeleton of *Megalonyx jeffersonii* (Pleistocene), which is in the Orton Geological Museum, has resulted in discovery of two previously unreported or underreported features: (1) flattened dorsal surface of the cranium; and (2) scalloping of the posterior edges of ribs. The mounted specimen was reconstructed from a combination of skeletal elements collected from Millersburg, Ohio, the cast of a skull collected from Henderson, Kentucky, and fully fabricated pieces probably based on *Megatherium americanum* from the Pleistocene of Argentina. The flattened cranial surface, consisting of a smooth parasagittal crest and reduced sagittal crest area, likely provided accommodation space for osteoderms on top of the cranium. Osteoderms are known from a variety of xenarthrans, including some pilosans, but at present they are unknown in *Megalonyx*. If osteoderms had been present in *M. jeffersonii* during life, they have been either not preserved or ignored at the time specimens were discovered and excavated. The scalloped pattern on the ribs is more problematic. It is uncertain whether this is an anatomical feature or even taphonomic in origin, but it is present in several different individuals in varying degrees of expression. If scalloping on the ribs is anatomical, this feature could provide new insight into the behavior of *M. jeffersonii*.

Funding Sources: Battelle Engineering, Technology and Human Affairs (BETHA), Endowment; Friends of Orton Hall Fund of The Ohio State University

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Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

Miniaturization does not explain the origin of rapid growth in mammals

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Mammals have high metabolic rates that fuel rapid juvenile-to-adult growth, as part of a suit of biological traits that may explain their evolutionary success today. Miniaturization from nonmammalian cynodont forebears is thought to underlie the origins of these traits and occurred among derived probainognathians during the Late Triassic–Early Jurassic. The earliest miniature mammal ancestors are long assumed to have had high metabolic rates and fast growth rates based on small body size, with evidence of fur that likely had insulating function, hence endothermy, in docodonts. However, bone histology data has been absent or compromised by diagenetic alteration, leaving the evolution of growth strategies during miniaturization unclear. Dental cementochronology suggests extended lifespans in *Morganucodon* and other Early Jurassic mammaliaforms, challenging the hypothesis that mammal-like growth first evolved during miniaturization. Here, we used synchrotron X-ray imaging to visualize long bone histology from size series of six taxa bracketing the mammaliaform node. With these data, we characterize growth patterns in the earliest miniature taxa and test whether miniaturization resulted from truncated growth duration, or decelerated growth rates. Our sample includes large and small-bodied nonmammalian cynodonts (e.g., *Tritylodon* and *Oligokyphus*), the tritheledont *Pachygenelus*, and mammaliaforms including *Morganucodon*, *Megazostrodon*, and docodontans, with adult body sizes from 0.02–10 kg. Living mammals in this body size range complete growth within several months. Instead, we find widespread evidence of extended growth durations spanning six to eight years, indicated by well-defined growth marks in lamellar bone tissue, resembling non-avian reptiles. Therefore, derived mammalian growth rates were not the result of evolutionary miniaturization on the mammal stem lineage and must have evolved later, within the crown group. Paradoxically, growth durations of these early post-miniaturization taxa may even exceed those of non-miniaturized cynodonts which exhibit highly vascularized woven-parallel tissue that transitions to slowed lamellar growth. This suggests that miniaturization on the mammal stem lineage was accompanied by a decrease in pace of life rather than an increase. Our results corroborate dental histology evidence and together suggest that the derived physiological traits that define living mammals were decoupled from, and evolved after, miniaturization.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Siwalik murine rodents constrain the age of the Miocene ape-bearing Ramnagar Locality, India

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The Middle Miocene Siwalik deposits of Ramnagar (Jammu and Kashmir, India) preserve an important hominoid-bearing vertebrate assemblage, yet the chronology of these deposits remains debated. Murine rodents are among the most reliable biostratigraphic indicators in the Neogene of South Asia due to their rapid evolutionary turnover, well-resolved stratigraphic succession, and widespread distribution. Consequently, they provide high-resolution temporal constraints for fossil-bearing sequences. This study aims to refine the age and paleoenvironmental context of the Ramnagar ape-bearing horizons using murine rodent systematics, phylogenetics, and biostratigraphy.

Fossil murine dental remains recovered from the Ritti-Mitti locality include diagnostic specimens of *Antemus chinjiensis* and associated micromammals. High-resolution micro-CT (μCT) scanning was employed to investigate taxonomically informative dental characters, including cusp morphology, enamel structure, and occlusal architecture. Three-dimensional reconstructions enabled detailed comparisons with extant and extinct murine taxa. A morphology-

based phylogenetic analysis was conducted to assess the evolutionary affinities of the Ramnagar murines within Murinae.

Phylogenetic results place the Ramnagar murines among the earliest members of the Murinae and recover close affinities with basal murine taxa reported from the Lower Siwalik Chinji Formation of the Potwar Plateau, Pakistan. The occurrence of *Antemus chinjiensis*, one of the oldest definitive murines known from South Asia, provides a robust biostratigraphic marker for the fossil-bearing sequence. Integration of these data with our recently published litho- and magnetostratigraphic studies indicates that the ape-bearing deposits correlate with the Chinji chronofauna and date to approximately 13.5–12.5 Ma. The associated vertebrate assemblage further suggests humid woodland to wooded grassland habitats under a monsoonal climate regime.

These findings provide an independent rodent-based age estimate for the Ramnagar hominoid locality and strengthen faunal correlations across the Siwalik Basin. More broadly, they demonstrate the utility of integrating murine biostratigraphy, μCT-based dental morphology, phylogenetic analysis, and magnetostratigraphy to establish high-resolution chronological frameworks for Miocene vertebrate localities and to improve our understanding of the evolutionary and paleoecological context of South Asian hominoids.

Funding Sources: Jackson School of Geoscience Travel Award (2025) Franklin Mosher Baldwin Fellowship (2022–23) SRF from CSIR UGC (2021) JRF (CSIR UGC) (2019)

Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

Tyrannosauroid paleodiet reconstruction using zinc, carbon, and oxygen isotopes: a case study of the Hell Creek Formation

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I examined the dietary ecology of fauna from the Late Cretaceous Hell Creek Formation (HCF). Measuring zinc (Zn), carbon (C), and oxygen (O) isotope ratios, I compare the isotopic signatures and ecological niche space occupied by *Tyrannosaurus* and *Nanotyrannus*. To complete this study, tooth crowns were sourced from three quarries in the Upper HCF of Montana and South Dakota. I identified and sampled tooth dentin and enamel from four taxonomic units: *Tyrannosaurus rex*; *Nanotyrannus* sp.; Chasmosaurinae indet.; and *Edmontosaurus annectens*. Carbon and O isotopes were measured from tooth carbonate, and O isotopes were additionally measured from tooth phosphate. To assess trace metal homogenization across the dentinoenamel junction (DEJ), a proxy for diagenetic alteration, I measured Zn, iron (Fe), manganese (Mn), and aluminum (Al) concentrations in enamel and dentin. If there was no indication of diagenetic homogenization of trace metals, I then measured Zn isotopes in tooth enamel. As reference for isotopic fractionation in predators of different consumptive habits, I measured Zn, C, O, and nitrogen (N) isotopes in a sample of modern fauna from Kenya and Tanzania. Specifically, four carnivore diet categories were compared: bone-eating carnivores (Spotted Hyaena *Crocuta crocuta*); bone-gnawing carnivores (African lion *Panthera leo*, African Wild Dog *Lycaon pictus*, African leopard *Panthera pardus*); flesh-eating carnivores (African cheetah *Acinonyx jubatus*); and small prey specialists (Caracal *Caracal caracal*). I compared the isotopic niche space occupied by these taxa along with representative modern prey taxa.

In both modern and fossil taxa, Zn isotopes are offset by trophic level. However, Zn isotopes display substantially less trophic differentiation compared to traditional proxies such as N, which much more clearly discriminates trophic level in modern taxa. Nonetheless, these initial results provide a critical window into the dietary ecology of *Tyrannosaurus* and other HCF fauna. Differences in three-dimensional Zn-C-O isotopic niche space reflect dietary and behavioral differences between *Nanotyrannus* and *Tyrannosaurus*. High Zn isotope ratios in *Tyrannosaurus* and *Nanotyrannus* may indicate high bone consumption in both tyrannosauroids. Overall, Zn isotopes represent a novel approach to assessing the often debated niche of *Tyrannosaurus* and provide new

quantitative perspectives on the ecology of Late Cretaceous dinosaurs.

Funding Sources: The Jurassic Foundation; Montana Geological Society

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A large and robust legless lizard (Squamata, Anguinae) from the Gray Fossil Site in the Appalachian Highlands of Tennessee

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The Gray Fossil Site (GFS) in eastern Tennessee has preserved a diverse array of herpetofauna from the early Pliocene. Among them, numerous anguine anguid specimens have been found, although, until now, they had not been placed beyond the subfamily level. These specimens include dentaries, a pterygoid, a jugal, frontals, parietal fragments, dorsal and caudal vertebrae, and many osteoderms. Using comparative anatomy from the same elements of extant anguids combined with some quantitative data, it was determined that a new, robust type of *Ophisaurus* is represented at the GFS, and it appears to represent the largest known anguine from North America. Some important novel features that make it distinct from other *Ophisaurus* include relatively robust dentaries, unique dentition in the tooth-bearing bones, prominent defensive structures, and a relatively wide centrum in the dorsal vertebrae. These features may suggest a more aggressive hunting strategy and defensive lifestyle than is seen in extant *Ophisaurus* species, with a more generalist predator niche and potentially greater environmental range as well. The GFS's highland forest environment is also beyond the range of extant *Ophisaurus*, as they tend to prefer more open grassland habitats. The identification of this new legless lizard provides a more thorough understanding of anguine evolution and Appalachian ecosystems during a relatively unknown period in the region's prehistory.

Funding Sources: Center of Excellence in Paleontology, East Tennessee State University, Johnson City, TN 37614

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

An enigmatic new reptile from the Jurassic Mörnsheim Formation, Solnhofen Archipelago, Germany

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The lower Tithonian Mörnsheim Formation (Solnhofen Archipelago, Germany) has been prolific, with numerous vertebrates described so far, including pterosaurs, lepidosaurs, and dinosaurs. In the past decades, the Schaudiberg Quarry near Mühlheim has yielded relatively large, partially complete but disarticulated vertebrate specimens. A new reptile was collected in 2016 and is permanently housed at the Lauer Foundation for Paleontology, Science, and Education. The specimen preserves both the cranial and postcranial skeleton, partially articulated, but is missing the anterior half of the skull and some of the axial and appendicular elements. The preservation makes taxonomic identification challenging as most of the skull bones are partially disarticulated, either unexposed from matrix, overlapped by other bones, or missing altogether. Using X-ray μCT scanning, we have accessed the hidden anatomy of the Mörnsheim reptile and identified several apomorphies. This reptile can confidently be assigned to Rhynchocephalia, due to the presence of acrodont teeth, amphicoelous vertebrae, and gastralia. Compared to the known rhynchocephalians from the Mörnsheim Formation (*Leptosaurus*, *Oenosaurus*, and a juvenile specimen of *Pleurosaurus*), the new specimen is relatively large and robust, reaching a total length of more than a meter. Our preliminary phylogenetic analysis places the new rhynchocephalian within

Pleurosauridae. The specimen shows affinities to the marine *Palaeopleurosaurus* and *Pleurosaurus*, such as the dentary teeth with anterior flanges, elongated presacral series, squared neural spines, and vertical synapophyses. However, the Mörnsheim rhynchocephalian differs from all known pleurosaurids by a combination of morphological traits, such as a tall and robust coronoid (similar to that of *Oenosaurus*), unfused surangular and prearticular, short retroarticular process, lower count of presacral vertebrae (estimated at 45), and elongated, robust limbs. Thus, it likely represents a new, yet undescribed taxon, further highlighting the diverse and unique Mörnsheim fauna.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Updated Paleoecology of Locherangan (Early Miocene, West Turkana, Kenya)

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Eastern Africa underwent multiple environmental changes during the early Miocene, with dynamic impacts on the region's fauna, including novel land connections that facilitated faunal interchange between Africa and Eurasia and the initiation of hothouse conditions during the Miocene Climatic Optimum. These conditions provided the backdrop for several prominent transitions in eastern African paleobiology, including a shift from woodland-dominated to grassland-dominated ecosystems, faunal turnover, and the evolution of hominoids. Over the past three years, our international, multidisciplinary research team has examined these dynamics through renewed and expanded paleontological and geological fieldwork at Locherangan, a ~17.5-Myr-old site in the western Turkana Basin of Kenya. Less well-studied than other regional records of similar age (e.g., Rusinga, Kalodirr/Morourot, Karungu, Buluk), Locherangan is unique among these localities in that it preserves lacustrine rather than fluvial deposits. This comparative framework provides new opportunities for studying faunal assemblages from different paleoenvironments and taphonomic contexts. In addition to characterizing Locherangan's geology and taphonomy, and uncovering new paleoenvironmental evidence from leaf macrofossils and paleosols, our team's vertebrate fossil excavations have expanded on historical work at the site to include several new collection areas and micromammal screenwashing efforts. Thus far, we have uncovered a diverse vertebrate faunal assemblage, including new occurrences of primates (*Afropithecus*, *Ekembo*, and *Simiolus*), carnivorans, artiodactyls, perissodactyls, proboscideans, hyraxes, small mammals, reptiles, and even an avian, prompting an overall redescription of the Locherangan fauna. Our project also (re)examines both previously described and undescribed Locherangan specimens at the National Museums of Kenya, bringing much of this remarkable fossil collection to light for the first time. Finally, our team is conducting ecomorphological and ecometric analyses of the Locherangan fauna to provide new insights into how eastern African ecosystems were shaped by environmental and paleoecological changes during the early Miocene.

Funding Sources: Turkana Basin Institute Research Fund "Rising Stars" Award Turkana Miocene Project (NSF EAR 2021579) The Finnish Society of Sciences and Letters (AKP)

Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

Clade- and region-specific body size ecometrics recover temperature in global squamate assemblages

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Squamate reptiles are an unusually rich but understudied archive of climate information, with high modern diversity, strong thermal sensitivity, and a fossil record that spans major intervals of environmental change. Previous work shows that maximum squamate body size can track warm Paleogene climates, associating gigantism to elevated temperatures, poikilothermic metabolic scaling, and ecosystem productivity. However, a gap remains in understanding how average squamate body size and its variation within assemblages reflect environmental conditions. Here, we test whether assemblage-level body-size structure in modern squamates provides a transferable ecometric signal of temperature, and whether that signal is consistent across clades and continents. We assembled body size records for 10,131 species, geographic range data for 8,782 species, and global mean annual temperature. We summarized body-size distributions across 54,090 modern assemblages and built maximum-likelihood ecometric models relating mean and variation in log body mass to temperature. Models were fit separately for major clades and continental regions to evaluate whether relationships are globally conserved or historically contingent. Squamate body-size ecometrics recovered temperature across many clade-continent combinations, but model performance varied among regions and lineages, where model-temperature correlations ranged from r = 0.16 to 0.91 and had a median correlation of r = 0.78. Several faunas showed strong temperature associations, including Serpentes and Lacertoidea in Asia and Iguania in South America, whereas European assemblages often showed weakened or unstable relationships. These breakdowns identify regions where modern assemblage-level body-size structure may be decoupled from contemporary climate, potentially reflecting postglacial recolonization, historical range contraction, low richness, or non-equilibrium faunal assembly. These results suggest that squamate ecometrics can provide a useful climate proxy, but only when calibrated in a clade- and region-specific framework. We show that ecometric models can diagnose where modern analogs are reliable and where paleoclimate reconstructions should be treated cautiously. This framework provides vertebrate paleontologists with a new tool for reconstructing temperature from fossil squamate assemblages and shows how historical biogeography shapes the climatic information preserved in assemblage-level trait structure.

Funding Sources: National Science Foundation DEB award numbers 2124836 and 2124770; Natural Environment Research Council award NE/W007576/1

Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

A new description and phylogenetic relationships of *"Crocodylus" clavirostris*, a large tube-snouted crocodyliform from the Paleocene of New Jersey

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Cretaceous and Paleocene strata of the Eastern United States were home to many species of tube-snouted crocodyliforms, such as *Thoracosaurus neocesariensis* and *Eosuchus minor*. Also of note is "*Crocodylus" clavirostris*, a little-known species of tube-snouted crocodyliform from the late Paleocene Vincentown Formation of New Jersey, originally described by Morton in 1845. The holotype for this species, ANSP 10079, is a large partial skull featuring a well-preserved braincase and incomplete rostrum, measuring 64 cm long. The skull notably bears two small pits in front of the eyes, which have historically been referred to as

antorbital fenestrae. Previously, this species has been suggested to be conspecific with either *T. neocesariensis* or *E. minor*. Here we incorporate "*C." clavirostris* into two new phylogenetic analyses, based on two previously published character-taxon matrices. In the first, "*C." clavirostris* is recovered as sister to all other gavialoids, separate from *T. neocesariensis* and *E. minor*, warranting placement in its own genus. Here, Gavialoidea is recovered sister to *Borealosuchus*, with the two forming a clade that is sister to all other crocodylians. In the second, analysis, *"C." clavirostris* is recovered as sister to *Thoracosaurus isorhynchus*, separate from *T. neocesariensis,* which is more closely related to *Eothoracosaurus* and *Portugalosuchus* than to *"C." clavirostris* or *T. isorhynchus.* Here, Gavialoidea is recovered as sister to Crocodyloidea. This position for *"C." clavirostris* is supported by the following characters: the presence of a choanal septum that projects outside the choana, which is lacking in other gavialoids; and the retention of the pterygoid/ectopterygoid flexure into maturity, which is known in *T. isorhynchus*, but not other basal gavialoids. Significantly, we find that the "antorbital fenestrae" previously reported are likely taphonomic in nature.

These results bear significant implications for the evolution of gavialoids and will help provide an improved understanding of character polarity at the base of Gavialoidea. Additionally, this placement of *"C." clavirostris* in the second analysis provides insight into the relationships of the "thoracosaurs" to other crocodyliforms and bears implications for the diagnosis of closely related taxa like *T. neocesariensis*.

Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

Ecosystem composition influences morphological drivers of dietary resource partitioning: A Triassic case study

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In modern terrestrial ecosystems, herbivorous taxa comprise a larger proportion of both biomass and species richness than carnivores and omnivores. The converse—an "upside down" ecosystem with relatively few herbivores and many carnivores—is only present in aquatic settings. The Late Triassic sediments of the southwestern United States have long been suggested to record an unusual and potentially unstable "upside down" trophic composition. This inherently impacts the way resources are partitioned, as carnivores are subjected to intense competition. Triassic ecosystems can therefore serve as a case study to explore potential mechanisms behind dietary resource partitioning, and whether that differs from observations in "right-side up" extant ecosystems. Here, we employ Elliptical Fourier Analysis (EFA) to quantify shape variation in the lower jaw, a direct dietary osteological correlate, of more than 350 amniote taxa spanning the Triassic and three modern ecosystems. Importantly, EFA makes no assumptions regarding osteological homology, enabling the direct comparison of shape across morphologically disparate groups and taxonomically diverse ecosystems through deep time. We find that morphological disparity is significantly influenced by taxonomic components and ecosystem compositions—statistically different patterns are observable when comparing the "upside down" Triassic to some, but not all, "right-side up" modern ecosystems. Patterns of morphospace occupation are primarily driven by diet and taxonomic affinity. Carnivores in the Triassic are conserved in their lower jaw shape, regardless of the spatiotemporal scale analyzed (e.g., across the Triassic or within a single formation), and herbivores drive most disparity. Modern ecosystems exhibit a range of dietary disparity, with similar patterns to the Triassic present in Yellowstone and the Everglades, and opposing patterns observed in Amboseli, which are driven by body size. Patterns of taxonomic disparity are conserved in all systems. Our findings suggest that carnivores, unlike herbivores, are influenced by both taxonomic affinity and competitive pressures, broadly partitioning resources through more subtle morphological changes, spatiotemporal partitioning, or extraoral/postcranial variation and, only in select cases, are partitioning resources in a manner similar to herbivores (e.g., substantive changes in

the feeding module) and that these are broader characteristics of terrestrial ecosystem structure.

Funding Sources: Harry Hess Fellowship

Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

Sneaking past the Grande Coupure: diversity of snakes across the Eocene–Oligocene transition (MP 19-22) from Dams (Quercy, southwestern France)

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The locality of Dams (Quercy, southwestern France) has yielded two distinct fossil assemblages, one from the late Eocene (MP 19) and a second from the early Oligocene (MP 22); it is one of the few examples of a locality with infillings across the Eocene–Oligocene transition. A minimum of 21 taxa (13 mammals, six lissamphibians) have been previously identified in Dams. Study of the snake remains from Dams yields two distinct assemblages, with a total of 11 taxa. The Eocene assemblage (five taxa) includes *Eoanilius* aff. *europae*, *Platyspondylia sudrei* Rage, 1988, and three constrictors, i.e., *Palaeopython* sp., "*Palaeopython*" *neglectus* Rochebrune, 1884, and an unnamed constrictor. The Oligocene assemblage (six taxa) includes *Eoanilius* aff. *oligocenicus,* three unnamed alethinophidian species, two constrictors, i.e., *Bavarioboa crocheti* Szyndlar & Rage, 2003, and an unnamed constrictor species, and the caenophidian "*Coluber*" cf. *cadurci*. Among the 11 snake taxa from Dams, "*Palaeopython*" *neglectus* is identified for the first time from a precise locality, and several unnamed Eocene and Oligocene alethinophidians are identified and described for the first time. The constrictor *Bavarioboa* Szyndlar & Schleich, 1993, is identified for the first time in the early Oligocene, pushing its appearance in the fossil record from the MP 25 back to MP 22. Comparison between the two assemblages highlights a complete turnover at the species level, with a single genus, *Eoanilius* Rage, 1974, present in both infillings.

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Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

The cephalic lateral line system of Devonian tristichopterids (Sarcopterygii, Tetrapodomorpha)

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The cephalic lateral line system is a mechanosensory network of canals and tubules, enabling fish to detect hydrodynamic stimuli. Micro-computed tomography (μCT) enables examination of minute, bone-enclosed structures such as tubules, enabling robust comparative analyses. We comprehensively reconstructed the three-dimensional cephalic lateral line system of *Eusthenopteron foordi* and examined structural variation across Tristichopteridae to test whether canal pathways are evolutionarily conserved due to skeletal constraints, and if tubules vary adaptively in response to ecology. Using microscopy and μCT segmentations, we extensively examined and compared canal pathways and tubule morphologies of *E. foordi*, *Tinirau clackae*, *Hyneria lindae*, and *Eusthenopteron jenkinsi*, characterizing the degree of branching, connectivity, and tortuosity. *E. foordi* and *T. clackae* represent marine shelf environments and *H. lindae* and *E. jenkinsi* represent fluvial settings. Specific bones associated with canals and canal pathways were conserved in all taxa and consistent with previous published descriptions of *E. foordi*. This suggests that canal pathways are constrained by skull morphology and that variation emerges at higher taxonomic levels. Conversely, tubules showed distinct variation. The marine shelf taxa, *E. foordi* and *T. clackae*, had tubules that were sinuous, with long, individual primary tubules with minimal

branching. *E. foordi* showed regional variation, with skull roof bones exhibiting increased branching and the greatest tubule density. Tubules of *H. lindae* and *E. jenkinsi*, fluvial taxa, were distinctly linear, with multiple secondary tubules branching from a primary tubule, connecting laterally with adjacent terminal tubules. This morphological convergence between the early diverging *E. jenkinsi* and the derived *H. lindae* indicates that tubule morphology is not linked to phylogenetic history. Instead, the transition to linear, highly branched, and interconnected tubule networks correlates with dynamic, sediment-laden fluvial environments, where maximizing sensory coverage was critical compared to clearer marine shelf settings. We conclude that while canals are constrained by skull morphology and are consistent phylogenetically, tubule systems can vary ecomorphologically. Environmental pressures likely drove tubule complexity, decreasing tortuosity and increasing branching and connectivity. Future work aims to explore the functional differences of these tubule patterns.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

New crocodylomorph and testudine discoveries in the "Mesaverde" Formation (Late Cretaceous, Campanian) of the Bighorn Basin, Wyoming, USA

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Turtles and crocodylomorphs are abundant in Campanian-aged continental deposits of Laramidia, yielding important paleoecological and biogeographic data. The "Mesaverde" Formation (middle Campanian) in Wyoming is comparatively understudied and occupies an intermediate location important for understanding latitudinal faunal variation. Work by the Raymond M. Alf Museum of Paleontology (RAM) in the northwestern Bighorn Basin has yielded significant new material.

A multi-taxon bonebed (RAM V2022023) preserves crocodylomorph teeth, osteoderms, and postcrania. An isolated hemipelvis from a relatively large individual (estimated body length 3.8–4.7 m) has an abnormally fused ilium and ischium, the first reported pathology from the formation. Another site (RAM V2025031) produced a partial immature eusuchian skull, including much of the braincase and dorsal cranial table, including the frontal, postorbitals, squamosals, and parietal. Maximum mediolateral width is 43 mm. A ventrally positioned foramen magnum, subtriangular supraoccipital with limited exposure on the cranial table, broad dorsotemporal fossae, and low otoccipital ridges, among other characteristics, closely resemble brachychampsins, particularly the paracontemporaneous *Brachycampsa sealeyi,* currently known only from the Menefee Formation of New Mexico.

Trionychids are the most common turtles in the "Mesaverde" Formation of the northwestern Bighorn Basin in Park County, followed by helochelydrids, Adocus, and baenids (both smooth-shelled and ornamented morphotypes). *Basilemys* is notably absent, possibly indicating a taphonomic bias favoring fluvial taxa. Underrepresentation of Baenidae is probably due to the poor diagnostic character of unornamented shell fragments. The dominance of trionchyids likely reflects both their easy recognition and also their association with aquatic environments; this is similar to other Late Cretaceous formations in Laramidia. All clades occur throughout the section. Associated carapace and plastron specimens are rare, with a single example each of *Neurankylus* sp., Helochelydridae indet., and a small unornamented baenid from high in the formation.

The crocodylomorph and turtle assemblages for the "Mesaverde" Formation are broadly similar to other middle Campanian assemblages in Laramidia. More detailed assessment is hampered by the paucity of diagnostic material across all formations of this age.

Funding Sources: David B. Jones Foundation, Mary Stuart Rogers Foundation

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Intraspecific variation and morphological overlap in carnivoran and primate proximal femora

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Numerous studies have identified postcranial elements that distinguish members of the order Carnivora by taxon or behavior. Even though proximal femora are common in the fossil record, rarely are they used for this purpose unless diaphyseal or distal morphology is also available. In contrast, the primate proximal femur has been extensively studied and is known to discriminate among locomotor groups. Despite this level of study, primate proximal femora occasionally appear in unpublished African Miocene–Pleistocene carnivoran collections, possibly due to damage to key features or to the fact that intraspecific variation within both orders includes features more commonly seen in the other order. Here, we investigate variation in the proximal femur of extant carnivoran and primate species to assess morphological overlap, improve taxonomic identification of fragmentary fossils, and evaluate the evolutionary and functional information preserved in this region. Linear measurements were collected directly from specimens and from 3D scans. Univariate and multivariate analyses (PCA, DFA) were run on log-transformed measurements and shape data (i.e., derived via division by the geometric mean). Euclidean distance values were used to compare average shape among taxa. Both carnivorans and primates exhibit high levels of intraspecific variation, while interspecific variation among carnivorans is low. In many carnivoran species, intraspecific variation shows geographic structuring, although the relative contributions of genetic and environmental factors are unclear. In relatively sexually dimorphic species, shape data also sorts by sex, which could be due to size-related shape change and/or sex-based differences in behavior. Multivariate analyses of shape successfully distinguish carnivorans from primates and separate major primate subfamilies, but—with the exception of aquatic taxa—do not reliably differentiate carnivoran locomotor categories or taxonomic groups. Average proximal femoral shape is most similar between arboreal and scansorial primates and carnivorans (e.g., colobines and certain viverrids, procyonids, and mustelids), although some convergence is also evident among terrestrial quadrupeds traveling on structurally complex substrates. We propose a framework for distinguishing primate and carnivoran proximal femora that remains effective for damaged fossil specimens and does not require diaphyseal or distal preservation.

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Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

A new Pleistocene gavialid from Taiwan and its implications for East Asian longirostrine crocodylian systematics

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Longirostrine crocodylians from East Asia, including *Penghusuchus*, *Toyotamaphimeia*, and *Hanyusuchus*, are important for understanding the evolution, biogeography, and taxonomic complexity of Gavialidae. Recent phylogenetic studies have recovered several of these taxa near the base of Gavialinae, and their mosaic of gavialine and tomistomine features may help clarify the early evolution of gavialines and the long-standing phylogenetic conflict between *Tomistoma* and *Gavialis*. Here we describe a longirostrine

crocodylian, referred to here as the Zhuoshui specimen, from the Zhuoshui River Basin of central Taiwan. The specimen is represented by a well-preserved skull from the Cholan–Toukoshan Formation and is interpreted as early to middle Pleistocene in age (2.58–0.99 Ma). Benthic foraminiferal assemblages suggest deposition in a shallow coastal setting. The locality has also yielded mammals, turtles, and fishes, suggesting a previously underrecognized Quaternary vertebrate fauna in Taiwan, possibly older than other well-known faunas on the island. The Zhuoshui specimen has enlarged seventh maxillary teeth, an iconic feature among East Asian longirostrine crocodylians. Among these taxa, it shows its closest morphological similarities to *Toyotamaphimeia*, but differs from that genus in premaxillary morphology, a region important for distinguishing among East Asian taxa. The specimen also bears paired pterygoid depressions anterior to the choanal region, similar to the condition in *Hanyusuchus* and further supporting a mosaic character between gavialine and tomistomine. Phylogenetic analyses based on a data matrix of 254 characters and 84 taxa consistently support its affinity with East Asian taxa, although its exact position varies among analyses. In most topologies, it falls outside the *Toyotamaphimeia* + *Hanyusuchus* clade, whereas in others it is recovered within a polytomy with other East Asian longirostrine crocodylians in the strict consensus tree. Referral of the Zhuoshui specimen to *Toyotamaphimeia* is problematic because of its morphological differences, unstable phylogenetic placement, and older geological age. The Zhuoshui specimen may represent a previously unrecognized genus-level lineage, providing new evidence for reassessing East Asian gavialid systematics and the gharial problem.

Funding Sources: National Science and Technology Council, Taiwan grant NSTC 113-2116-M-178-001 to T.-R. Yang

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Technical Session VIII: Fishes (Thursday, November 12, 2026, 1:45 PM)

The earliest known eudipnoan from the Lochkovian of Guangxi, China

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A substantial morphological gap exists between the earliest known lungfish, *Diabolepis* from the Lochkovian of Yunnan, China, and eudipnoans (all lungfishes except *Diabolepis*). Here we report the earliest known eudipnoan, represented by a complete skull, mandible, and well-preserved squamation from the Lochkovian of Guangxi, South China.

The new material displays an intermediate condition that bridges the morphological gap between *Diabolepis* and eudipnoans. The skull roof maintains a mosaic of cosmine-covered bones. Micro-CT imaging reveals prominent swellings of the cerebral hemispheres and large, anteroposteriorly elongated nasal capsules. Separate pineal and parapineal canals persist. The well-preserved hypophyseal region exhibits paired canals for the internal carotid arteries; additionally, paired vomers are preserved. Regarding scale morphology, this specimen shares with *Youngolepis* the presence of an anteroventral process, whereas derived lungfishes lack both the anteroventral and anterodorsal processes. It also shares a paired dentary with *Diabolepis* and other primitive sarcopterygians. In the mandible, the infradentaries form a linear series resembling the condition in *Diabolepis*. Unlike in *Dipnorhynchus* and *Chirodipterus*, the surangular does not extend to the ventral edge of the symphysial dental plate. Furthermore, this specimen and eudipnoans share several derived traits of the skull roof, including multiple D bones surrounding the pineal region and paired I bones that bear the pit line and meet at the midline posterior to the B bone. The main lateral-line canal remains separate from the supraorbital canal, resembling the condition in *Dipnorhynchus*. Together, these features illuminate the sequence of anatomical transformations during the transition from *Diabolepis* to derived eudipnoans.

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Assessing the phylogeny of Palaechthonidae: implications for early primate relationships and biogeography

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The first potential primates to appear in the fossil record are the Plesiadapiformes, a cluster of 10 families variously placed as stem primates or stem euarchontans (i.e., members of the clade that include Primates, Dermoperta, and Scandentia). Palaechthonidae represents one of five plesiadapiform families to appear during the Early Paleocene, thus representing one of the earliest known potential primate lineages. Despite the family's likely importance in understanding primate origins, Palaechthonidae remains poorly understood, being treated as a wastebasket assemblage, grouped together based on a lack of derived traits rather than diagnostic features. The lack of a cladistic analysis for this family has contributed to uncertainty near the root of the primate tree. Here we report on the first comprehensive phylogenetic analysis of Palaechthonidae, including all known species, as well as primitive members of other plesiadapiform families that have historically been connected to Palaechthonidae: Microsyopidae, Paromomyidae, Purgatoriidae, and basal members of Plesiadapoidea (i.e., Plesiadapidae + Carpolestidae + Saxonellidae). A parsimony analysis was conducted in TNT based on 108 dental characters for 36 taxa. The results of our phylogenetic analysis are consistent with the hypothesis of a non-monophyletic Palaechthonidae. Many species assigned to Palaechthonidae occupy very basal positions in the tree with *Palenochtha* positioned near the root of the primate clade (sensu lato). Additionally, *Asioplesiadapis youngi*, a plesiadapiform species known from the Early Eocene of China, similarly holds a primitive position within our analysis, suggesting the taxon's previous placement in Plesiadapidae may be inappropriate. This hypothesis of relationships would also imply a complex biogeographic scenario for the early evolution of plesiadapiforms, as all other primitive taxa are North American. As such, the primitive positioning of numerous palaechthonid species, as well as the primitive placement of *Asioplesiadapis*, have important implications for interpretations of the earliest radiation of primates and their geographic dispersal.

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

NMS G.2014.54.2—An insight into avian neurosensory evolution from an early Eocene bird

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The early Eocene London Clay Formation (LCF) of south-east England yields undistorted 3D bird fossils that have been crucial to our understanding of avian neurosensory evolution. To date, LCF brain cavity endocasts are known for *Lithornithidae, Pelagornithidae, Prophaethontidae,* and *Halcyornithidae*. The exceptional preservation quality of avian crania from the LCF in the immediate aftermath of the K–Pg boundary offer a unique insight into neurosensory evolution during a period of explosive radiation that saw the origin of the majority of extant avian clades. This study uses X-ray micro-CT to investigate neurovascular structures in the first of five undescribed crania belonging to small avian taxa. NMS G.2014.54.2 comprises an isolated cranium from a sparrow-sized bird, missing its rostrum. The brain cavity endocast of NMS G.2014.54.2 differs markedly from *Lithornis*, *Halcyornis*, *Odontopteryx*, and *Prophaethon* in overall size and in several features including the aspect ratio of its telencephalon and

form of the cerebellum. The brain cavity endocast also exhibits a marked rostro-caudally compressed and highly flexed shape in lateral view. The foramen magnum is strongly positioned ventrally, providing an insight into the form of the neck and head carriage.

This new specimen represents a new taxon, providing important information about avian diversity in a subtropical shallow shelf marine environment in the aftermath of the K–Pg extinction. Neurosensory features in these new specimens may provide information on whether Neornithes possessed a cognitive survival advantage at the K–Pg boundary that facilitated the subsequent neornithine radiation and diversification of birds in the early Cenozoic.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A new mid-Cretaceous spinosaurine from Brazil (Maranhao State: Itapecuru Formation) provides insights on the evolution of Late Cretaceous spinosaurines

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The last of the fish-eating, sail-backed spinosaurids rank among the largest land predators and include the spinosaurine *Spinosaurus aegyptiacus*, first described in 1915 from Cenomanian-age beds in Egypt, and *Oxalaia quilombensis*, described in 2011 from Cenomanian-age beds Brazil. The original skeletal material of *S. aegyptiacus* and the isolated snout of *O. quilombensis* were destroyed in museum fires, leaving their morphology and origins all the more mysterious. By the Cenomanian time, these two spinosaurines were separated by a narrow Equatorial Atlantic gateway. Fossils of their predecessors documenting earlier stages in the evolution of spinosaurines have come largely from Brazil and southern Asia. We describe a new spinosaurine from the Aptian–Albian Itapecuru Formation (~105 Mya) from outcrops along the banks of the Itapecuru River in Maranhão State. The partial skeleton includes jaw and nasal crest fragments as well as more of the forelimbs and hind limbs than known in any other spinosaurine specimen. The subadult individual, estimated to have a body length of ~8 m, suggests that the transition from the anterior rosette to more posterior teeth was more gradual and the trunk sail was composed of broader, lower neural spines than in Cenomanian-age spinosaurines. The forearm bones are very derived, the radius hatchet-shaped with an expanded distal end. The manual unguals are recurved, unlike the less recurved, scythe-shaped unguals of *Spinosaurus*. The pedal unguals are only moderately flattened unlike the broader, lower pedal unguals of *Spinosaurus.* Phylogenetic analysis places the new Brazilian species as the immediate outgroup to Cenomanian-age spinosaurines. During mid Cretaceous times and despite occupying contiguous land areas, it seems that faunas on northern South America (Brazil) and Africa (Niger) were dominated by spinosaurines and baryonychines, respectively, with not so much as a single tooth found of the opposing subfamily. The new Brazilian spinosaurine provides the most complete picture we have to date of a spinosaurine before the opening of the Atlantic Ocean.

Technical Session VIII: Fishes (Thursday, November 12, 2026, 1:45 PM)

A new Jianghanichthyid (Teleostei: Cypriniformes) from the Eocene Huachong Formation, with insights into the evolution of Cephalic Sensory Canals

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Pre-Oligocene cypriniform fossils reveal a restricted continental distribution, but stark geographic contrast in early biodiversity. While North American records are solely catostomids, Asian records are highly diverse, spanning catostomids, cyprinids, and jianghanichthyids. As the only recognized extinct family within the order, Jianghanichthyidae offers a unique window into early cypriniform evolution. Here we describe *Jianghanichthys huachongensis*, from the middle–late Eocene Huachong (also Huayong) Formation in the Sanshui Basin, Guangdong, China. While specimens of *J. huachongensis* are typically preserved as partially articulated on fragile slabs because of a shallow lacustrine or swamp-like paleoenvironment, they exhibit exceptional preservation of the delicate cephalic sensory canal system. This new species differs from the previously described *Jianghanichthys hubeiensis* and *Jianghanichthys sanshuiensis* in opercular morphology, the pattern of sensory canals in the opercular region, and various meristic and morphometric characteristics. Distinct from extant cypriniforms but resembling *J. hubeiensis*, both the supraorbital and otic (temporal) sensory canals of *J. huachongensis* connect within the parietal, and the supratemporal commissure also extends through the parietal region. Another distinctive feature of the new species is the fusion of the infraorbital and preopercular canals immediately posterior to the orbit. Furthermore, a true opercular canal is lacking in *J. huachongensis*, whereas *J. hubeiensis* presents an opercular canal through the opercular arm extended from the preopercular canal, and *J. sanshuiensis* exhibits a canal within a groove along the opercular arm. These findings reveal significant intrafamilial variation in the opercular region and suggest that early members of Cypriniformes exhibited a greater degree of intrafamilial morphological diversity than previously recognized, and perhaps even more than extant cypriniform families. Ultimately, this new material provides novel diagnostic features for the family and sheds light on sensory system diversity in early-diverged clades of Cypriniformes. If the overarching evolutionary trend in cypriniforms involves a reduction in sensory canal connections and a structural shift away from the parietal region in derived forms, a hypothetical intermediate between Jianghanichthys and modern cypriniforms might be expected to retain only a single canal connection involving the parietal.

Funding Sources: Open Grant of State Key Laboratory of Palaeobiology and Stratigraphy (Nanjing, China) to J. L. and National Key Research and Development Project of China (2024YFF0807603)

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Investigations of the cichlid skeletal fossil record reveal novel insights into the morphology and temporal distributions of the clade

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Living cichlids exhibit remarkable taxonomic richness and ecomorphological disparity, making them a useful study system for understanding how clades evolve at varying timescales, spatial scales, and ecological regimes. Despite their importance in the study of evolutionary processes, the cichlid fossil record has remained largely unintegrated into evolutionary studies of the clade. This is not due to a lack of available material, since cichlids have a substantial record of articulated skeletal material for a freshwater, principally tropical, group. Instead, this discrepancy results from an inadequate understanding of the precise phylogenetic placements of these taxa. Many of these fossils have not been subjected to modern techniques of morphological analysis, such as micro-computed tomography (μCT), that would allow for better estimates of their relationships to the modern assemblage. Here, we use μCT data to illustrate anatomical detail of three fossil cichlids from the Neotropics. Two of these, the previously described taxa †Nandopsis woodringi from the Miocene of Haiti, and †Macracara prisca from the Pliocene of Brazil, reveal anatomy not visible to the naked eye and otherwise uncodeable into a morphological

matrix. A third, new specimen is shown, representing the earliest known occurring member of the family, based on palynological and lithological analyses.

Funding Sources: National Science Foundation (Award DEB 2341834, 2341835, 2341836)

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

What, if anything, is a pursuit predator? Using 3D humerus shape to track the evolution of cursoriality and predation strategies in fossil canids

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The categorization of locomotor modes and hunting strategies is central to describing the ecology of modern predatory mammals and reconstructing the ecology of fossil species, yet clear and consistent definitions for cursoriality and pursuit predation have been elusive. Cursoriality is generally defined morphologically but is frequently treated as a locomotor category or a description of behavior. In carnivores, pursuit predation and cursoriality are often considered equivalent, despite inconsistencies in the morphology associated with each. To address these obstacles, I present relative maximum running speed as an index of cursoriality based on locomotor performance, which aligns with the expected patterns of cursorial morphology while remaining grounded in running ability. I also reframe predation strategies in canids, defining a continuum from group hunting to solo pounce/pursuit hunting, which reveals that pounce/pursuit predators are more cursorial than pack hunters. Finally, using humerus morphology to predict relative maximum running speed, I evaluate the evolution of cursoriality and predation strategies in the canid fossil record. The results indicate an increase in cursoriality at the origin of Caninae and suggest a pack-hunting predation strategy for a number of fossil canids, including the dire wolf, *Aenocyon dirus*, and *Borophagus.*

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Hesperornithiform bird femora from the Campanian-aged "Mesaverde" Formation of Wyoming reveal morphological diversity in a coastal assemblage

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Hesperornithiformes were specialized diving birds that lived during the Late Cretaceous, found in aquatic deposits across Laurasia. However, their diversity in Campanian coastal environments remains poorly understood for many formations. We identified 11 isolated, partial hesperornithiform femora (5 left, 6 right) from the Campanian-aged "Case Sites" in the "Mesaverde" Formation of the eastern Bighorn Basin, Washakie County, Wyoming, representing a coastal environment. Specimens were identified through detailed morphological comparison to characters in published hesperornithiform phylogenetic matrices. All specimens can be referred to Hesperornithiformes based on the presence of a "hunch," or thickening along the shaft; two specimens are too fragmentary for more refined identification. Most specimens (n = 9) are identifiable as Hesperornithidae due to a highly concave lateral shaft margin and, in the best-preserved specimens, well-defined tubercles for m. iliofemoralis and m. caudofemoralis along the medial margin. No specimens preserve genus- or species-specific synapomorphies, in part due to taphonomic wear. We observed a great range of size and variation in morphology; although no femur is complete, we estimated total femur lengths of 55–115 mm based on comparison with more complete femora.
Macroscopic surface texture of the femoral shafts is consistent with adult- or near-adult-sized individuals, suggesting that the size variation may in part reflect taxonomic diversity rather than solely ontogeny. Thus, multiple hesperornithiform taxa may have coexisted within this Campanian coastal ecosystem of Wyoming, potentially partitioning

ecological roles. This level of diversity is consistent with other assemblages for the Western Interior Seaway.

Funding Sources: David B. Jones Foundation, Mary Stuart Rogers Foundation

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Packing and unpacking: An analysis of regional North American mammal diversity in response to climate change at the end of the Pleistocene

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Since the Last Glacial Maximum (LGM, ca. 21 kya), North American mammal species have drastically altered their ranges in response to warming climate and deglaciation. As a result, past mammal assemblages differed greatly in both taxonomic and functional diversity from those of today. Here we use ecological niche models (ENM) of 498 North American mammal species to analyze regional trends in mammal diversity through time and assess possible changes in functional niche availability. We trained ENMs for each species and projected habitat suitability onto climate models of eight time intervals from LGM to today. We then recorded taxon lists for 100 x 100 km^2 grid cells spanning Canada to Panama, and calculated species richness, functional richness (FRic), and functional redundancy (FRed) in each grid cell for each time interval. Grid cells were divided into three groups: cells predicted to have species richness greater than zero in all time intervals, cells that were glaciated during at least one interval, and unglaciated cells that were predicted to be uninhabitable in at least one interval. We also categorized grid cells into five equal-interval latitudinal groups: 58–70°N, 45–58°N, 33–45°N, 20–33°N, and 7–20°N. We find that the three diversity metrics accumulate at different rates in each group of grid cells. FRic increases more rapidly than species richness in formerly glaciated cells, indicating these regions experienced niche expansion due to warming climate and deglaciation, allowing for a wider variety of functional roles. FRed increases substantially in cells identified as uninhabitable and in mid-latitudes, and therefore these regions likely underwent niche packing during the Pleistocene–Holocene transition. In cells identified as permanently inhabited and in the two southernmost latitudinal groups, values of all three metrics are fairly stable through the Pleistocene–Holocene transition but experience significant decreases during the Holocene and current intervals. As such, these cells likely experienced niche unpacking at the end of the Pleistocene, due to warming temperatures and receding ice sheets allowing for species ranges to expand northwards out of glacial refugia. These findings can be tested with the Quaternary fossil record of mammals in North America and may provide insight into how modern mammal communities may disassemble and reassemble in response to ongoing climate change.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

An evaluation of flight origin using phylogenetic mapping in Oviraptorosaurian families

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Oviraptorosaurians are a group of theropod dinosaurs understood to be secondarily flightless, meaning they evolved from ancestors capable of flight and are widely regarded as extremely birdlike. Our goal was to assess the distribution and variation of avian traits present in this group to better understand the evolution of flight. We constructed a character matrix of traits known to be important for avian flight and mapped them onto a published phylogenetic tree representing the current understanding of Oviraptorosaurian relationships. Using ten representative taxa across three families (Oviraptoridae, Caudipteridae, and Caenagnathidae) and two outgroups (*Archaeopteryx lithographica* and *Velociraptor mongoliensis*), we learned that these traits showed considerable variation. Some traits, such as quill knobs, appear to have been lost once in an

Oviraptorosaurian ancestor. Other traits, including the pygostyle and furcula, show significant variation, suggesting they are very labile traits. The ability of some traits to change easily suggests they may have other, non-avian functions. Although we were unable to determine whether the distribution of traits supported one flight origin hypothesis over another, there is support for current ideas that suggest avian flight may have evolved multiple times in the ancestors of birds and their flighted theropod relatives.

Technical Session VI: Dinosauria II: a “bird-hipped” bonanza (Thursday, November 12, 2026, 8:00 AM)

Taphonomic analysis of the MayRae Quarry, Yellow Cat Member (Lower Cretaceous, Barremian), Cedar Mountain Formation, eastern Utah, USA

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The MayRae Quarry of the Yellow Cat Member, Cedar Mountain Formation (Barremian, Utah), preserves a multitaxic vertebrate assemblage dominated by the ankylosaurian *Gastonia*. Other taxa are rare, including *Utahraptor*, a large indeterminate theropod, *Moabosaurus*, and *Cedarosaurus*. Fossil root traces are sparse. The bonebed horizon extends >120 m along the hillside, and sporadic test excavations penetrate only 1–3 m into the slope. Here, the Yellow Cat Member consists of basal mudstones (distal floodplain) grading upward into siltstones (intermediate floodplain) and sandstones interbedded with silty mudstones (proximal crevasse-splay). Meter-thick channel sandstones of the Poison Strip Sandstone cap this sequence. This succession indicates increasing proximity to a river channel. The bonebed occurs within the intermediate floodplain facies. Sparse root traces suggest brief periods of landscape stability. Conchostracans in the overlying stratum indicate ephemeral floodplain pools following burial. Most of the 2,000+ bones retain original surface textures and exhibit weathering stages 0–1. Only a few individuals are partially articulated and/or closely associated. Isolated, partially articulated limbs and armor elements are common, whereas most specimens are disarticulated elements, showing variation in decomposition rates, burial rates, and transport distance. Trample breaks and scratches are common. Evidence of predation or scavenging includes: (1) shed theropod teeth; (2) probable crocodilian bite marks, including punctures, gouges, and possible healing responses on *Gastonia* spikes; and (3) *Moabosaurus* ribs bearing a theropod tooth mark closely associated with an ulna, sternals, and a cololite with gastroliths, finely comminuted plants and small gymnosperm cones, all suggesting both scavenging and rapid burial. Insect modification is rare. Pathological features include ulcerative dermatitis-like pitting on osteoderms and evidence of healed skeletal trauma.

The quarry records multiple crevasse-splay depositional events on a floodplain, producing a time-averaged assemblage. The dominance of *Gastonia* suggests repeated accumulation of carcasses near a river channel. Minimal transport, low weathering, rare insect damage, and the presence of some articulated and associated remains indicate some carcasses were buried prior to extensive soft-tissue decay. Variable trampling intensity across the bonebed reflects differences in exposure duration before burial.

Funding Sources: Brigham Young University

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Reinterpretation and revised diagnosis of the chasmosaurine ceratopsid *Utahceratops gettyi* based on new cranial material

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Utahceratops gettyi, a late Campanian chasmosaurine currently known only from the middle unit of the Kaiparowits Formation, Grand

Staircase-Escalante National Monument, southern Utah, was initially based on numerous specimens, including three partial skulls, isolated cranial elements, and disarticulated bonebed material from at least two individuals. Accordingly, *U. gettyi* was diagnosed by four autapomorphies: (1) posteriorly-positioned nasal horn, (2) short, robust, and dorsolaterally-directed supraorbital horn core with blunt tip; (3) low and elongate (>10 cm) episquamosals on mid portion of lateral margin; and (4) dorsally-curved median portion of transverse bar of parietal. A new, well-preserved partial skull (DMNS EPV.95450) adds significant new insight, particularly to the unique morphology of the preorbital rostrum of the skull. The new specimen includes a complete rostral, a fragmentary premaxilla, a nearly complete maxilla, a partial jugal, and a partial squamosal. These elements can confidently be referred to *Utahceratops* by shared anatomy among cranial elements. Significantly, this new skull permits a reinterpreted and updated cranial reconstruction. This includes an anteroposteriorly elongate and comparatively dorsoventrally short preorbital region and indicates that *Utahceratops* retained an accessory antorbital fenestra, a character typically noted in early-branching ceratopsians (e.g., *Zuniceratops*, *Diabloceratops*). The absence of significant diagenetic distortion also reveals that the previously apomorphic, posteriorly displaced epinasal is situated in a more anterior position, similar to other early branching chasmosaurines (e.g., *Pentaceratops*, *Cryptarcus*, *Chasmosaurus*). A revised diagnosis introduces three new apomorphic characters, strengthening the validity of this taxon. Despite the reinterpretation and revised diagnosis of *Utahceratops* being restricted to the preorbital region of the skull, it has important implications for the systematics, functional morphology, and paleoecology of this taxon, especially in the context of emerging evidence for a third, sympatric chasmosaurine taxon in the Kaiparowits Formation and morphology shared between *Utahceratops* and taxa from “northern” Laramidia.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Basin margins and mountain edges: sparsely sampled high- and mid-elevation localities bordering the richly fossiliferous Bighorn Basin, Wyoming

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The North American early Cenozoic fossil record is well-known from intermontane basins in the western interior. Here, long rock records demonstrate how environments and faunas change in response to changing climate through time. However, this fossil record mainly preserves relatively lowland floodplain environments which is not reflective of the full range of environments that fossil taxa would have inhabited. In modern tropical and subtropical ecosystems, species diversity is often associated with increasing topography so sampling outside of these intermontane basins may prove particularly important for clarifying regional diversity patterns and identifying pockets of endemicity and potential speciation. Here, we present new and historic data on fossil localities in the Bighorn Basin from the Aycross Formation, Wapiti Formation, and Blue Point Marker—all of which are early–middle Eocene in age. Sites in these formations preserve taxa that inhabited the foothills and mountains surrounding the more densely sampled depositional basins where high-resolution faunal changes can be observed. These foothill and mountain sites present new opportunities to test hypotheses generated mainly from lowland depositional basins (e.g., the Willwood Formation in the Bighorn Basin). Recent work at high elevation sites on Carter Mountain recovered unique samples of Microsyopid plesiadapiformes, suggesting size-based species diagnoses typically used in the Bridger Basin may be inappropriate or inaccurate in mountains. Ongoing work in the Aycross Formation has multiplied the number of known localities two-fold and expanded the sample of unique anaptomorphine omomyids, a group which experiences significant taxonomic decline in coeval lowland depositional basins. Unique faunal co-occurrences, endemic taxa, and early occurring species are frequently found among other foothill

and mountain sites of the Wapiti and Aycross Formations in comparison with coeval lower elevation sites. While basin margins and mountain edges will never have the same expansive record as sites in traditional depositional basins, they are calibrated by and complimentary to lowland basin records. Furthermore, they may serve as critical comparative samples for understanding the limits of faunal dynamic models generated from these lowland basins.

Funding Sources: David B. Jones Foundation

Technical Session VIII: Fishes (Thursday, November 12, 2026, 1:45 PM)

Remarkable heterodonty in a Carboniferous ray-finned fish

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Ray-finned fishes, or actinopterygians, are an extraordinarily diverse group of vertebrates, with more than 35,000 extant species. Extant actinopterygians exhibit a diverse slate of feeding modes, from planktonivory to durophagy. Substantial diversity in feeding mode among actinopterygians first appeared in the Carboniferous, with large hypercarnivores and deep-bodied durophages being long-recognized examples. However, the diversity in feeding mode of smaller taxa remains understudied due to challenges of studying flattened, diminutive remains. Haplolepids are a modest clade of small, highly specialized taxa from the Carboniferous that bear adaptations similar to those seen in more recent taxa, such as neopterygians. Despite an extensive history of study, their internal anatomy is poorly understood, limiting information bearing on both their relationships and feeding ecology. Here we present information on the anatomy of *Parahaplolepis westolli*, a haplolepid from the early Pennsylvanian of Newsham, Northumberland, United Kingdom. Described in 1983, the holotype specimen is disarticulated and tiny, with a skull roof only 7 mm long. Computed tomography allowed for exceptional access to its internal anatomy. Alongside information relating to phylogenetically significant regions of the body, such as the neurocranium and scapulocoracoid, this specimen also bears a well-preserved mandible and palate. These show tube-like teeth on the anterior margin of the dentary, and large, molariform teeth on both the prearticular and palate immediately anterior to the adductor chamber. The presence of remarkably specialized feeding anatomy in such an early-diverging taxon furthers the evidence that adaptations formerly thought to be restricted to more recent clades arose independently—sometimes in multiple instances—early in actinopterygian history.

Funding Sources: This research was supported by the National Science Foundation (Award EAR 2219007)

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

Histological and neutron CT evidence for distinct developmental strategies for the formation of dental batteries among captorhinid reptiles

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One of the revolutionary innovations associated with the early stages of amniote history is the evolution of a specialized feeding mode: herbivory. The ability to efficiently break down cellulose-rich tissues, known as high-fiber herbivory, has been suggested to have developed after a transitional period of omnivory and low-fiber herbivory. Over the last 300 million years, herbivory evolved independently multiple times, leading to vertebrates becoming primary consumers in terrestrial trophic systems. Captorhinids are among the most widely recognized Paleozoic groups of small, omnivorous and herbivorous eureptiles, as they were among the first to rapidly diversify and achieve global distribution. Previous research has suggested that dental batteries composed of

multiple rows on the maxilla and dentary evolved independently in at least two lineages of captorhinids: one basal taxon of the group Captorhinidae (*Captorhinis aguti*) and all taxa within the more derived group Moradisaurinae (*Captorhinikos valensis* and *Moradisaurus grandis*). The primary objective of this study is to compare the different multiple-tooth-rowed (MTR) captorhinids to gain a deeper understanding of the evolution of high-fiber herbivory within this clade. High-quality neutron computed tomography and histological analyses were used to examine the dental attachment, implantation, and replacement cycles for the three captorhinid taxa. Two unprepared, fragmentary jaw elements from the multiple-tooth-rowed region of *M. grandis,* from the Moradi Formation of Niger, reveal a novel tooth replacement pattern that differs from the well-known and well-described labial resorption and lingual apposition pattern observed in *C. aguti*. Interestingly, some tooth positions within the MTR exhibit gomphosis, a dental characteristic not reported for captorhinids, as all described specimens have roots directly fused to the jawbone. Additionally, when teeth within and across rows are compared, successive heterochrony can be observed (from gomphosis to ankylosis). We propose that these unique characteristics may be related to the parallel alignment of the tooth rows, as well as the ability to effectively grind and thoroughly process plant material in this large-bodied, high-fiber herbivore, *Moradisaurus*, compared to the smaller captorhinid taxa.

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Technical Session VI: Dinosauria II: a “bird-hipped” bonanza (Thursday, November 12, 2026, 8:00 AM)

A new Mongolian species informs distribution patterns and modes of evolution in protoceratopsid dinosaurs

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Distinguishing new species from unsampled growth stages of established ones is a pervasive challenge in paleontology. Many recent and ongoing debates in dinosaur taxonomy such as those surrounding *T.rex-Nanotyrannus, Triceratops-Torosaurus*, and *Pachycephalosaurus-Stygimoloch-Dracorex* are rooted in this challenge. Protoceratopsid dinosaurs from the Late Cretaceous of the Gobi Desert are known from hundreds of specimens and complete growth series and present an ideal empirical test case for examining our ability to distinguish between growth stages of closely related species. We recognized the first new valid protoceratopsid species in a quarter century represented by a complete growth series of 14 specimens ranging from embryos to adults and diagnosed by at least three autapomorphies, two of which are age dependent. In order to examine whether the new species can be distinguished from others across all growth stages, we applied four common ordination and clustering analyses to a dataset of 20 traits scored across 54 specimens representing all valid, and most of the named, protoceratopsid species. These analyses confirm the distinctness of the new taxon and allow accurate taxonomic assignment of nearly all protoceratopsid specimens regardless of ontogenetic stage. Only the two smallest juveniles of the new species are consistently misclassified, confirming statements in the literature that very young juveniles should not be used as holotypes for new species. Our analyses consistently show that taxa named on different growth stages like *Platyceratops*, *Magnirostris*, and *Breviceratops* are likely synonymous with existing taxa rather than representing new ones. While previous studies that attempt to disentangle ontogenetic from taxonomic variation in fossil vertebrates often rely on histological analysis, a significant outcome of this study is that reliable taxonomic assignments can be achieved using standard ordination methods on morphological traits alone.

Additionally, our taxonomic analyses confirm sympatry of different species pairs, including our new taxon, at three of eight examined localities. As sympatric species cannot be ancestral to one another, this finding implies that protoceratopsid taxa do not form an anagenetic sequence of chronospecies as previously suggested. Rather, trait evidence for reciprocal monophyly and sympatric distributions support cladogenesis as a common mode of evolution in protoceratopsid dinosaurs.

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Small sized tragulids from the Upper Miocene to Lower Pliocene deposits of the Siwaliks of Pakistan

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This research work is focused on the small-sized tragulid remains collected from the Siwalik deposits, which range in age from Late Miocene to Early Pliocene. The collected specimens have been characterized based on morphometric data in the form of anatomy of dental elements. This resulted in the proposal for additions to the dental terminology by introducing two new cusp names for the description of upper deciduous premolars; the first description of DP3, second description of dp4, and third description of p3 of *Siamotragulus nagrii*; description of a m1 of the genus *Siamotragulus*; and possibly confirms the presence of the genus *Tragulus* in the Siwaliks based on a specimen from the Tatrot Formation. The study is part of the reassessment of Siwalik tragulids.

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

New fossils and revised systematics of lysorophians reveal high levels of diversity across two major radiations across the Permo–Carboniferous

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Lysorophia, or Molgophidae, are elongate, fossorial early tetrapods with a fossil record spanning the Permo–Carboniferous, with their earliest record in Mazon Creek, Illinois (309–307 Ma). Recent anatomical and phylogenetic studies recover lysorophians within the highly specialized recumbirostran clade, Chthonosauria, revealing greater taxic and ecological diversity than previously recognized. However, historic lysorophian materials remain unrevised, obscuring patterns of diversity and evolution of lysorophians across the Permo–Carboniferous. Here, we present new anatomical data of lysorophians from different localities spanning the Permo–Carboniferous of North America. Micro-CT-informed anatomy of a large-bodied lysorophian from the Late Carboniferous Kinney Brick Quarry of New Mexico (USNM PAL 706594) reveals a new taxon diagnosed by its unique number of 74 presacral vertebrae among other features. We also redescribe "*Brachydectes elongatus*" from the early Permian of Oklahoma using new and historic material and propose reassignment of this taxon to a new genus, diagnosed by a unique high skull and 97 presacral vertebrae. Finally, reexamination of "*Brachydectes newberryi*" material from the early Permian Eskridge Shale of Nebraska, also supports assignment of this material to a new genus based on its narrow bullet-shaped skull, reduced marginal dentition, and lower vertebral count.

Phylogenetic analysis using the most recent recumbirostran-focused matrix, recover USNM PAL 706594 as sister taxon to *Brachydectes newberryi*, while also supporting the removal of "*B.*

elongatus" from the genus *Brachydectes,* recovering this taxon as the sister taxon to all other lysorophians. Two distinct lineages with specialized cranial morphotypes of lysorophians are identified: the first is a bullet-shaped skull with a sloped occiput present in Carboniferous forms and Eskridge material; the second, is a high, "domed" skull, with a vertical orientation of the occipital elements characteristic of Oklahoma and Texas material. Increased vertebral count appears to have evolved independently within each lineage. Our findings reveal a greater lysorophian diversity than previously recognized, suggesting that morphological disparity of the clade was well-established by the Carboniferous. The increase in recognized lysorophian taxa over the past decade indicates that additional material will likely expand the known diversity and evolution of this group across the Permo–Carboniferous.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Testing for functional regionalization in the snake vertebral column

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Snakes navigate diverse ecosystems all over the world using their characteristic limbless mode of locomotion. While functional research typically takes a holistic approach to snake vertebral motion, considering the snake precloacal vertebral column to act as a homogenous series of repeated units, snakes—like their limbed ancestors—have morphological regionalization along their vertebral columns. Here, we investigate the apparent contradiction between theorized homogenous joint function and known regionalized joint morphology by quantitatively comparing the range of motion (ROM) of intervertebral joints along the snake body. Using *ex vivo* marker-based XROMM of fully intact ball pythons we find that, despite clear differences in vertebral morphology, ROM is very similar among joints sampled from four morphological regions of the spine. Bilaterally, the combination of zygosphene and prezygapophysis of each vertebra creates an osteological slot within which a process formed by the zygantrum and postzygapophysis slides during motion. Visualization of these osteological interactions highlights previously unappreciated integration between the zygapophyseal and zygosphene-zygantrum joints. Covariation of zygosphene and prezygapophysis angles relative to zygantrum and postzygapophysis angles along the vertebral column allows the process/slot relationship to maintain uniform constraints on ROM despite overall morphological change. These ROM results from intact cadavers resemble osteological ROM estimates generated from bones alone, suggesting that robust inferences about intervertebral ROM can be drawn from the snake fossil record.

Funding Sources: Brown University Department of Ecology, Evolution, and Organismal Biology BioMechanics Core Facility Fund

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Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

***Asaphestera* and the origin of pan-amniotes**

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Asaphestera platyris is known only from an incomplete skull roof from the earliest Pennsylvanian of Joggins, Nova Scotia, Canada—the same site and age as *Hylonomus* and *Protoclepsydrops*, long considered the oldest known amniotes. After a very brief description in 1934, it was merged with "microsaur" and indeterminate tetrapodomorph material and redescribed in 1963 as the archetype of a "microsaur." In 2020, the "microsaur" material was redescribed and named *Steenerpeton*, while the

real *Asaphestera* was redescribed as a pan-mammal with a temporal fenestra. In 2025, another redescription cast doubt on the fenestra and declared *Asaphestera* a nomen dubium, implying it was probably a "microsaur" and possibly the same as *Steenerpeton* after all and finding *Asaphestera* (*Steenerpeton* was not included) next to the recumbirostran "microsaur" "*Llistrofus*" (a junior synonym of *Hapsidopareion*) in a preliminary phylogenetic analysis. A fresh look at the specimen shows that there is indeed no fenestra (and no frontal contribution to the orbit), but the specimen is diagnostic. The postparietal is single, triangular, and enters the skull table (shared with procolophonians, especially *Nyctiphruretus*); tabular and supratemporal are therefore both present, unlike in "microsaurs." The "palpebral", which would be an exclusive "microsaur" feature, is part of the palatine and likely the vomer in dorsal view, showing part of the choanal margin. There is a long parietal/postorbital contact. The orbits are large, and the temporal region is extremely short, much as in *Nyctiphruretus*. Yet, phylogenetic analyses of a recently published large matrix of early limbed vertebrates place *Asaphestera* only one node closer to Amniota than to the "microsaurs," rootward of Diadectomorpha (while *Nyctiphruretus* remains a sauropsid amniote, *Steenerpeton* remains a non-recumbirostran "microsaur" and *Hapsidopareion* remains a recumbirostran); analysis of an even larger matrix of early amniotes and their closest relatives places *Asaphestera* with *Brouffia* and *Coelostegus* immediately outside the smallest clade of recumbirostrans (no other "microsaurs" are yet sampled; *Hapsidopareion* is nested in Recumbirostra), captorhinids, diadectomorphs and amniotes (in which *Nyctiphruretus* remains nested). Both results could be interesting for placing an animal of small body size at the divergence between amniotes and "microsaurs," with implications for the origin of the amniotic egg.

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

Lewis's Legacy: increased protosuchid diversity in the Kayenta Formation of the Navajo Nation

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Protosuchids were a small-bodied clade of terrestrial crocodyliforms found in Upper Triassic through Lower Cretaceous sedimentary rocks of China, southern Africa, Argentina, eastern Canada, and the western United States. However, the acme of the clade was likely during the Early Jurassic, where in the Kayenta Formation protosuchids co-occurred with "sphenosuchian" crocodylomorphs and early-diverging mesoeucrocodyliforms. Barnum Brown first reported *Protosuchus richardsoni* from the Moenave Formation of northern Arizona in 1933, but the first protosuchid discovered in the overlying Kayenta Formation was briefly mentioned by G.E. Lewis in 1958 from a tritylodontid bonebed in the upper part of the formation on the Navajo Nation. The co-occurrence of those clades in the Kayenta Formation provided some of the first fossil evidence for an Early Jurassic age of the unit. Later discoveries in the formation by UC Berkeley, Harvard University, the Museum of Northern Arizona, and UT Austin, along with new CT data and phylogenetic interpretations, have greatly increased our sampling of the clade in the Lower Jurassic of the American Southwest.

Lewis's specimen is anatomically identical to *P. richardsoni*, extending its biostratigraphic range from the Moenave Formation. Other skulls from the Kayenta Formation on the Navajo Nation represent the holotype specimen of *Eopneumatosuchus colberti* and two *Edentosuchus*-like taxa. Here, I introduce the skull roof and braincase of a new unnamed protosuchid taxon and a partial skeleton of cf. *P. micmac*, which preserves a nearly complete skull and mandibles, mostly articulated presacral vertebral column, associated dorsal and ventral osteoderms, a partial humerus, partial ilia, a complete femur, and a calcaneum. The specimen of cf. *P. micmac* represents a geographic range extension from the Fundy Basin of Nova Scotia. The new taxon is characterized by a unique pattern of pits and grooves on the frontal, parietal, postorbital, and squamosal.

As many as six distinct protosuchid taxa occur in the Kayenta Formation on the Navajo Nation, many of which preserve disparate tooth anatomy and thus probable dietary differentiation, including herbivory. This relative heightened diversity of protosuchids in the Early Jurassic perhaps reflects an ecological release after the extinction of most "sphenosuchian" crocodylomorphs and carnivorous archosauriform clades like phytosaurs and "rauisuchians" at the end of the Triassic.

Funding Sources: University of Texas at Austin; Smithsonian Institution; Museum of Northern Arizona

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Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

The identity of the gomphothere from Love Bone Bed, Alachua County, Florida

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Proboscidean diversity peaked during the Miocene in North America. Many of these species are found in the fossil record of Florida, including longirostrine gomphotheres, shovel-tusked amebelodontids, and short-jawed rhynchotheres. Amebelodontids were especially diverse during this time. These proboscideans are found at various sites from ~10 Ma to ~6 Ma in Florida, including the historically well-known Mixson's Bone Bed, Tyner Farm, McGehee Farm, and the Moss Acres Race Track. They are characterized by dorsoventrally flattened lower tusks, elongated mandibular symphyses, and molars with incipient double trefoils. The ~9 Ma fossiliferous Love Bone Bed in northern Florida has also yielded the remains of a longirostrine gomphothere, which was referred to the amebeldontid *Amebelodon* (*Serbelodon*) *barbourensis*. In a larger effort to reassess the diversity of amebelodontids of North America, we investigated the gomphothere sample from the Love Bone Bed to determine its taxonomic identity and relationships with other younger amebelodontids in Florida and tested the hypothesis that the Love Bone Bed gomphothere is 1) the same taxon as *Serbelodon barbourensis* from the Xmas Quarry in Nebraska, and 2) is an amebelodontid similar to the younger species *Amebelodon floridanus*.

We compared the Love Bone Bed gomphothere material to the sample of *Serbelodon barbourensis* from Xmas Quarry, the type locality, and with other amebelodontid remains from Florida and Nebraska. We have found that the Love Bone Bed specimens do not possess any of the characteristics of *Serbelodon* from Xmas Quarry. In this project, we focus on determining the correct identity of the Love Bone Bed gomphothere. Unlike *Serbelodon*, the Love Bone Bed gomphothere has a longer mandibular symphysis and peg-shaped lower tusks. The lower tusks of *Serbelodon* are dorso-ventrally flattened, typical of other amebelodontids, but have a relatively short mandibular symphysis. Compared with other amebelodontids from Florida, the Love Bone Bed gomphothere exhibits minimal pseudoanancoidy, absence of posttrite trefoils, and peg-shaped tusks. These gomphotheres do not possess any synapomorphies of the Amebelodontidae. However, the bunodont dentition, elongated mandible, and downturned upper tusks are all characteristic of gomphotheres from the genus *Gomphotherium.* Therefore, we conclude that no amebelodontids are found at the Love Bone Bed, and the gomphothere cannot be referred to *Serbelodon*.

Funding Sources: Florida Museum of Natural History University of Florida Undergraduate Scholars Program

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Assessing the impact of ontogenetic development on the formation and variation of taphonomic signatures in vertebrate remains

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The disproportionately low number of juvenile vertebrate specimens in the fossil record

constrains our understanding of the impact of ontogeny on paleoecology, phylogenetic relationships, and evolutionary histories. Age-specific mortality rates and the taphonomic bias associated with the increased porosity and incomplete ossification of juvenile bone are among the most common factors associated with this disparity. We are studying the role of taphonomic bias in shaping age distributions within the fossil record through a comparative analysis of vertebrate remains from the White River Group in Toadstool Geological Park in Nebraska and modern vertebrate assemblages from the Pilcomayo Megafan in western Paraguay. Both study areas represent aggrading fluvial environments, which have a high sediment load and are ideal environments for fast burial and eventual fossilization. By comparing relative abundance and elemental representation between the fossil and modern data sets, we can identify the taphonomic biases and preservation patterns that may differentially affect vertebrate skeletal elements across age classes. We studied 380 carcasses from Paraguay, of which 18 represented juveniles (identified by non-ossified apophyses, unfused epiphyses, unfused cranial sutures, and deciduous dentition), and 9,529 specimens from Nebraska, of which 35 represented juveniles. Our juvenile remains exhibit greater degrees of weathering and abrasion, as well as a lesser degree of completeness relative to adult specimens in the same assemblage across both modern and ancient settings. Systematic differences in weathering, abrasion, and completeness between age classes in the White River Group suggest that patterns of bias, while interpretable, are tied to local depositional environments. Ground-truthing these patterns with sedimentological interpretations of comparable depositional environments to subenvironments observed in Paraguay allows us to assess the genetic mechanism of such biases and whether the scarcity of juvenile vertebrate fossils reflects biological reality or preservational distortion.

Funding Sources: David B. Jones Foundation, UNM, and the Grand Rapids Public Museum

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

The first *Foraminacephale* (Dinosauria: Pachycephalosauria) from the United States: A fine frontoparietal dome from the Campanian of Havre, Hill County, northern Montana.

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Foraminacephale brevis is a small-bodied pachycephalosaurid ornithischian dinosaur from the Campanian-aged Dinosaur Park and Oldman Formations of Canada. Here we describe a frontoparietal dome, BDM 060 (Badlands Dinosaur Museum, Dickinson, North Dakota), from what is mapped as the Judith River Formation, near Havre, northern Montana, but is stratigraphically equivalent to the middle Dinosaur Park Formation of Alberta (*Styracosaurus-Lambeosaurus* zone, based on specimens recovered nearby). BDM 060 is well-preserved and includes a natural endocast of the cerebellar and olfactory fossae. The dorsal surface is pierced by numerous small foramina and is anteriorly inflated such that an anterior frontoparietal “brow” is formed. The supratemporal fenestrae are closed, and the temporal chambers are slit-shaped. A finely preserved stapes of the middle ear is present in the left temporal chamber. The posteromedial extension of the parietal in BDM 060 is angled ventrally and is approximately rectangular in shape. We compared BDM 060 to pachycephalosaurid taxa from North America and Asia in order to constrain its taxonomic affinity. BDM 060 is different from *Hanssuesia sternbergi* because of the posterior position of the frontoparietal “brow” and a much broader frontoparietal in the latter. BDM 060 is different from *Stegoceras validum* because of the triangular posteromedial extension of the parietal in the latter. BDM 060 and *F. brevis* share a suite of characters, namely a highly pitted dorsal surface of the frontoparietal; an anteriorly located frontoparietal “brow,” closed supratemporal fenestrae; slit-shaped temporal chambers; and orbital fossae with numerous foramina. BDM 060 represents the first specimen of *Foraminacephale brevis* from the United States, extending its known range southwards by ~340 km. This further record of classic Canadian taxa in Montana adds to

evidence that latitudinally arrayed biogeographic provinces are partly a chronostratigraphic artifact.

Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Remarkable taxonomic diversity of Upper Cretaceous polycotylid plesiosaurs in north Texas

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Recent discoveries and a reevaluation of historical finds of plesiosaurs from Upper Cretaceous deposits in north Texas reveal a remarkably long temporal record and significant taxonomic diversity of polycotylid plesiosaurians. Polycotylids are well known from the Western Interior Seaway (WIS), with few published reports from the Gulf Coast of North America. Here, we report occurrences ranging in age from the Cenomanian (~96 Ma) to Campanian (~80 Ma). The stratigraphically oldest find is an association comprising fragmentary mandibular and basicranial material from the late early Cenomanian (~96 Ma) Arlington Member of the Woodbine Formation, a fluvio-deltaic depositional system. The second oldest occurrence includes a specimen unearthed from the middle Cenomanian (~95 Ma) part of the Britton Formation of the Eagle Ford Group (EFG), an open marine deposit. The specimen was collected in the 1970s and is missing the skull but otherwise preserves almost the entire appendicular skeleton along with ribs, gastralia, and vertebrae from the cervical and dorsal regions of the body. A second taxonomically distinct partial skeleton was collected slightly above this horizon, and preserves portions of the skull, large sections of the vertebral column and pelvic girdle elements. Higher in the Britton Formation, from the latest Cenomanian *Sciponoceras gracile* biozone (~93 Ma), a relatively complete and mostly articulated polycotylid plesiosaur was collected that preserves a complete skull, almost the entire axial skeleton, the proximal portion of the right front flipper, and a partial pelvic girdle. The youngest polycotylid collected from the EFG to date (*Collignoceras woollgari* biozone; ~91.5 Ma) includes a nearly complete skull, along with portions of the axial skeleton, significant portions of the pectoral and pelvic girdles, and a single hindlimb. The youngest occurrences of polycotylids in north Texas come from the lower and middle Campanian Taylor Series and include a partial skeleton comprising a significant portion of the vertebral column, nearly complete pectoral and pelvic girdles, and a fragment of a maxilla. Preliminary phylogenetic analysis suggests that at least three of the specimens represent new taxa and are informative in understanding the evolutionary history of Polycotylidae. Although preliminary, our findings underscore the importance of prospecting and collecting new material and reassessing historical finds in museum collections.

Funding Sources: Stig M. och Birgitta Bergströms grant (#BE2026-0002) to M.M. ISEM at SMU for postdoctoral support for R.G.D.L.G. and the Digital Earth Sciences Lab

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

The First Record of *Coronosaurus brinkmani* (Ceratopsidae, Centrosaurinae) from the Judith River Formation of Montana

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Centrosaurines from the lower Judith River Formation (JRF) of Montana (MT) and equivalent lower Oldman Formation strata in Alberta document an early radiation of the clade characterized by weakly developed nasal ornamentation and elongate supraorbital horns. However, the transition between these early-diverging taxa and the more derived eucentrosaurines remains poorly understood.

A new specimen (ROM 77588) from the upper McClelland Ferry Member of the JRF, MT, represents a rare associated centrosaurine skeleton from this critical interval. The specimen preserves cranial and postcranial elements, including a well-preserved nasal and paired ischia. The tall, recurved nasal horn of ROM 77588 is consistent with referral to *Coronosaurus brinkmani* and exhibits a pronounced basal overgrowth and associated sulcus, consistent with *Coronosaurus,* although it can be present but more weakly developed in *Centrosaurus apertus.* The distal ischial terminus is mediolaterally compressed into a distinctive rectangular, paddle-like morphology previously recognized in non-eucentrosaurine centrosaurines such as *Wendiceratops pinhornensis.* Reexamination of comparative *Coronosaurus brinkmani* material reveals the same morphology, previously unrecognized in the taxon.

Morphological comparisons, stratigraphic position, and phylogenetic analyses therefore support referral of ROM 77588 to *Coronosaurus brinkmani*, representing the first record of the taxon from the JRF. The anatomy and stratigraphic position of *Coronosaurus* illuminate the stepwise acquisition of derived centrosaurine features among Campanian centrosaurines, including enlargement of the nasal ornament from the low ridge of taxa like *Medusaceratops* to the erect horn of eucentrosaurines, reduction of the supraorbital horns, and modification of the ischial terminus from a broad paddle-like structure to the reduced tapering condition of derived taxa. These results identify *Coronosaurus* as a key transitional centrosaurine and demonstrate the value of postcranial anatomy for resolving ceratopsid taxonomy and evolution.

Funding Sources: University of Toronto Research Excellence Award, 2026; NSERC research fund NSERC Grant File Number: RGPIN 355845

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

The first pterosaur from the Early Cretaceous (Aptian) Potomac Formation in Prince George's County, Maryland, USA

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The record of Early Cretaceous pterosaurs in North America is sparse compared to Europe and Asia. Presently, only three North American genera are recognized: *Radiodactylus* from the Aptian–Albian Glen Rose Formation in Texas, *Uktenadactylus* from the Albian Paw Paw Formation in Texas, and lastly *Bennettazhia* from the Albian Hudspeth Formation in Oregon—with additional fragmentary and ichnological records from Alberta, Mexico, and western USA. In 2021, a pterosaur cervical vertebra was excavated by a family participating in a dig program within the M-NCPPC Dinosaur Park in Prince George's County, Maryland, USA. This site preserves an outcrop of the Aptian Potomac Formation (Arundel Clay facies) from a former iron and clay mine and has yielded a wide variety of freshwater and terrestrial plant and animal fossils. This cervical vertebra is the first record of an Early Cretaceous pterosaur from Maryland, and the eastern North America as a whole.

The pterosaur fossil from Dinosaur Park is a three dimensionally preserved anterior portion of a mid-cervical vertebra. Due to its delicate nature, computed tomography and segmentation modeling were used to visualize the sediment-filled neural canal. The preserved portion of the vertebra is long and narrow and posteriorly has a subtriangular posterior cross-section. The prezygapophysis is anteriorly rounded, and mediolaterally narrow, with a small elliptical facet. The lateral edge of the prezygapophysis merges with the body of the vertebra. The cotyle is shallow and has a medially and laterally rounded hypapophysis. The vertebrocostal sulcus is shallow. The lateral pneumatic foramen is positioned into the opening of the medial wall of the neural canal, and the opening for the neural canal is deeply incised posterior to the prezygapophysis. The neural spine is low.

The morphological traits suggest that the Maryland pterosaur belongs to Azhdarchoidea. This specimen could be placed in the Family Azhdarchidae, based on the vertebra being elongate overall and narrower than wide, the narrow and rounded prezygapophysis that merges with the body of the vertebra, and the low neural spine. However, this specimen is unique in exhibiting a deeply incised neural canal opening, with the lateral pneumatic foramen found on the medial wall of that opening. If verified as an azhdarchid pterosaur, this would be the oldest record of Azhdarchidae in North America.

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

A juvenile giant from Hokkaido, Japan: new insights into *Desmostylus* growth and dispersal

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Desmostylus, a key genus of the extinct marine mammal lineage Desmostylia, inhabited the North Pacific coastline from the Oligocene to the Miocene. Although numerous dental remains have been reported, postcranial material is scarce, leaving the taxonomy, ontogeny, and ecology of the genus incompletely understood. This study presents new insights into the growth and dispersal of *Desmostylus* based on a juvenile specimen (NMNS-PV 44111) from Hokkaido, the northernmost island of Japan. The specimen was previously difficult to interpret because its locality and stratigraphic context were incomplete. Archival documents rediscovered in 2024 place the specimen in the sandstone of the lower Chikubetsu Formation, dated to 16.8–15.5 Ma. NMNS-PV 44111 includes an incomplete left humerus, a well-preserved distal end, a poorly preserved humeral head, and a cast of the natural mold of the humeral shaft. We assigned the specimen to *Desmostylus* based on its relatively large size, thick humeral diaphysis, broad trochlea, and deep trochlear fossa, which are features that distinguish it from basal desmostylians and paleoparadoxiids.

The distal humerus was ossified, whereas the humeral head and lesser tubercle epiphysis remained unfused, indicating a juvenile stage older than early m1-stage individuals but younger than m2-stage individuals. This specimen was a juvenile ontogenetic stage older than early m1-stage juveniles but younger than m2-stage individuals. Based on comparisons of humerus size and ontogenetic stage, NMNS-PV 44111 was within the range of *Desmostylus*. From the estimated body size of *Desmostylus* specimens, including NMNS-PV 44111, the body size growth rate significantly changed from m1, and the growth rate is thought to have been rapid until approximately the time of m2 eruption, after which it slowed significantly. This growth pattern may be related to reproductive age near the onset of m2 function.

Stratigraphic and paleontological evidence place the specimen within the Middle Miocene Climatic Optimum, a period linked to marine transgression and warm conditions that may have facilitated a northward range expansion of this genus. This study demonstrates that reassessing legacy specimens with archival, stratigraphic, and comparative anatomical data can substantially refine the life history and paleobiogeography of extinct marine mammals.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Report of new ear ossicle elements for Caribbean sloths (Mammalia, Pilosa, Megalocnidae) from the Late Pleistocene–Holocene of Hispaniola

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Ear ossicles of the middle ear cavity (malleus, incus, stapes) represent some of the smallest bones found within mammals, which makes their preservation and retention in fossil mammals

difficult and rare. Amongst fossil sloths from the Caribbean, the only ear ossicles known were the malleus from just two genera (*Acratocnus*, *Neocnus*) from Haiti; no others have been recorded from any taxa on any other islands. Recent explorations of underwater cave systems in the Dominican Republic resulted in four sloth crania with in situ preservation of the malleus. The crania represent the three sloth genera known to Hispaniola (*Acratocnus* [n = 2], *Neocnus* [n = 1], and *Parocnus* (n = 1]) and represent the first ear ossicles recovered for Parocnus. Presence of the malleus prompted microCT scans to enable non-destructive study of the tiny bones and to investigate if other ear ossicles were also retained. In addition to the malleus elements noted, the incus and stapes elements were also recovered from representatives for each genus. CT data from previously scanned sloth crania from Haiti (n = 11) were also investigated for the presence of ear ossicles hidden within the auditory region. Of the 11 crania from Haiti, a pair of stapes were the only ear ossicles recovered and belonged to a singular *Neocnus* specimen. In addition to expanding the known morphologies for the ear ossicles and their taxonomic and geographic breadth, the general results indicate that CT scanning of auditory regions for ear bones yields the best results when an element is already in situ and visible. Scanning without evidence of a malleus or incus can at least produce the stapes, as they often become saved within the inner ear after falling through the oval window post-mortem, but at a lower rate. The structures and chambers of the inner ear, which were also unknown for the Hispaniola taxa, are also contained within the CT scans and represent the next steps in exploring the auditory and locomotor habits of these insular sloths.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

First ichthyosaur from the Late Triassic of Vancouver Island, British Columbia, Canada

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Ichthyosaur fossils are well known and abundant in the Triassic record of northeastern British Columbia, recording a rich diversity. While occurrences of ichthyosaurs have been recorded on Haida Gwaii, southeast Alaska, and Vancouver Island from this time period, little has been reported in the literature on these western specimens. Here we describe the first occurrence of an ichthyosaur from Vancouver Island, consisting of a series of blocks containing articulated rib and vertebral impressions measuring roughly 4–5 m long, although cranial and caudal portions of the skeleton are absent. These blocks were collected from the Parsons Bay Formation (Late Triassic, Norian–Rhaetian) in Holberg Inlet on northern Vancouver Island. Although the specimen has been known for several decades, recent reexamination of the material revealed the presence of paddle elements for the first time, providing new information on the taxonomic affinity of this specimen. The forefin is partially exposed and not complete, measuring at least 17 cm in diameter at the widest point. The phalanges are rounded to oval-shaped and are less densely packed together, most similar to "shastasaur-grade" ichthyosaurs such as *Besanosaurus*, and unlike the hexagonal digits of more derived genera of parvipelvians such as *Macgowania* and *Ichthyosaurus*. Further preparation of the specimen may reveal more of the proximal limb elements, which may aid in more specific identification. Shastasaurids were a family of mostly large-bodied ichthyosaurs which went extinct following the end-Triassic extinction, while parvipelvians persisted into the later Mesozoic. This specimen represents a rare occurrence of an ichthyosaur from the Wrangellia terrane in the eastern Pacific Ocean and may provide insight into ichthyosaur evolution and diversity at the end of the Triassic period.

Funding Sources: Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant RGPIN-2020-04012
NSERC Undergraduate Student Research Award

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Surpassing scratching the surface: 3D imaging of bioerosive insect traces in dinosaur bones

from the Lower Cretaceous (Barremian) Yellow Cat Member of the Cedar Mountain Formation, Utah, USA

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Bioerosion is an important taphonomic process. Insects are significant agents of bioerosion, but the insects responsible for bioerosion and the types of traces they create are still under study. Here, we report on traces found on and in disarticulated sauropod bones from the Gray Ash Quarry (BYU Locality 2893), which is positioned high in the Yellow Cat Member of the Cedar Mountain Formation. More than 70% of the bones preserve external insect traces. The only other body fossils are large theropod teeth. The matrix is a green, silty mudstone. Three bone specimens exhibiting varying degrees of bioerosion and manual preparation were selected for CT scanning and segmentation to assess the extent of internal bioerosion and to segment the burrow systems. The specimens included a long bone, a rib fragment, and an indeterminate bone fragment. The burrows are extensive. They extend from the surrounding matrix, along the surface of, and through cortical bone. The burrows are most convoluted in trabecular bone where they are concentrated. Cross-cutting of burrows is common, with small burrows cutting through larger burrows. Many burrows within the matrix and bone preserve meniscate backfill composed of bone-rich frass. Some larger burrows are lined with rinds of compacted bone frass. The openings of the borings are typically ellipsoidal, with maximum diameters ranging from 1 to 10 mm.

The morphology of the traces eliminates some insects as possible tracemakers. While bioerosion is often attributed to dermestid beetles, they do not modify buried bone or create extensive borings. Termites create star-shaped marks on bone surfaces and line tunnels with carton, neither of which were observed. The range of burrow sizes in the Gray Ash bones indicate the tracemaker grew substantially during ontogeny, indicating relatively long term infestation. Crosscutting burrows by smaller burrows indicate multiple infestation phases. We speculate the tracemaker was the larval stage of a large beetle. This study provides the first 3D visualization of insect bioerosion in the Cedar Mountain Formation and highlights how extensively insects can modify bone. The extent of bioerosion indicates the tracemaker was deliberately targeting bone for feeding, highlighting the role of insects as decomposers in ancient ecosystems and their ability to bias the fossil record.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

A preliminary taphonomic evaluation of a Late Triassic fossil quarry utilizing *Typothorax* osteoderms.

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Ongoing research in partnership between Southern Connecticut State University's Vertebrate Paleontology Lab and the Museum of Texas Tech University's Paleontology Division has yielded an abundance of Late Triassic (~213 Ma) vertebrate fossils from the Jeffers Ranch (Upper Sonsela Member: Chinle Formation) site in northeastern Arizona. Here we provide an overview of new material and the results of a taphonomic evaluation of an aetosaur-dominated quarry (SCSU-PL28). Previous work documented multiple vertebrate taxa collected from Jeffers Ranch, including: metoposaurids, mystriosuchinine phytosaurs, aetosaurs (*Typothorax* and *Paratypothorax*), rauisuchids (*Postosuchus*), theropod dinosaurs, and lungfish. Recent discoveries add additional taxa including shuvosaurids, tanystropheids, and drepanosaurs as well as "clam shrimps," unionid bivalves, plant material, and numerous unidentified small teeth. Past field seasons have also produced numerous osteoderms of the aetosaur *Typothorax coccinarum* from the "aetosaur quarry" (SCSU-PL28); these offer insights into the biostratinomy of this bonebed. Osteoderm specimens display a spectrum of preservation conditions. Some

osteoderms possess extensive fragmentation, reduced surface ornamentation, and evidence of scavenging (e.g., scratch and bite marks); this suggests prolonged surface exposure and interactions with external forces. In contrast, other osteoderms are well preserved with minimal fragmentation and distinct pitting associated with rapid burial and limited biostratinomic alterations. Taken together, this variation suggests a complex depositional history possibly associated with reworking events within a river system. Specimens were recovered from the primary bonebed and stratigraphically adjacent layers below and above it. This suggests redistribution of material vertically in the bedding layers, a feature associated with bioturbation and multiple depositional events over time. Future work will incorporate biogeochemical data and spatial analysis of the vertically dispersed material to further interpret potential diagenetic effects on the fossil assemblage and its preservation. The integration of new material and biostratinomic data will help construct a detailed, comprehensive, narrative for the taphonomy of the Jeffers Ranch site.

Funding Sources: Connecticut State University and Southern Connecticut State University

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Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

Powering the grid, unearthing the past: Fossil fish discoveries from paleontological monitoring in eastern Oregon

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The Miocene–Pliocene Idaho Group has historically yielded a diverse assemblage of fish, mammal, bird, mollusk, and crustacean faunas from the Poison Creek, Chalk Hills, and Glenns Ferry formations. While providing paleontological resource monitoring during construction of a utility project in Malheur County, Oregon, Eocene Environmental Group paleontologists discovered numerous new paleontological localities. Most significant are three microfossil localities preserving thousands of microvertebrate fish fossils. These localities were discovered both on the surface prior to ground disturbance and by construction equipment disturbing in situ fossiliferous layers. Paleontological monitors worked in coordination with construction personnel to ensure the preservation and recovery of significant fossils. Poorly cemented sandstones allowed for on-site dry screening of thousands of pounds of fossiliferous sediment, allowing for efficient bulk processing in the field.

To date, fossil identifications include fish mandibles, cranial elements, vertebrae, and fin spines from Cyprinidae genera *Mylocheilus* and *Ptychocheilus* (minnows), Salmonidae genus *Oncorhynchus* (trouts and salmons), Ictaluridae (catfishes), Catostomidae (suckers), Centrarchidae (sunfishes), and Cottidae (sculpins). Additionally, numerous *Pacifastacus chenoderma* crayfish were recovered from one of our sites, and occasional mammal and bird microfossils were also present. Several of the fish taxa have biostratigraphic utility within the Idaho Group and contribute to refining local stratigraphic correlations.

Project monitoring locations were determined using the Bureau of Land Management (BLM) Potential Fossil Yield Classification (PFYC) system recently released for Oregon and Idaho in coordination with the BLM Regional Paleontologist. Notably, these discoveries were made in areas designated as having unknown paleontological potential, emphasizing the importance of monitoring in poorly studied areas to refine resource assessments and prevent the inadvertent loss of scientifically significant paleontological resources. Collaboration with resource monitors, land management agencies, and construction personnel was critical to the successful identification, preservation, and

protection of these paleontological resources. Systematic paleontological monitoring not only protects paleontological resources from construction-related impacts but also expands regional stratigraphic and paleontological knowledge.

Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

Analysis of local Lance Creek Formation food webs reveals network dynamics prior to the end-Cretaceous mass extinction

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The Cretaceous–Paleogene (K–Pg) mass extinction fundamentally reorganized vertebrate ecosystems and biodiversity, allowing for the establishment of their modern compositions. Recent studies have analyzed Maastrichtian global ecosystem networks, revealing evidence of stable biodiversity just before the mass extinction. This study assessed whether global patterns of stability are also reflected at the local scale based on microvertebrate assemblages preserved from the Lance Creek Formation of southeastern Wyoming. Using our database containing more than 8,000 newly collected individual fossils, we established four distinct locality-based food web networks that highlight ecosystem changes leading up to the K–Pg extinction. All sites are no more than ten miles from one another, with three contained to a single outcrop that spans 13 m in stratigraphic succession. Networks were built with taxa represented by nodes, node size representing fossil abundance, and edges representing dietary interactions.

We measured stability through both the analyses of diversity metrics and simulating node removal. The diversity of the networks was measured by the connectance, degree distribution, clustering coefficients, cliques, Shannon's Diversity Index, Simpson's Diversity Index, and evenness. Our food web networks reveal statistically similar values for these diversity metrics with some minor differences in evenness between sites with varying depositional settings. Simulations were then run to test the removal of specific nodes and their influence on the network. Nodes that represent highly abundant and previously postulated keystone species (e.g., ceratopsians and hadrosaurs) were targeted for removal hypothesized due to their shifts in trophic impact. We find that some networks destabilized rapidly while others demonstrated higher levels of resiliency through these simulations. Overall, our results yield a variety of network dynamics suggesting that, at this local scale, ecosystems maintained their stability across all observed microsites. The continued assessment of Lance Creek microvertebrate food networks will provide insight into how North American Maastrichtian ecosystems varied and evolved during this monumental chapter in vertebrate evolution.

Funding Sources: David B. Jones Foundation; Loyola University Chicago Carbon Scholars Program

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Technical Session IX: Archosaur paleobiology & pterosaurs (Thursday, November 12, 2026, 1:45 PM)

Reappraisal of the genus *Quetzalcoatlus* Lawson, 1975 (Pterodactyloidea: Azhdarchidae) and the status of *"Quetzalcoatlus" lawsone*

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Quetzalcoatlus is an iconic genus of azhdarchid pterosaur from the Maastrichtian Javelina Formation of Big Bend National Park in Texas, USA. The genus is traditionally understood as including two species: the type species *Quetzalcoatlus northropi* is among the largest described pterosaurs with a wingspan of 10 meters and is known from a mostly complete wing, one cervical vertebra, and femora, whereas *Quetzalcoatlus lawsoni* is a moderately-sized azhdarchid with a wingspan of 5 meters known from several individuals that collectively represent nearly all parts of the skeleton. The type species *Q. northropi* and referred species *Q. lawsoni* have usually been regarded as sister taxa and often recovered as such in multiple phylogenetic analyses. However, the discovery of the similar giant azhdarchid *Thanatosdrakon amaru* from Coniacian-Santonian Argentina challenges this long-held paradigm.

Following our comparative work and phylogenetic analyses, we identify at least 10 synapomorphies uniting *Quetzalcoatlus northropi* and *Thanatosdrakon amaru* to the exclusion of "*Quetzalcoatlus*" *lawsoni*, whereas multiple previously proposed synapomorphies of the genus *Quetzalcoatlus* instead diagnose a larger clade that additionally includes material from the Ouled Abdoun Basin. Our expanded phylogenetic analysis finds strong support for the recently proposed hypothesis that *Quetzalcoatlus* as traditionally understood is non-monophyletic. The strongly supported relationship between *Quetzalcoatlus northropi* and *Thanatosdrakon* indicates that the *northropi* and *lawsoni* lineages diverged in at least the Santonian, and that both forms represent derived morphologies within Azhdarchidae that are unique in distinct ways. "*Quetzalcoatlus*" *lawsoni*, in turn, is recovered as the sister-species of a new Ouled Abdoun Basin form, previously regarded as aff. *Quetzalcoatlus* sp. This form is notable in being relatively small for an azhdarchid (at 1.80 meters in wingspan), demonstrating that the "*Quetzalcoatlus*" sensu lato clade is much more morphologically diverse than previously thought.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

First avian remains from the middle Miocene Madison Valley Formation of Bozeman, Montana

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The Barstovian-aged Madison Valley Formation of southwestern Montana has yielded a rich assemblage of small vertebrate fossils. Much of this material was collected in the 1950s via screenwashing at the Anceney locality located just west of Bozeman, Montana, by field teams from the Carnegie Museum of Natural History. The mammalian fauna of the Anceney locality has been described in detail, but no bird material from the locality has ever been formally described, and few fossils from the Madison Valley Formation have been reported in the past 15 years. The rodents from the Anceney locality indicate a transitional fauna between early and late Miocene assemblages and are more indicative of mammalian assemblages west of the Rocky Mountains. These details of the mammalian fauna provide an ecological context within which to interpret the avian community of the locality. Here we provide the first reports of avian material from the Anceney locality. This material includes postcrania from small-bodied birds, including partial and complete carpometacarpi. The avian material from the Anceney locality fills a geographical and ecological gap in our understanding of North American bird communities during the Miocene. Extant bird genera have been reported from the Pliocene of Kansas and Oregon, so the Anceney material represents an opportunity to compare how the North American avifauna changed across the climatically turbulent Miocene–Pliocene boundary. Additionally, the Anceney bird material represents one of very few assemblages of Barstovian-aged small-bodied birds from the interior of North America. Similarly aged localities are typically biased towards medium-to-large birds, and to date are primarily located near the coast. Therefore, this material sheds light on the small-

bodied members of the Barstovian avifauna in the North American interior.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Modeling late Quaternary large mammal extinctions in South Africa using paleo-food webs

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The causes and consequences of late Quaternary megafaunal extinctions have been debated since the 19th century. African extinctions have received relatively little attention, although its losses are important in the global context given the long co-evolutionary history of hominins and the ecosystems in which they lived. The most detailed record of African megafaunal extinctions derives from South Africa, where previous research suggests that the bottom-up impacts of environmental change across the Pleistocene–Holocene transition contributed to the extinction and extirpation of several species of large grazing ungulates. Coinciding with this environmental change are increasing Later Stone Age hunter-gatherer populations that may have placed top-down pressures on mammal communities. Here, we use dynamic paleo-food web modeling to quantify how environmental changes (decreasing primary productivity and shifting biomasses of grass vs. browse forage), anthropogenic impacts (increasing human population density and various prey preferences on large mammalian groups), and a combination of the two may have affected the structure of faunal communities over the Pleistocene–Holocene transition. We use random forest modeling to infer predator–prey links between mammal species at Boomplaas Cave, a well-sampled archaeological site in the Western Cape that spans the last glacial-interglacial transition. Dynamic paleo-food webs are created using the ATNr R package, where biomass flows through trophic networks are modeled using allometrically-determined equations. We model disruptions to the mammalian communities at Boomplaas during the Late Pleistocene and compare modeled results to the empirical record of extinctions and community composition. Modeling runs in which primary productivity is altered produce faunal changes that are most consistent with the empirically observed changes. Even when humans are modeled to selectively target large grazing prey, top-down impacts produce faunal changes which are of negligible magnitude compared to environmental changes. This study offers a novel way of analyzing late Quaternary extinctions and has the potential to be applied in the future to systems globally.

Funding Sources: Leakey Foundation Research Grant F202510672, NSF BCS Grant 2039759, NSF BCS Grant 2452118

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

North American plants and mammals tracked climate with high fidelity, but mammals fell behind under anthropogenic pressure

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The relationship between climate and species distributions is often described as complex, partly because many species do not appear to track climate in directions predicted by niche and distribution models. However, large-scale climate tracking is a long-term process that may be obscured at ecological timescales and increasingly constrained by human land use. Here, we reconstruct the realized climatic niches of 16 plant taxa and 45 mammal species across North America from the end of the last deglaciation (11,700 years BP) to the present, introducing

climate fidelity as a metric of the temporal stability of climatic niches across changing climates and human land-use regimes. Across all timescales, plants exhibit higher climate fidelity than mammals, despite their limited dispersal ability. During the early Holocene, when climate change was rapid but anthropogenic pressure was minimal, mammalian climate fidelity was 11% lower than that of plants, with 42% of mammal species having lower climate fidelity. Nonetheless, at this time, some large mammals tracked climate as effectively as plants, whereas small mammals already exhibited lower climate fidelity. As human land use intensified after European arrival, mammalian climatic niches shifted dramatically, experiencing a 17% loss of climate fidelity, decoupling from climatic gradients, and instead aligning with patterns of land-use intensity. Large mammals were preferentially extirpated from warm, humid climates now dominated by cities and croplands and displaced toward colder, drier, and montane regions, while many small mammals expanded into anthropogenic landscapes. In contrast, plant climatic niches remained largely structured by latitude and climate throughout the Holocene, with comparatively weak responses to land-use change. At the community scale, these processes erased long-standing latitudinal gradients of mammalian climate fidelity, replacing them with spatial patterns driven by human modification of the landscape. By integrating deep-time fossil records with modern occurrences, climate fidelity provides a framework for identifying taxa and communities most vulnerable to ongoing climate change, particularly species that historically tracked climate well but are now constrained by anthropogenic barriers. This approach highlights how human land use has fundamentally altered the capacity of mammals, more than plants, to respond to a rapidly changing climate.

Funding Sources: NSF 1945013

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Was the Miocene Calvert Formation of Maryland a megalodon nursery ground?

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The extinct mega-tooth shark *Otodus megalodon*, alternatively *Carcharocles*, *Carcharodon*, or *Megaselachus megalodon*, had a broadly cosmopolitan distribution in the Miocene and into the Pliocene. Within their wide geographic distribution, special attention has been given to localities that may represent nursery grounds where adult sharks gave birth, or where young sharks could feed and grow while sheltered from competition and predators. Some extant shark species have been observed to utilize nursery grounds, but the extent to which extinct species used nursery grounds is uncertain. Several proposed nursery grounds for megalodon have been identified, including the Miocene Gatún Formation of Panama, the Miocene–Pliocene Bone Valley Formation of Florida, and the Miocene Calvert Formation of Maryland. We tested the hypothesis that the Miocene Calvert Formation of Maryland represents a megalodon nursery ground using a sample of 135 teeth. Using these teeth, we have produced an estimated population age-distribution using tooth size-to-body length estimates, and we have applied Elliptical Fourier analysis to determine what proportion of the teeth were produced by juvenile sharks based on shape data. While a slim majority of the teeth in our sample were produced by juveniles (50.4%), the estimated age distribution across the entire Calvert Formation is not reflective of the expected age distributions seen in extant shark nurseries, which leads us to conclude that the Calvert Formation likely represents a locality with a large number of juvenile individuals rather than a true nursery ground.

Technical Session XV: Dinosauria IV: a mostly “bird-hipped” bonanza (Saturday, November 14, 2026, 8:00 AM)

Oldest record of jacana-like birds (Charadriiformes) from the Green River Formation and its implications for shorebirds in the Early Eocene

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Extant shorebirds (Charadriiformes) are a species-rich neo-avian clade with extensive ecological and morphological diversity and worldwide distribution. Representatives of this clade have been dated to the earliest Eocene of Europe and North America, but these estimates rely on fossils of poor preservation quality. Here, we describe a new charadriiform taxon with a long, narrow beak and a proportionally long and curved hallux on each foot from the lower Eocene Fossil Butte Member of the Green River Formation, Wyoming. Extant charadriiform birds typically have a hind toe that is short in length with a long hind toe observed only from the family Jacanidae. This Green River specimen shares similarities with a slightly younger lower Eocene Messel Formation bird from Germany with a comparable beak profile, *Vanolimnicola longihallucis*, but is markedly larger in the skull and in the hindlimbs (by at least 24%). Cranial and postcranial morphology suggests *V. longihallucis* used a "wading bird" ecology, possibly representing the earliest inferred occurrence of this behavior in Charadriiformes. The new Green River taxon also resembles *Songzia* from the lower Eocene Yangxi formation of China based on the long legs and toe proportions, but the Chinese taxon is inconclusively ascribed to Ralloidae. Morphological features of the Green River taxon such as its long, narrow beak, long legs, and pedal digit proportions suggest that this taxon likely foraged on the ground in a lacustrine setting. As such, we hypothesize that this jacana-like bird had an ecological niche akin to that of extant sandpipers, some of which are small-bodied shoreline-probing birds. Specialized morphologies associated with the unique behaviors characteristic of extant members of this clade are absent in the oldest known jacanids, suggesting a shift in their ecology at some point in their evolution. This new taxon, in conjunction with several previously described similar fossils, bolsters our current understanding of the biogeographical range of shorebirds within the context of the early Cenozoic era.

Funding Sources: University of Chicago, The Field Museum of Natural History

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Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

A description of the postcranial osteology of *Daspletosaurus* based on a new specimen

Spenser Mehew[1], Stephen Brusatte[2], Ethan Warner-Cowgill[3], Glenn Storrs[4]
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Tyrannosauroids were the top apex predators in North America from the Campanian to the Maastrichtian. Much attention is focused toward *T. rex*, which only appeared at the end of the age of the dinosaurs. *T. rex's* older relative, *Daspletosaurus*, is debated as to whether it evolved separately through cladogenesis or successively from *D. torosus* to "*D. wilsoni*" to *D. horneri* via anagenesis. CMC VP15826 is an osteologically mature (~10-meter-long) *Daspletosaurus* from the Coal Ridge Member (~76.3–75.8 Ma) of the Judith River Formation of Montana. The morphology of the disarticulated, partial skull of CMC VP15826 indicates that it may pertain to *D. torosus,* the problematic "*D. wilsoni*," or potentially a new species. The ectopterygoid, quadratojugal, and cervical epiophyses of CMC VP15826 feature characters diagnostic of *D. horneri*, yet CMC VP 15826 is ~0.6–1.1 myr older than the taxon. The specimen also lacks only one of the three features used to diagnose the contemporary *D. wilsoni* from the stratigraphically older *D. torosus* on the quadratojugal. Most studies of the tyrannosauroid group have focused on the craniomandibular skeleton. Here, a thorough description of the osteology of the largely intact postcranial skeleton of CMC VP15826 is provided. The axial skeleton is mostly preserved with only six cervical ribs, three cervical vertebrae, nearly a dozen caudal vertebrae, and ten chevrons missing. Much of the appendicular skeleton is preserved save for the right leg, pubes, third left metatarsal, two manual phalanges, manual unguals, and the left radius. A variety of characteristics are found to be individually variable between tyrannosauroid

taxa. The humerus is an intermediate length for tyrannosauroids according to select datasets, with some suggesting it is proportionally larger than *D. horneri* and lacks a humeral entepicondylar ridge, a trait not witnessed in *D. torosus*. The left ilium features the basal state of the supraacetabular ridge meeting the iliotibialis origin scar, while the ridge terminates below the iliotibialis scar on the right. We find that high individual variation in these features makes it difficult to identify a set of clear characteristics for diagnosing *Daspletosaurus* as a genus and particularly in distinguishing the often fragmentary fossils into distinct species. This study highlights the importance of using the suite of postcranial characters in future phylogenetic studies.

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

An early Permian cave deposit records strikingly simple teeth in a terrestrial ecosystem

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Bally Mountain is a relatively unknown paleontological site located in southwestern Oklahoma. This locality is characterized by a diverse fauna that were deposited in a series of caves open during the early Permian and is broadly comparable to the much better-known Richards Spur locality. In contrast to Richards Spur, Bally Mountain has received little attention, with limited prospecting and very few fossils formally described. This sparse sampling presents an opportunity, as individual caves would be geologically short lived and, thus, represent a sample of a relatively temporally restricted ecosystem. Here, we aim to test foundational biotic patterns in this ecosystem by quantifying the dental complexity of a single cave system during the early Permian. In particular, we test for the amount of intraspecific variation and the variation between different species that lived in the same environment. We use a Medit i700 intraoral scanner to create 3D models of 28 fossil jaws from Bally Mountain and Orientation Patch Count Rotated (OPCR) to quantify tooth complexity. The current Bally Mountain sample consists of two different species, *Captorhinikos valensis* and *Captorhinus aguti*, and two indeterminate taxa, Captorhinidae indet. and *Captorhinus* sp. Specimens all include marginal dentition that are often missing one or more teeth. Average dental complexity is low (~8 patches per tooth) relative to both modern and Mesozoic saurian OPCR data. Individual variation is low, often less than one patch per tooth, on average. *Captorhinikos valensis* and *Captorhinus aguti*, which have previously been suggested to consume different foods based on qualitative morphology and dental wear, show nearly identical means and distributions of dental complexity ($P = 0.259$). In fact, there is no statistical difference between the four groups ($P = 0.434$) in our study. Similarly, there is no clear difference between the dental complexity of the dentigerous elements examined. The Bally Mountain fauna thus shows a strikingly homogenous dental complexity, in contrast to other environments in which dental complexity has been examined. Future work will expand sampling by targeting additional caves from the Bally Mountain site and the extremely productive Richards Spur locality, which will permit comparisons between different environments and ultimately lead to a better understanding of ecological variation during the early Permian.

Funding Sources: EMBRACE-EAR-Seed 2432203 and University of Central Oklahoma's Faculty on Campus Grant

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Experimentally determining the forces and sedimentary environments involved in miring crocodilians

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Miring has been inferred as the cause of mortality of a wide range of fossil organisms. In the modern-day Pilcomayo Megafan system in Paraguay, the *Caiman yacare* frequently becomes mired during the dry season when moving from drying ephemeral bodies of water. When the caiman are unable to free themselves, they die and can become buried in the next depositional event, giving them a chance of becoming a future fossil on the fan and providing a key modern analog for those hypothesized fossil occurrences of mirings.

In our modern dataset, mired organisms are generally preserved in fine grained sediments, equivalent to many fossil occurrences. Miring results in a bias towards elements of the limbs being preserved over lighter elements of the skeleton such as the vertebrae, ribs, and skull. Mired organisms seem to exhibit a preferred limb position, with the limbs being stuck beneath the body in a more upright position (unless altered by bioturbation). Scavenging also seems to be less prevalent in mired organisms both fossil and modern, with no evidence found for it in our modern data set and scant evidence in the fossil record.

Analyses of fossil trackways and modern biomechanical studies infrequently assess whether the properties of saturated sediment are able to create enough suction force to trap organisms, but our data from the Pilcomayo also allow us to assess the influence the impact of this factor on miring. By using the limbs from *Alligator mississipiensis* and a range of sediment compositions, we have measured the forces required to escape miring and compared them to the forces crocodilian can produce to free their limbs. We can then predict whether a healthy caiman can free itself from a miring situation, what sediments are likely to be able to trap it, and what sized individuals are at risk of becoming mired at all. This combination of observational and experimental data provides us with greater insight into the miring of organisms of the distant past.

Funding Sources: David B. Jones foundation, University of New Mexico, Grand Rapids Public Museum

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Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

Cranial modification preceded a serpentiform body in the evolution of glass lizards

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Anguines (glass lizards) are long-bodied, limb-reduced squamates found across Laurasia. They are a part of the more inclusive clade Anguidae (anguines, diploglossines, gerrhonotines, and Anniella) that contains both lizard-like and snake-like species. Likely owing to their pervasive osteoderms, the anguid fossil record is relatively rich compared to that of other squamates. The paucity of postcranial remains has, however, obscured transitions from limb-based to body-based locomotion among anguids. An articulated skeleton of Oligocene *Parophisaurus pawneensis* now reveals the earliest modifications of the glass lizard total clade that preceded body elongation and limb loss. We performed phylogenetic analyses (Bayesian and maximum parsimony) in a dataset (n = 168 taxa, 638 characters) with expanded sampling of crown and stem anguids (glyptosaurs) and uniformly find *P. pawneensis* as sister to all extant anguines. Despite retaining an unmodified postcranium, *Parophisaurus pawneensis* shares key cranial apomorphies with serpentiform anguines. These include a characteristic medial prefrontal margin, ectopterygoid posterior process loss, a premaxillary-maxillary fenestra, recurved marginal teeth, and fewer dentary teeth. Dental modifications suggest that early pan-anguine evolution may have been driven by dietary shifts, with subsequent shifts in habitat preference favoring body elongation and limb reduction. Our results imply a single evolution of a limb-reduced

long body in crown anguines. The timing of which corresponds with Oligocene global cooling and aridification and the rise of widespread grasslands, which are a major habitat of crown anguines. We infer a North American origin of Pan-Anguinae in the latest Cretaceous or early Paleogene, and a European origin for Anguinae in the Oligocene, followed by reentry into North America from Asia via Beringia in the Miocene after stem-anguine extinction. Morphology thus agrees with molecules in recovering a Laurasian clade of glass lizards, with those in Asia being most closely related to North American *Ophisaurus*. Although the crown originates in the Oligocene, the transition to a more snake-like body began earlier in European stem anguines. Finally, our denser sampling of crown and stem anguids reveals robust morphological support for Xenosaurus as the extant sister of Anguidae. This result is frequently recovered by molecular datasets and brings us closer to a comprehensive understanding of anguimorph evolution.

Funding Sources: Yale Institute of Biospheric Studies

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Tooth morphology through time in fossil and extant *Sceloporus* lizards

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Fossils can provide critical context for phylogenetic comparative analyses. Here, we investigate the evolution of tooth morphology in *Sceloporus* lizards, a diverse genus for which fossil material remains poorly studied. We quantified tooth morphology in 50 extant species, with a male and female specimen each, and 23 fossil specimens, including 8 from the Miocene and 15 from the Pliocene, to examine patterns of dental evolution through time. After incorporating phylogeny, we found that extant males had wider (but not taller) teeth than females (p-value = 0.001), perhaps due to a link between tooth width and bite force. Fossil specimens had taller and narrower teeth than extant species, suggesting that there may be trends of decreasing length and increasing width. In particular, the average teeth of fossil specimens from the Miocene were taller (0.95 mm) and wider (0.32 mm) than those from the Pliocene (0.87 mm and 0.27 mm, respectively). Finally, we provide a list of available fossil specimens and images of the dentary bone of *Sceloporus* in hopes that this will allow further contribution to the literature on a genus that is poorly represented.

Funding Sources: National Science Foundation, Grant Numbers 2154897 and 2154898

Technical Session XVIII: Paleontological Practices: Education & Outreach (Saturday, November 14, 2026, 1:45 PM)

Criteria for improving the educational content of extinct organisms in children's print media at the Department of Paleobiology, National Museum of Natural History (NMNH), Smithsonian Institution

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For two decades, Smithsonian Enterprises, a division of the Smithsonian Institution, has partnered with children's book publishers to develop Smithsonian-branded books. Publishers pay fees or royalties to license the Smithsonian name and logo, while Smithsonian experts review and approve the educational content for accuracy. This collaboration enables higher quality educational products to reach consumers, improves profit margins for publishers, and funds Smithsonian scholarship and research.

The Department of Paleobiology at the NMNH values this partnership and created rubrics for editing content. When reviewing content, two sets of criteria based on age categories are recognized: under 5 years old and 5+. Life reconstructions for both age groups have the same criteria; that the organisms must feature morphologies that are

within the last decade of scientific understanding (e.g., integument, posture). While up-to-date morphologies are desirable, publishers prefer to use art they have already bought or licensed. Giving publishers a ten-year timeframe in which to update their artwork provides them with flexibility and also allows the scientific community to reach consensus.

For the five years old and younger bracket, reconstructions of taxa may have human-like expressions or be "cute," and animals from different time periods may appear in the same image. For media with a target audience of 5+, all artwork must be accurate, no anthropomorphism is acceptable, and taxa appearing within the same image must have co-existed. Negative adjectives (e.g., stupid, bloodthirsty) are avoided in favor of words that more properly describe inferred behaviors.

The benefits of this partnership have led to global sales of 4.6 million books over the last 7 years, many of which are held in libraries and seen by a wider audience. Despite these successes, publishers are still very risk adverse, often wanting to focus on taxa already known by the public and reducing an organism to a series of factoids, with few exceptions. Pushes by the authors to explore other educational frameworks such as teaching about whole environments or using dinosaurs as a tool to talk about larger biologic or geologic concepts have gone unheeded. The paleontological community has a role to play in how the children of the world are educated about our science. The authors urge more members of our community to write for children and to work with publishers to improve the diversity of content available to today's youth.

Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

Machine-learning reveals shared downstream biochemical damage resulting from convergent mammalian and archosaurian endothermy: A universal, time-integrative proxy

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Amniotes convert chemical energy stored in fats and sugars into biochemical energy equivalents and heat. Warm-blooded taxa, such as birds and mammals, have taken energy conversion to new extremes. However, these extant endothermic clades utilize distinct biochemical strategies: While endothermy mechanistically relies on the proton-leakage across mitochondrial membranes, birds modify biochemical cycles involving the avian thyroid hormone (ATH) to create membrane potential, while mammals altered their fatty acid metabolism. Resulting active thermoregulation has allowed exploration of energetically costly traits, such as migration, encephalization, complex reproductive strategies, and large body size. But when and why did these convergent metabolic biochemistries evolve in the avian and mammalian stem? Tracing the evolution of metabolic biochemistries and their potential mechanistic linkage to extrinsic factors is fundamentally complicated by the lack of a universal proxy applicable to convergent thermoregulatory approaches in both modern and fossil amniotes. Here we systematically explore the localized cellular and systemic symptoms of endothermy in mammalian and avian stem and crown clades in the search for a universal and time-integrative proxy that can be applied to reveal metabolic evolution. We pioneered novel hyperspectral Raman imaging across the electromagnetic spectrum (from deep-UV, to visible green, to near-infrared light) and collected n = 1500 molecular fingerprints at the (preserved) cellular and whole-tissue skeletal level. Across our phylogenetically and ecologically diverse suite of modern and carbonaceous fossil mammaliamorphs (n = 50) and archosaurs (n = 50), machine-learning classification (Support Vector Machine; Random Forest; Python) applied to spectral fingerprints revealed that (bone) cell membrane and systemic structural protein oxidation resulting from byproducts of mitochondrial biochemistries represent shared downstream symptoms of mammalian- and avian-style endothermy. These oxidation products are thermodynamically stable, water-insoluble, indigestible to microbes, and thus exhibit exceptional fossilization potential. Applying this new proxy at the cellular and whole-tissue level allowed us to phylogenetically pinpoint the origins of metabolic endothermy to

mammaliamorphs and archosaurs. Metabolic upregulation appears to follow major mass extinction events, suggesting regional ecological rather than global climatic drivers.

Funding Sources: JW and MM: NASA ICAR grant 80NSSC26M0025. JW: The David & Lucile Packard Foundation

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A young *Mammut americanum* from Hollidaysburg Fissure, Blair County, Pennsylvania

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In 1973, a mastodon (*Mammut americanum*) was collected by Penn State paleontologist Roger Cuffey from Hollidaysburg Fissure, a cave exposed in Keyser formation limestone of Blair County, Pennsylvania. The cave is a vertical opening, 12 meters deep and 1.8 meters wide, extending 5.5 meters into the wall of the quarry. The fissure is filled with rubble from cave breakdown, red-brown clay, and pieces of charcoal. Limestone blocks were more common in the upper ⅓ of the fissure. Preliminary analyses of the mammal assemblage indicate a Rancholabrean age. The Hollidaysburg Fissure fossil assemblage contains more than 50 different species, including mammals, reptiles, amphibians, and birds. The bones of the young mastodon were disarticulated in red-brown clay among large limestone blocks in the upper section of the fissure (2.7–5.5 meters from surface). The skeletal inventory includes fragmentary specimens from the axial, cranial, dental, and appendicular regions There are three teeth present, a left upper M1 that is erupted but largely unworn, a left upper M2 that is unerupted without any wear or roots, and a left upper dP4 in full wear. The long bones, which include fragments of an ulna, humerus, radius, and a femur in multiple pieces, are unfused. The proximal and distal ends of the femur are completely unfused. Based on this information, this mastodon was likely a late-stage juvenile less than a year old at death. The age of the Hollidaysburg Fissure mastodon is consistent with other mastodon-bearing caves within Pennsylvania such as Port Kennedy Cave and Frankstown Cave, where young *M. americanum* are common.

Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

Gaps in the fossil record provide new insights into extinction dynamics of mammoths and other Pleistocene megafauna

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As mammoths (*Mammuthus* sp.) and other Pleistocene megafauna went extinct, did their populations fail catastrophically (and ecologically instantaneously) or did they undergo protracted population declines? The probability of becoming a fossil is determined by a combination of geological, taphonomic, and biological factors, such as changes in preservation potential due to shifts in climate, depositional setting, and/or population size. While such factors may be particularly challenging to differentiate using regional- to continental-scale data, highly fossiliferous Late Pleistocene records can provide geographically, climatically, and environmentally constrained fossil time series from which aspects of population demographics may be evaluated. This is particularly relevant for mammoths, for which thousands of directly dated specimens are useful for assessing extinction timing across North America and Eurasia. Using these fossil time series, we combined the temporal distributions of specimen ages with the distributions and sizes of temporal gaps between dated specimens to test for shifts in population trajectories through time consistent with either protracted population decline or abrupt population failure. We found that sampling can be excellent during mammoth extinction intervals. For example, in northern North America and Siberia, the gap sizes between fossil occurrences during the extinction interval are consistent with expectations based on the prior ~40,000 years. This finding indicates that

populations failed catastrophically and without dwindling over millennia. Results were similar for mammoth populations on Arctic islands, where they persisted for millennia after the extinction of their mainland cousins (and in the absence of humans). While we find that mammoth extinctions followed similar patterns across the Holarctic, the record for woolly rhinos (*Coelodonta antiquitatis*) indicate a significant increase in gaps sizes during extinction. In the absence of a sedimentological driver, this finding is consistent with a population undergoing long-term stress and protracted population decline leading to their extinction. The Late Pleistocene provides opportunities to evaluate extinction characteristics that are generally impossible to quantify from most of geologic time. While the fossils themselves tell much of the story, gaps in the fossil record can be equally revealing for evaluating species' demographic histories.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Ornithischian teeth recovered from a paleontological salvage in the lower Kayenta Formation (Lower Jurassic: Sinemurian) of southwestern Utah represent a previously unknown taxon

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Construction of the Southern Parkway (SR-7) through Long Valley, Washington County, Utah, necessitated the salvage of several significant Lower Jurassic paleontological sites. Among these, site Ws538 (lower Kayenta Fm., ~40 m above the Springdale Mbr.) yielded abundant plants, vertebrate tracks, and fishes, alongside a diverse assemblage of isolated teeth of dinosaurs, crocodylomorphs, and pterosaurs. Although the site is now covered by the highway, processing of salvaged fossiliferous matrix continues. To date, 15 distinct ornithischian teeth have been recovered. All possess constricted, phyllodont crowns characterized by well-developed fluting across the entire crown from apex to base and lack a primary midline ridge. Cheek teeth range from crowns 4.6 mm tall, 4.6 mm long, and 2.6 mm thick labiolingually to crowns 2.7 mm tall, 2.8 mm long, and ~2.5 mm thick labiolingually. The anterior carina is slightly longer than the posterior carina. Well-developed cingula are lower on one side than the other. There are 10–14 well-developed ridges on either side of the crown. A few (2–4) well-developed denticles are generally restricted toward the crown base. The taller, recurved mesial teeth lack cingula and range from 5.9 mm tall, 4.5 mm long, and 2.3 mm thick labiolingually to 4.0 mm tall, 2.8 mm long, and 2.0 mm thick labiolingually. These teeth are more finely fluted (14–22 ridges) and either lack denticles or have a few restricted toward the crown base.

Two smaller ornithischian teeth from the middle Kayenta Fm. at Gold Spring, Navajo Nation, Arizona, have similar anatomy to the new mesial teeth from Utah, but lack well-developed fluting. Many typical early-diverging ornithischian teeth, such as those of *Scutellosaurus,* exhibit a well-developed central ridge and cingulum, and only the teeth of *Agilisaurus* and *Hexinlusaurus* from the Middle Jurassic of China share well-developed fluting. Variously considered a Triassic sister group to Dinosauria or as stem Ornithischia, silesaurids have somewhat similar teeth, with *Kwanasaurus* and *Eucoelophysis* teeth from the uppermost Triassic Chinle Fm. being the most similar. However, anatomy of the new ornithischian teeth from Utah are most reminiscent of *Laquintasaura venezuelae* from the basal Jurassic (Hettangian) of Venezuela, differing only in their smaller size, less recurved crowns, and weaker fluting. Given this resemblance, the Utah teeth are referred to cf. *Laquintasaura* sp. until other skeletal remains are recovered.

Funding Sources: Creamer & Noble Inc., William Self Associates, Utah Department of Transportation, St. George Dinosaur Discovery Site

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Preliminary quantitative analysis of isolated archosauromorph teeth from the Upper Triassic (Revueltian) Homestead site, Garita Creek Formation, east-central New Mexico, USA

Nicholas D. Mirabile[1], James J. Bartlinski[1], Caeden Carter[2], Isaac Pugh[3], Steven J. Hageman[1], Sterling J. Nesbitt[3], Michelle Stocker[3], Bruce H. Lauer[4], René L. Lauer[4], Andrew B. Heckert[1]
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The Revueltian (Norian) age Homestead site of the Garita Creek Formation in New Mexico yields a diverse microvertebrate assemblage, including thousands of isolated archosauromorph teeth. These teeth are difficult to identify taxonomically, as associated remains with in situ teeth are extremely rare at the Homestead site and rare in Upper Triassic deposits globally. This makes accounting for sources of variation (e.g., taxonomic, positional, ontogenetic) especially difficult, especially with qualitative observations. Quantitative methods utilizing traditional morphometrics and multivariate analyses exist, but, within Archosauromorpha, have largely been used on younger taxa, principally theropod dinosaurs. Applying these techniques, specifically principal component analysis (PCA), linear discriminant analysis (LDA), and non-metric multidimensional scaling (nMDS), we can quantitatively describe both intraspecific (e.g., heterodont phytosaurs) and interspecific variation of archosauromorph teeth from Homestead. Preliminary PCA and LDA analyses corroborate previous qualitative analyses ascribing phytosaur teeth to different tooth positions (tip-of-snout, premaxillary, maxillary/dentary “blade” teeth). Despite the presence of four distinct groupings following the PCA and LDA analyses, the groupings likely reflect the heterodont nature of phytosaur dentition, and they largely correspond with the different tooth positions in phytosaurs mentioned above. In future studies, further taxonomic identification of each tooth could be obtained from examining phytosaur teeth from sites of similar age, location, and stratigraphic position that exhibit better preservation of diagnostic features and subsequently preliminarily assigning a taxon to the individual groupings based on similarity to the teeth of the other sites.

Additionally, an nMDS analysis using 16 characters of 40 non-phytosaurian teeth effectively establishes four primary morphotypes (A-D) of other archosauromorph teeth not readily assigned to any particular clade.Two of these (A-B) are relatively low crowned but vary in degree of recurvature. Morphotypes C-D are taller but vary in shape and, especially denticle density.

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Examining prey size preferences in theropods using preserved gut contents: How much does food processing bias what gets preserved?

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Predatory dinosaur ecology and hunting styles have been the subject of much speculation. Fossils that retain direct evidence of diet as fossilized gut contents have anchored that speculation, but numerous biases shape not only which individuals fossilize but which of their prey are likely to co-fossilize. Prey size and prey traits (skeletal type, number of preservable parts, etc.), together with predator traits (oral processing mechanics, digestive intensity, etc.), distort the connection between the true prey pool a predator exploited in life and the prey pool that could co-fossilize with it.

The core issue is that, in life, many prey individuals from different species and life stages were available to a predator. The predator ate a subset of them (the ecological filter), and the way it processed its prey meant only a subset could be preserved in an identifiable way (the physiomechanical filter). This is no obstacle to coarse ecological classification (e.g., identifying a carnivore), but it blocks the subtler inferences about hunting or processing style. To test what can still be inferred, we surveyed the modern ecological literature and assembled a database of predator–prey records. We modeled prey size as a

function of predator size, predator clade, and observation type, using 15,260 paired predator–prey observations, 8,699 of them from stomach surveys (regurgitation or dissection). Those stomach records are the direct analog of fossilized gut contents: we kept only prey that were (1) bone-bearing and (2) identifiable at least to size. This gives us a baseline for comparison.

Prey mass scales positively with predator mass, and the apparent prey-to-predator ratio depends on how the diet was observed (gut contents versus scat or direct observation). Avian and mammalian predators take proportionally larger vertebrate prey than crocodilians and non-snake squamates. Snakes take proportionally large prey as well, but with substantially lower variance in prey size. Across 20 fossil theropod predator–prey co-fossilizations, the theropods most closely resemble non-snake squamate predators (monitors, tegus, and the like). We speculate this is due to similar prey processing rather than similar ecology: both theropods and monitor lizards bear ziphodont teeth, so the similarity in the size ratio of vertebrate prey recovered from theropod and lizard stomachs may come more from how they ate than how they hunted.

Funding Sources: Coe College

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Seasons eatings: comparing the power and utilization of 2D and 3D molar shape analyses to predict diet in bats

Elise Mitchell[1], Matthew Ebner[1], Fletcher Farris[1], Sharlene Santana[2], David M. Grossnickle[1]
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In mammals, 3D shape analyses of teeth are powerful tools for predicting diet. However, an issue with these methods is that they require 3D data which can be challenging to obtain, especially for fossil taxa where dietary information that cannot be observed can provide valuable information about an animal's ecology and ecosystem. In contrast, 2D dental measurements are easier to collect via photographs and published images. Thus, our aim is to test whether 3D analyses provide greater predictive power than simpler 2D metrics that capture similar molar traits. We examine the relationship of 2D dental measurements and diet in mammals and compare the results to those of similar analyses using 3D metrics by employing phylogenetic comparative methods including MANOVAs to test for variations in molar shape among the tested dietary groups. We use extant bats as our base study system because they include considerable dental and dietary diversity. Further, insectivorous species exhibit ancestral molar morphologies very similar to those of early mammals, making bats ideal analogs for fossil studies. We collected 3D geometric shape data and 15 linear measurements for 140+ species of bats (500 specimens). Although our results suggest that the 3D data are stronger predictors of diet than 2D linear metrics, the difference is minimal—2D metrics differentiate diet categories to nearly the same degree as 3D metrics. As such, these measurements were applied to a handful of extinct bat species to compare the molar morphologies to modern taxa in an attempt to infer their diets. The results place the fossil taxa with modern insectivores who have similar molar morphologies. These results suggest that 2D metrics are reliable tools for inferring diet in mammals of unknown diets, including fossils, especially when application of 3D metrics is not feasible. Future avenues for this project include the application of 2D measurements to non-chiropterans and other mammalian fossil taxa in hopes to gain a greater understanding of the tie between molar morphology and diet in mammals.

Funding Sources: Funding was provided by the NSF (IOS 2017738 and IOS 2017803)

Technical Session VIII: Fishes (Thursday, November 12, 2026, 1:45 PM)

Historical contingency of early vertebrate phylogeny: what if and what now

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Phylogenetic hypotheses are sensitive to taxon and character sampling, whereas sampling mode, intensity, and coverage are all functions of geographical and socioeconomic factors. How did such historical contingency affect our phylogenetic understanding of early vertebrates? Would we come to harbor different assumptions and interpretations if the order of taxic discoveries was reversed? A simple approach was taken to explore these questions by editing the current consensus datasets in early vertebrate phylogeny under alternative scenarios of recent human history, removing or re-coding taxa by geographical regions. Then a maximum parsimony analysis was performed on each of these alternate datasets.

Historical contingency substantially impacts early gnathostome phylogeny. Coding only for Chinese taxa in the current datasets generates consensus trees in which: a) antiarchs form a basal grade from euantiarchs to yunnanolepids; b) maxillates associate with arthrodires instead of the gnathostome crown; and c) *Meemania* and *Shenacanthus* each falls outside the Chondrichthyes + Sarcopterygii clade. By their character coding, it would remain ambiguous under this scenario as to whether “antiarchs” are unequivocally jawed vertebrates. Expanding the sampling to include Asiatic and Oceanic regions in the order of cultural and economic proximity to the recent China, additions of well-preserved ptyctodonts would support “acanthothoracids” or maxillates to form a sister group to the less resolved gnathostome crown. Actinopterygians may be nested among “sarcopterygians.” These trees may even conform to the unorthodox idea that “acanthodians” are stem to both chondrichthyans and osteichthyans.

Positing a different scenario in which the early vertebrate dataset began to be compiled in the Americas, the initially supported topology would have either “actinopterygians” polyphyletic within the Sarcopterygii or “sarcopterygians” paraphyletic within “actinopterygians.”

These thought experiments reveal biases inherent to both our current understanding of early vertebrate phylogeny and our current practice in formulating cladistic characters. The results also predict a wide margin of possible future shifts in phylogenetic hypotheses. Efforts to counteract the regional biases should be led with growing local interest and by budding research centers in Africa, South America, Central Asia, and the homelands of Indigenous Peoples in high latitudes of the Northern Hemisphere.

Funding Sources: Canadian Museum of Nature

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A reassessment of early flamingo filter feeding ecology based on new cranial material

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The skeletal anatomy of modern flamingos (Phoenicopteridae) are highly modified to their unique filter feeding ecology. Such modifications include curved beaks lined with keratinous lamellae that form a filter feeding mesh; elongated cervical vertebrae resulting in a long, flexible neck; and long, gracile legs for wading. Studies of how flamingos acquired their characteristic morphology hold potential to help inform how birds become specialized to such extreme environments. The Oligo–Miocene Saint-Gerand-le-Puy of central France is a highly fossiliferous locality with a diverse and well-studied avifauna, including some of the earliest known records of flamingos. That flamingo record is dominated by extinct, straight beaked flamingos (Palaelodidae), presumed to be target feeding generalist waders and reflective of feeding strategy ancestral for modern filter feeding flamingos. A much rarer member of that same prehistoric avifauna is *Harrisonavis*, the earliest known filter feeding flamingo. Thus, comparisons of the beaks of palaelodids and *Harrisonavis* are likely to shed light on the origins of the modern filter feeding flamingo beak. However, much of the cranial anatomy of both palaelodids and *Harrisonavis* remains unknown, including nearly all of the mandibulae. Here, we report new specimens of the mandibulae of both palaelodids and

Harrisonavis from the Saint-Gerand-le-Puy locality, and we reassess the rest of the cranial anatomy of both taxa with comparison to grebes (Podicipediformes), the closest living relatives to flamingos.

Funding Sources: University of the Pacific, Torres laboratory

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Modeling flight style using soft tissue preservation in Eocene Aves

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The flight mechanics of fossil Aves is one of the most studied biomechanical topics with numerous Lagerstätten providing excellent conditions for soft tissue preservation, and thus flight reconstruction. One such formation, the Green River Formation, has been relatively understudied compared to similar preservational conditions. This study begins to remedy this lack of research by looking at a specimen of an unidentified panpasseriform in comparison with other named fossil species. This soft tissue preservation will provide insight in life appearance, which aids in building a model to test flight capabilities compared to extant relatives and contemporary fossil taxa. Findings on preserved musculature enable for a more accurate view of body frontal area, which allows for calculation of drag the body experiences. Additionally, comparison of the preservation of feathered wing area allows calculation of the aspect ratio and wing loading of the specimen.

Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

Fossilisation on fans: Insights into the paleoecology and taphonomy of terrestrial fluvial settings by comparing the White River Group of Nebraska to the Pilcomayo Megafan, Paraguay

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Fluvial megafans dominate deposition in modern sedimentary basins and so provide a compelling analogue for a significant portion of preservation in the deep-time terrestrial fossil record. For the last five years, we have been gathering ecological and taphonomic data from the world's largest megafan: the Pilcomayo Megafan in Paraguay. Our goal is to use these data to begin to describe vertebrate preservation in megafan settings and use this analogue for more accurate assessment of the fidelity of the fossil record, potentially opening new windows of palaeoecological inquiry. We have also been collecting parallel data from terrestrial vertebrate fossil assemblages from definitive or potential ancient megafans to compare with our modern data. We are currently able to compare ~4,500 identifiable specimens from known sedimentary environments in the White River Group (WRG) spanning the Eocene–Oligocene Transition (EOT) at Toadstool Geologic Park, Nebraska to >450 identifiable individuals from two study areas comprising all major sedimentary subenvironments on the present-day Pilcomayo Megafan. Prior to collecting sedimentological data from the WRG sites, fossil taphonomic characteristics (including weathering, abrasion, completeness, and degree of scavenging) were most comparable to those from the actively depositing subenvironments of the Pilcomayo (channel, depositional lobe). Assuming they can be compared, the density of remains in the Eocene–Oligocene horizons indicates that they were more abundant than those on the modern Paraguayan land surface. Sedimentological description shows that the majority of the WRG localities that we surveyed can be interpreted as being deposited in the same two active subenvironments. Compositional and temporal fidelity of these sites

in Paraguay appears high, suggesting that individual horizons in the WRG could reflect ecological assemblages. By extension, however, the area of the megafan that is likely to be sampled by the fossil record would be relatively small.

Funding Sources: David B. Jones Foundation, University of New Mexico, Grand Rapids Public Museum

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Divergent mammalian body size trends across the Eocene–Oligocene Transition in Sioux County, Nebraska

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At approximately 34 Ma, the Eocene–Oligocene Transition (EOT) marked a dramatic shift in prevailing Cenozoic global climate regimes from a greenhouse to icehouse Earth. The highly fossiliferous White River sediments of the western Great Plains that span the late Eocene and early Oligocene provide the means to investigate the effects of the EOT on terrestrial North American communities. Previous attempts to elucidate the effects of the EOT on mammalian body sizes from the Chadronian and Orellan NALMAS as preserved in the White River Group suffer from coarsely binned data and/or samples from large geographic ranges. The present work uses body mass proxy data from a stratigraphically continuous dataset of four common White River mammal genera to identify higher-resolution body size trends than previously possible for the EOT.

Represented genera are the stem lagomorph *Palaeolagus,* the rodent *Ischyromys*, and the artiodactyls *Leptomeryx* and *Hypertragulus* collected from Oglala National Grassland, Sioux County, Nebraska. All specimens were collected with high-accuracy DGNSS geopositional data and modeled onto a stratigraphic framework of mapped local and regional marker beds of the Chadron and Brule formations. Body mass estimates were derived from lower first and second molar occlusal areas. Trend analyses for linear, monotonic, and non-monotonic trends of m1 and m2 datasets indicate significant trends in all four taxa analyzed. As predicted by Bergmann's rule, *Ischyromys* (n = 81) displays a substantial increase (~90%) in body size from the late Eocene to the early Oligocene. However, *Palaeolagus* (n = 166) shows a similarly marked decrease of ~55% in body mass. *Leptomeryx* (n = 319) increased in body mass by ~20% from the late Eocene to the earliest Oligocene but decreased by ~10% after the first appearance of *Hypetragulus.* Despite a smaller sample size and more limited stratigraphic range, *Hypertragulus* (n = 64) body mass estimates decreased by 20% over the Orellan. These decreases in body mass, contrary to changes predicted by Bergmann's rule, may have related to the documented increasing aridity in the early Oligocene, leading to diminishing nutrient quality and/or dietary competition and manifest in dental adaptations (e.g., hypselodonty, appearance of cementum, increased enamel volume). The implication is varying scale and directionality of climate-driven mammalian adaptation across the EOT in continental North America.

Funding Sources: GSA Graduate Student Research Grant, Toomey Foundation for the Natural Sciences, Fossil Club of Lee County

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Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Glimpses of faunal change across the glacial-interglacial cycle during the Late Pleistocene from renewed studies of cave sites on the Edwards Plateau of central Texas

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Long regional records of vertebrate biodiversity offer the potential to clarify the context, chronology, and cause(s) of end-Pleistocene extinctions by providing a baseline of pre-extinction faunal dynamics, including the response of taxa and communities to climatic shifts associated with the glacial-interglacial cycle. New investigations

expand an already robust record of the Late Pleistocene from the Edwards Plateau of central Texas by applying stringent fossil identification methods, adding radiometric and paleoclimatic context, documenting new sites and revisiting classic ones. Nearly all of the previously known 17 sites fall within Marine Isotope Stage (MIS) 2 and post-date the Last Glacial Maximum (LGM). New data clarify the natural history of individual taxa, including the bat *Tadarida brasiliensis*, while also expanding the geographic breadth and temporal depth of the regional record. Fossils from Phillips Paleo Cave on the western Edwards Plateau reflect a fauna, including *Nothrotheriops*, that resembles others from western North America, with age data placing that fauna near, or beyond, the limits of radiocarbon dating. Age and faunal data from renewed study of Inner Space Cavern, on the eastern edge of the plateau, illustrate that two sites in the cave contain long records spanning from MIS 2 into MIS 3. Within that sequence, the sloth *Megalonyx*, spectacled bear *Tremarctos*, and glyptodont *Glyptotherium* occur prior to the LGM, with the bear and glyptodont found only in deposits dating to MIS 3. *Holmesina* and giant *Hesperotestudo* were discovered in the region for the first time in Bender's Cave and are hypothesized as dating to MIS 5. Fossils from Bender's Cave and other groundwater conduit caves (those with underground streams) document a greater abundance of megafaunal browsers relative to dry cave sites. Today, the region straddles the divide between mesic eastern North America and the arid west. The presence of megafauna typical of southern and western Pleistocene biogeographic provinces suggests similar latitudinal and longitudinal variation in the past. Some of the observed variation reflects change in regional conditions during the Pleistocene. Longitudinal variation across the Edwards Plateau is evident, but poorly resolved due, largely, to a lack of radiometric age data. Still, the emerging patterns appear consistent with individualistic species responses to change in temperature and moisture associated with the glacial-interglacial cycle.

Funding Sources: Geological Society of America Graduate Student Research Grant, Texas Academy of Science Student Research Award, Francis L. Whitney Award from UT Austin

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Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

New tyrannosaur from the Bisti/De-Na-Zin Wilderness (Upper Campanian) of New Mexico provides insights into biogeography and palate anatomy of apex predators in southern Laramidia

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Tyrannosaurs were among the largest terrestrial carnivores known and they dominated the Late Cretaceous ecosystems of Laurasia. Counterintuitively for animals of such immense size, the Campanian fossil record shows evidence of provincialism across both North America and Asia among tyrannosauroids and other dinosaurs. This pattern is particularly clear in southern Laramidia, where most species are known from single formations or depositional basins during the Campanian. Within the San Juan Basin teeth referable to Tyrannosauroidea have been known for decades, however, all diagnostic skeletal material from the Fruitland and Kirtland Formations has previously been identified as *Bistahieversor sealeyi*. Recent efforts by the NHMLAC to explore the Bisti/De-Na-Zin Wilderness of New Mexico have uncovered new material including a set of remarkably well-preserved cranial bones from a single individual. This new tyrannosaur from the San Juan Basin (Kirtland Formation) is clearly distinguished from *B. sealeyi* by several features including a smaller, more gracile skull—providing the first evidence of sympatry and potential niche partitioning among tyrannosaurs in southern Laramidia. Building on the recent recognition of several new genera of tyrannosauroids across New Mexico, Texas, and Utah during the Campanian, we also assess the diversity dynamics and ecological implications for these apex predators in light of this new material. Further, the specimen shows fine surface details and intra-sutural tissue that provide a unique opportunity to study the correlations among skeletal and soft tissue in the tyrannosaur palate. To more

completely reconstruct this palate, we collected data on the direct associations among palatal tissues using contrast-enhanced μCT scanning of extant reptiles and birds. Based on these comparisons, we provide a new reconstruction of the palate skeleton and soft tissues including the extent of the soft tissue of the palatal shelf, the length of the nasopharyngeal duct, and position of the choanae in tyrannosaurs. Taken together, these findings provide key insights into the anatomy and biogeography of these remarkable predators.

Funding Sources: National Science Foundation (EAR-PF-1952888), NHMLAC Dinosaur Institute Gretchen Augustyn Family Expedition Fund and Dinosaur Institute Fellowship Fund

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A heavy burden: linking body mass, locomotion, and osteopathology in Miocene rhinocerotids

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The Miocene of North America was characterized by a changing landscape. The transition from closed, wooded C3 habitats to open, grassy C4 habitats drove rapid dietary and locomotor adaptations in local fauna. We hypothesize that sympatric rhinocerotids, such as *Aphelops* and *Teleoceras*, responded to these environmental pressures through divergent locomotor strategies—specifically, trends toward cursoriality and extreme graviportality. If these taxa adopted distinct ecological strategies, this divergence should be quantifiable in their postcranial morphology. While these locomotor adaptations reflect distinct ecological strategies, the biomechanical relationship between rhinocerotid body mass, locomotor habit, and osteopathology remains unexplored. Here, we examine the instances and severity of weight-bearing pathology, hypothesizing that the extreme body mass and graviportality of *Teleoceras* incurred a higher biological cost via increased osteopathology compared to the lighter, cursorial *Aphelops*. To study this relationship, the femur and humerus were measured for diaphyseal circumference and articular dimensions. Indeterminate elements were taxonomically sorted using multivariate and bivariate robusticity parameters. Measurements were then input into taxon-specific regressions to estimate body mass. To quantify ecological adaptations, locomotor habit and cursoriality were estimated using functional limb morphometric indices. Specimens were then quantitatively scored for pathology count and severity. A generalized linear model indicates that the large-bodied *Teleoceras* exhibits a higher frequency of load-bearing pathologies compared to the lighter *Aphelops*. Furthermore, intraspecific analysis reveals that heavier *Teleoceras* individuals incurred significantly more severe injuries, establishing a correlation between higher body mass, graviportality, and increased osteopathology occurrences. This work demonstrates that the biological cost of increased body mass and graviportality in these extinct rhinocerotids is a higher susceptibility to load-bearing osteopathology. Through this process, we can quantify the biomechanical trade-offs large mammals face when adapting to changing landscapes. Future research will address the application of this biomechanical framework to other large-bodied taxa.

Funding Sources: Kansas Geological Foundation

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Linear morphometrics fail to support strong sexual dimorphism in *Uintatherium anceps*

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Sexual dimorphism is common among extant mammals and other vertebrates, but documenting or quantifying this pattern in the fossil record is notoriously challenging. Recent research by neontologists has shown that sexual dimorphism is less uniform and ubiquitous among living mammals than previously thought. As such, studies of dimorphism in extinct taxa are likely to hold key

insights into the broader role of sexual selection in mammalian evolution.

Uintatheres, mammals belonging to the extinct order Dinocerata, are among the most recognizable of all Paleogene organisms. Unmistakable for their bizarre skulls with multiple pairs of horns and saber-like upper canines, uintatheres have captivated paleontologists since the late 19th century. Uintatheres have long been regarded as a classic example of dramatic sexual dimorphism in the fossil record, with males purported to be larger and possess more prominent horns and canines than females. However, the hypothesis that uintatheres were highly sexually dimorphic has never been formally tested.

I used traditional, linear morphometrics on a collection including most known skulls of *Uintatherium anceps* to quantify patterns of cranial variation within this taxon. To test for evidence of dimorphism in this dataset, I employed a broad range of techniques including tests of deviation from normality and unimodality, cluster analysis, and a recently developed effect size statistical framework. Despite using a diversity of methods, I found little evidence of sexual dimorphism in *Uintatherium*. To contextualize these results, I performed the same suite of analyses on a similar dataset of cranial metrics from the extant American bison and recovered stronger evidence of sexual dimorphism. Use of *Bison* as an extant model in variance-based regression analyses also yielded predictions of only minimal to moderate sexual dimorphism in the cranial metrics chosen in *Uintatherium*.

In light of these findings, I argue that strong sexual dimorphism should not be treated as the null hypothesis for *Uintatherium*. These results may also point to a broader pattern in mammalian evolution in which traits like horns and large canines emerge in both females and males of a species despite only being selected for in one sex. The methods employed in this study are easily reproducible, and application of similar approaches to other extinct taxa may reveal when and how many times sexual dimorphism evolved across the tree of life.

Funding Sources: Allison R. “Pete” Palmer Award of the Paleontological Society, University of Kansas Biodiversity Institute and Natural History Museum, David B. Jones Foundation

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Theropod track assemblages from the Upper Cretaceous (Campanian) Prince Creek Formation of northern Alaska, USA

Xochitl Muñoz[1], Kevin May[1], Lauren N. Wilson[2], Jaelyn J. Eberle[3], Gregory Erickson[4], Patrick Druckenmiller[1]
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The Upper Cretaceous Prince Creek Formation (PCF) of northern Alaska preserves an unrivaled window into Cretaceous polar ecosystems. However, much remains to be learned about the richness and paleoecology of the PCF, which is especially true for non-avialan theropods due to the paucity of described fossils. Here, we describe a remarkable assemblage of avialan and non-avialan dinosaur tracks. Numerous small (~10 cm) tridactyl prints are preserved, likely belonging to theropods. Non-avialan theropods known from PCF body fossils include the tyrannosaurid *Nanuqsaurus hoglundi*, a troodontid, an ornithomimid, two dromaeosaurids (dromaeosaurine and saurornitholestine), and two different morphotypes of Richardoestesia teeth. Birds known from body fossils from the PCF include Ichthyornithes, Hesperornithes, and multiple derived ornithurine species. Recent U-Pb CA-ID-TIMS dating reveals the fossiliferous portion of the PCF is Campanian in age (~81–73 Ma). Most body fossils are found in the upper section, near Ocean Point, which has been dated to ca. 73 Ma. In contrast, some of the best track localities, such as Uluksrak Bluff, are up to 80 km upriver near the base of the unit and therefore stratigraphically lower in the section, providing critical data on the PCF faunal composition from this poorly known interval. We conservatively recognize four tridactyl track morphotypes based

on divarication angle, digit length and width, and digital pad and claw mark morphology. Three of these morphotypes measure approximately 10 cm in length, with one being significantly larger. Interestingly, all probable avialan tracks are from relatively large birds and are thus inconsistent with the robust avialan body fossil record composed of small-bodied bird species (e.g, roughly equivalent in mass to the extant Call duck, *Anas platyrhyncos domesticus*). Notably, there is a marked absence of didactyl tracks, which are expected given the presence of at least three deinonychosaur taxa from higher in section. We posit that some of these tracks could have been made by small ornithopods, such as thescelosaurids, which are also represented by body fossils. We also recognize a large (~48 cm) tridactyl track, which could tentatively be attributed to a tyrannosaur based on its size. Collectively, trace and body fossil evidence expands our understanding of theropod richness from high paleolatitudes (~82°N), and these tracks reveal a taxonomic richness not yet recognized from body fossils alone.

Funding Sources: National Science Foundation DGE 2235201, EAR 1226730 and EAR 1736515; Alaska Geological Society and Pacific Section of AAPG grant, Otto William Geist Fund

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Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

From the Late Pleistocene to the future: modelling the spatiotemporal dynamics of large cervids in North America

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Moose (*Alces alces*) are a cold-adapted mammal that first arrived in North America during the Late Pleistocene. While much is known about this cervid, recent studies thus far have not assessed the impact of glacial coverage, climate, and biotic factors on their biogeographic distributions in a historic and paleontological framework. Further, prior research has hypothesized a potential role of moose in the extinction of *Cervalces scotti* (stag-moose), with both taxa having been speculated as sharing a relatively similar ecological niche. We aim to understand historic range shifts in potentially competitive North American cervids and further develop predictive models of future shifts in their extant relatives.

Using fossil and historic occurrences, changes in the potential species distributions of various cervids were modeled over the last 15,000 years using a Maximum Entropy (MaxEnt) approach combined with the BIOME4 vegetation model. While moose cover large areas of North America, their modeled range during the Late Pleistocene does not overlap greatly with stag-moose, which is concentrated around the greater Great Lakes region. The overall region of suitable habitat of stag-moose most greatly coincides with a different cervid, *Rangifer tarandus* (caribou). Late Pleistocene model outputs suggest suitable moose habitats include tundra, coniferous and some deciduous forest, while stag-moose was suited to a mix of grassland/parkland, deciduous, and coniferous forest. Consistent with their lower latitude distributions at this time, many Pleistocene caribou were predicted as inhabiting mainly deciduous, coniferous, and mixed forest (similar to extant woodland caribou). Our results are consistent with the demise of *C. scotti* being driven from a combination of abiotic changes and pressures related to potential niche overlap with both caribou and moose, rather than being primarily a result of competition with moose.

To assess vulnerability under anticipated climatic changes, we modeled moose distributions in 2050 and 2090 under moderate and high emission scenarios. These predict that suitable moose habitat will shift considerably northward, further restricting its range. Coupled with other anthropogenic, parasitic, and disease pressures, this species likely faces substantial future threats. Approaches combining fossil and modern occurrences, along with biotic and abiotic variables, may play a key role in determining priority areas for future conservation efforts.

Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

First anatomical description of historical mosasaur specimens from the Niobrara Formation (Kansas, USA) housed in Rio de Janeiro, Brazil

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The Mosasauridae represents a diverse clade of extinct, highly adapted marine reptiles that thrived globally during the Late Cretaceous. The Niobrara Formation (Coniacian–Campanian) has yielded some of the best-preserved mosasaur material worldwide, making it central to understanding the evolution of the group. Despite extensive research on North American specimens, significant fossil material housed in international collections remains largely overlooked. This study presents the first detailed anatomical description of previously undescribed mosasaur specimens housed in the Museu de Ciências da Terra, Rio de Janeiro, Brazil. Collected in 1883 from the Niobrara Formation of Kansas (USA), these specimens were donated by Harvard University's Museum of Comparative Zoology in 1943. The collection includes five specimens: MCT.R.00262 (axis, cervical, and dorsal vertebrae); MCT.R.00263 (series of 18 caudal vertebrae); MCT.R.00264 (scapula, dorsal, and caudal vertebrae); MCT.R.00265 (a partial skull with premaxilla, prefrontal, squamosal, pterygoid, splenials, surangular, and both dentaries); and MCT.R.00266 (a fragmentary skull with both maxillae, frontal, lacrimal, splenial, dentary, surangular, and basisphenoid). Postcranial elements feature robust, strongly procoelous vertebral centra, blade-shaped neural spines, an axis-fused intercentrum, articulated hemal arches, and a fan-shaped scapula. The terminal caudal sequence MCT.R.00263, assigned to Mosasauridae indet., exhibits an atypical early posterior inclination of the neural spines, lacking the expected initial procumbent orientation. Comparative osteological analysis preliminarily assigns MCT.R.00262 and MCT.R.00264 to Tylosaurus and Platecarpus, respectively, both common in the Smoky Hill Chalk Member. Smaller cranial elements in MCT.R.00266 are strongly attributed to Platecarpus based on diagnostic frontal and maxillary morphology, alongside a slender dentary with 11 teeth. Notably, the Wallace County specimen (MCT.R.00265), confidently referred to Tylosaurus based on a premaxilla with a knoblike edentulous rostrum, 13 dentary teeth, and 11 pterygoid teeth, displays an unusually straight ventrolateral dentary margin associated with an exceptionally robust dentition. These previously undocumented osteological variations within the Niobrara provide opportunities for future biomechanical studies on feeding and aquatic locomotion, while highlighting the scientific value of historical international collections.

Funding Sources: CAPES #88887.178218/2025-00; CNPq INCT Paleovert #406902/2022-4, #407158/2022-7, #308707/2023-0, #E-26/210.294/2021; FAPERJ #E26/200.558/2026; FINEP #2914/24

Technical Session VI: Dinosauria II: a "bird-hipped" bonanza (Thursday, November 12, 2026, 8:00 AM)

A chasmosaurine (Ornithischia: Ceratopsidae) skull from the Coal Ridge Member of the Judith River Formation (Campanian) suggests convergent evolution in Chasmosaurinae

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The Upper Cretaceous Judith River Formation (JRF) of Montana has produced fossils of several large horned ceratopsids. The formation is divided into four members, in ascending order: the Parkman Sandstone, McClelland Ferry, Coal Ridge, and Woodhawk members. The JRF is roughly coeval with other dinosaur-bearing units from western North America, including the Oldman and Dinosaur Park (Alberta), Two Medicine (Montana), Kaiparowits (Utah) and Fruitland (New

Mexico) Formations. The biogeography of dinosaurs across these formations is a subject of ongoing research, and coeval, distinct clades of chasmosaurine (long-frilled) ceratopsids have been hypothesized to be endemic to northern and southern regions of Laramidia. Most recently, a rediscription of *Cryptarcus* from Alberta suggested convergent evolution of southern-style frill morphologies in some northern chasmosaurines. A recently excavated chasmosaurine skull (MOR 11940) from the JRF in Montana also exhibits several morphologies that are most comparable to southern taxa *Utahceratops* and *Pentaceratops*, including the jugal, horncores, and parietosquamosal frill. Despite these similarities, it cannot be referred to either of these taxa as other features of the skull, such as the premaxilla-nasal contact, are more similar to northern taxa like *Chasmosaurus*. U–Pb geochronologic dating of detrital zircons at the site has yielded a maximal depositional age of 75.11 ± 1.96 Ma, which is consistent with placement within the Coal Ridge Member of the JRF, and indicates that MOR 11940 may have overlapped in time with other Campanian chasmosaurines including *Pentaceratops* and *Cryptarcus*. Morphological comparisons and cladistic analyses suggest that the presence of *Pentaceratops*-like skull characteristics in two coeval northern chasmosaurines may represent convergent evolution in northern and southern taxa.

Funding Sources: Canadian Museum of Nature (CMN) Student Travel Grant

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Technical Session VI: Dinosauria II: a “bird-hipped” bonanza (Thursday, November 12, 2026, 8:00 AM)

Critical reappraisal of jaw muscle reconstruction along the coronoid process in ceratopsian and iguanodontian dinosaurs

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While osteological correlates can be reliable indicators of soft tissue, reconstructions are often debated. One example is in reconstructing jaw muscles in ornithischian dinosaurs, particularly those with a coronoid process like ceratopsians and iguanodontians, including hadrosaurs. Although extant phylogenetic bracketing narrows down plausible jaw muscle anatomy, nuanced variations have led to disparate jaw muscle reconstructions. Traditional jaw muscle reconstructions have positioned temporal muscle insertions along the caudal rim of the coronoid process in ceratopsians and iguanodontians whereas a more recent study hypothesized a superficial division of temporal musculature placed lateral to the coronoid process with muscle fibers also stretching rostrally along a labial dentary ridge. Here, I survey known anatomy of temporal adductor muscle insertion across modern vertebrate groups with a coronoid process caudal to dentition to understand how a novel coronoid process affects jaw muscle arrangement, given their absence in other vertebrates, including those bracketing non-avian dinosaurs (i.e., crocodilians and birds). I also examine features and variations of coronoid processes in jaws of 32 ceratopsian and 36 iguanodontian taxa to explore all plausible muscle reconstructions based on limitations of bone morphology. Although the bony makeup of the coronoid process is largely not homologous across vertebrates, its function is consistently for temporal muscle attachment. In all cases, including many lepidosaur and turtle groups, there is a muscle body attaching lateral to the coronoid process. Additionally, although temporal muscle attaches largely only to the surangular or coronoid bone, few vertebrates, including some turtle and salamanders, show either a shift in some temporal muscle fibers attaching to the dentary or the development of a novel muscle division attaching rostrolaterally. Furthermore, temporalis and masseter muscles in mammals are together another case of novel adductor muscles attaching rostral and lateral to the coronoid process of a dentary. These details are consistent with the plausibility of a rostrolateral attachment of temporal musculature in ceratopsians and iguanodontians, although the specific muscle division is unclear. These observations highlight the importance of testing a wide range of jaw muscle reconstructions in dinosaurs when modelling feeding mechanics to understand the extent of possible mechanical performance.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

A non-dinosaurian dinosauriform tibia from the "*Syntarsus*" bonebed, Forest Sandstone, Zimbabwe

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The faunal turnover at the Triassic–Jurassic boundary is characterized by the radiation of dinosaurs and pterosaurs and the extinction of their close relatives, e.g., silesaurids and lagerpetids. Although the precise phylogenetic placement of these groups remains debated, their position as early members of Avemetatarsalia is well-supported. Placing Triassic–Jurassic vertebrate assemblages into a robust temporal context is crucial for constraining the timing and tempo of this faunal transition. Here, we describe the proximal end of a tibia from the Chitake River "*Syntarsus*" bonebed from the Forest Sandstone of Zimbabwe, which has consistently been interpreted as Early Jurassic in age. This specimen lacks unambiguous dinosaurian synapomorphies. As in other early ornithodirans, the cnemial crest is present but straight in proximal view, rather than the anterolaterally curved condition present in dinosaurs, and there is no fibular crest. The medial and lateral condyles are at roughly the same caudal extent, as in many silesaurids and theropods. We therefore identify this tibia as representing a non-dinosaurian dinosauriform, and not the neotheropod "*Syntarsus*" *rhodesiensis*. The presence of an early dinosauriform within the putatively Jurassic-aged Forest Sandstone suggests three potential interpretations: this specimen represents a relictual population of early avemetatarsalians surviving into the Jurassic; the Forest Sandstone is entirely Triassic in age, with its biostratigraphy and absolute age requiring revision; or the Forest Sandstone encapsulates the faunal turnover that occurred during the T–J boundary event, with some portions comprising either Late Triassic or Early Jurassic sediments.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

New perspectives improve equity and inclusiveness of processes involved in publishing research articles: a guide for students and their advisors

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The need to publish or perish at all academic levels from early career students to highly experienced researchers has never been more significant and highly recognized than at present. As academic and related positions become increasingly difficult to obtain, and there are more candidates for each one, the need to improve research credentials continues to increase. Additionally, new technologies, including those that allow online publication and open source publication are increasing the complexity of this process. More individuals engaged in research also increase the level of competition for limited space in the most desirable journals. Whenever resources become harder to obtain, and competition for them increases, it becomes more essential to generate safeguards to ensure that all authors are treated well throughout the process. Methods to ensure appropriate treatment for all authors and manuscripts include the institution of a code of conduct to which all potential manuscript reviewers and journal editors must agree. These agreements parallel those already in effect for others involved in the process of reviewing and editing manuscripts for publication. Authors already must agree to a code of conduct prior to having a manuscript accepted for review by many journals, and many professional societies have codes of conduct for attendees at their conferences, but to date journals have not instituted similar codes for reviewers and editors. Here, we review these needs and present a proposed code of conduct to assist in ensuring professional treatment during all phases of the publication process and for all participants. A second proposal presented here is for journals to generate a "no scoop" policy to safeguard authors' proprietary original data from being used inappropriately during the consideration for publication of a research article. These topics are a valuable addition to any courses taught with

the intention of assisting students in improving their experiences while attempting to publish their research.

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Does any species obey the rule? Investigating clade- vs. species-level allometry in living and extinct theropods

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Allometric scaling regimes are typically classified as ontogenetic (scaling during growth), static (among individuals of shared developmental stage), or evolutionary (between species). Scaling relationships are thought to represent evolutionary "lines of least resistance," describing directional preferences for generation of novel phenotypic diversity, but the relationship between the different forms of allometry remains uncertain. It is, for instance, unclear whether ontogenetic and static allometry are truly distinct phenomena, and whether evolutionary allometry is prescriptive (a "rule" which members of a clade obey) or descriptive (the mathematical average of multiple species-specific relationships). Here, I address these questions through the lens of intersegmental limb proportional variation among extant and extinct theropod dinosaurs. My results indicate that, among theropods, static allometry is simply the manifestation of variation about a species-specific ontogenetic trajectory. In both extant and extinct theropods, evolutionary allometry likewise appears to describe the average of ontogenetic allometric regimes among the constituent species of a given clade. Species-specific allometric trends track and often parallel the clade-level trajectory, but no species truly follow it. Thus, these analyses suggest that evolutionary allometry is best seen as descriptive, not prescriptive. Evolutionary allometry, then, does not represent a "top-down" constraint governing phenotypic diversification, but the average of multiple species-specific ontogenetic curves among related species. In sum, my results suggest that static and evolutionary allometry are best seen as epiphenomena of ontogenetic allometry, which itself reflects the developmental program of each species (and, presumably, every individual). Therefore, it is biologically justified to combine ontogenetic, static, and evolutionary allometry into a common framework, as the latter two can be considered proxies of the former. Clade-level evolutionary allometry may not act as a top-down constraint but does represent an estimate of the ontogenetic scaling regimes governing the development and evolution of species within that clade. Therefore, investigations of the developmental basis of phenotypic diversification in extinct systems need not be restricted to rare cases in which ontogenetic or population-level samples are available.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A new, remarkably complete skeleton of *Holmesina septentrionalis* (Xenarthra: Cingulata: Pampatheriidae) and associated fauna from the Pleistocene of Florida

Rachel E. Narducci[1], Richard C. Hulbert[1], Robert W. Sinibaldi[1], Jason R. Bourque[1], Mitchell S. Riegler[1], Hunter C. Neeley[1], Andrew N. Caudill[2], Jacob L. Plummer[1], Advait M. Jukar[1], Jonathan I. Bloch[2]
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Species of *Holmesina* were large-bodied, herbivorous, armadillo-like mammals known from the Plio–Pleistocene of South and Central America, the Gulf Coast, and central USA. Fossils of *H. septentrionalis* are most commonly recovered from the Pleistocene of Florida (ca. 140 localities) and Texas (ca. 15 localities) as isolated bones. Here we report a newly discovered skeleton of *H. septentrionalis* (UF-VP 530000), only the fourth known and the most complete yet recovered for the species. It was discovered in June 2025 at a new, submerged site in northern Florida, Steinhatchee River 2B, mostly collected during the course of three dive days at a depth of ca. 5 m in low-visibility water. The site is a former fluvial sinkhole filled with organic-rich, compacted, black clay bounded laterally by late Eocene limestone. Well-preserved partial skeletons of *Tapirus* and a

llama have also been recovered, along with a nearly complete fish (*Cynoscion* sp.). Screenwashing a small clay sample (6 matrix bags) produced fossils of other fish (including Lepisosteidae), Sirenidae, Anura, Sternotherus, Serpentes (3 taxa), *Geomys pinetis*, and *Sigmodon* sp. The latter two suggest the locality was surrounded at least in part by grassy habitats with sandy, well-drained soils. UF-VP 530000 is ~90% complete, missing only the left forelimb, right radius, and some podial elements, with negligible taphonomic deformation or modification. Fused limb and vertebral epiphyses demonstrate that it is an adult individual, and measurements of the astragali fall within the ranges for *H. septentrionalis* and exceed those of *H. floridanus*. The maximum length of the cranium is 335 mm, 263 mm for the mandible, 176 mm for the tooth row, and occlusal surface area provides a body mass estimate of 280 kg, exceeding results previously reported for *H. septentrionalis*. Investigation of intracranial anatomy through CT scanning revealed an intact cribriform plate (crucial for olfactory bulb reconstruction) and detailed anatomy of the endocranium, inner ears, ear ossicles, and paranasal sinuses. This newly documented morphology is similar to that of *H. cryptae* and differs from *Pampatherium humboldtii* in having less pedunculated olfactory bulbs and greater encephalization. A total 50 cranial osteoderms were recovered (~70% complete), allowing for the first accurate reconstruction of the cranial shield for this species. Additional collecting and screenwashing are needed to better understand the paleoecology and age of the site.

Funding Sources: The Wright, Tucker, and Fite Endowment; The Toomey Endowment

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A CT segmentation workflow: Utilizing Boolean tools for challenging fossil datasets

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Computed tomography (CT) data of fossils presents considerable challenges for segmentation due to noise, poor contrast, beam hardening, and scattering artifacts from dense inclusions. These problems arise from both the physical properties of fossils and inherent limitations of CT technology and can result in a dataset with variable gray values throughout, making simple threshold-based segmentation ineffective. Here, I outline a flexible workflow that addresses these issues by leveraging Boolean operations, simple logic functions that include addition, subtraction, intersection, and exclusion. Terms from the open-source software 3D Slicer are used, though the workflow can readily be adapted to other segmentation platforms. The process begins by creating two segmentation layers: “Threshold”—set with the threshold tool and adjusted as needed for regional gray values—and “Selection”—a targeted region of interest defined with tools such as 3D Paint or Fill Between Slices. Applying the Boolean intersection operation combines these layers, restricting the threshold segmentation to the selected volume. This result is similar to painting with an editable intensity range but is computationally faster and allows for efficient editing of larger, well-defined volumes. This not only produces cleaner models with less slice-to-slice variation but also allows for “broad brushstrokes” at the outset of segmentation, improving workflow efficiency. The resulting segmentation can then be added to or subtracted from a third layer representing the anatomical feature of interest, supporting both additive and subtractive refinements as local gray values vary.

By updating and integrating the threshold and selection layers iteratively across the dataset, anatomical segmentation is progressively refined without overwriting earlier work. This strategy—emphasizing broad initial segmentation followed by targeted cleanup—maximizes efficiency and anatomical accuracy while relying on simple, computationally lightweight tools. Overall, this adaptable workflow enables robust segmentation of challenging fossil CT datasets, enhancing preparation methods in paleontological research.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Geckos (Squamata, Gekkonomorpha) from the Late Oligocene and Early Miocene of Peninsular Florida

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Geckos are a diverse group of lizards with a global distribution in tropical and subtropical regions. Despite their broad geographic range and antiquity as a group, they are poorly known in the Cenozoic fossil record of North America. Here we describe gecko fossils from three karstic sinkhole sites in Peninsular Florida: Brooksville 2 (B2) (latest Oligocene, ~26 Ma), the Miller Site (MS) (Early Miocene, ~19.5–19 Ma), and Thomas Farm (TF) (Early Miocene, ~18.5–18 Ma). Specimens include a maxilla, a frontal, and dentaries from B2; a maxilla from the MS; and dentaries, maxillae, a premaxilla, and a vertebra from TF. Fossils from TF and MS closely resemble extant members of the genus *Coleonyx,* the only North American representative of the primarily terrestrial family, Eublepharidae. Cranial features that the fossils share with extant *Coleonyx* include dentary with a reduced process along the lower margin of the splenial suture that borders the anterior inferior alveolar foramen; small, evenly spaced, homodont, cylindrical, labio-lingually bicuspid teeth; and a medially fused premaxilla bearing teeth that are not lingually recurved, including one along the midline sulcus on the internal face of the ascending nasal process. The vertebra is procoelous and, despite being that of an adult, has a distinct notochordal canal, a feature only present in eublepharids and some sphaerodactylids across Gekkota. Brooksville 2 may have more gekkotan diversity, with a eublepharid and a plausible sphaerodactylid represented. For the latter, this would signify the oldest fossil record of the family in North America and challenge current biogeographical hypotheses that sphaerodactylids reached the North American mainland via post-Miocene dispersal from the Caribbean. Using fossil taxa from these localities (e.g., aff. *Coleonyx*, helodermatids, heteromyid rodents, molossid bats, a rhinophrynid frog, and boids, among others) as potential palaeoecological indicators, we contrasted the paleofaunas with extant representative clades, many of which are today found in subtropical-tropical xeric to seasonally dry environments. Results suggest that portions of Florida were likely more xeric in the latest Paleogene through early Neogene, with habitats resembling those found in the southwestern US and Mexico today. Most living species of *Coleonyx* inhabit xeric habitats with associated rock features, including karstic microhabitats like those found in and around the B2, MS, and TF localities.

Funding Sources: The Wright, Tucker, and Fite Endowment; Southwest Florida Fossil Society Scholarship

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Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

The diversification of archosauromorphs through the lens of the reptile assemblage of the Manda Beds (Middle Triassic) of Tanzania

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Archosauromorphs, saurian reptiles more closely related to birds and crocodylians than to squamates, diversified into a variety of body sizes and ecologies at the dawn of the Mesozoic Era. Phylogenetic hypotheses predict those diversifications occurred in the late Permian or Early–Middle Triassic; however, many groups only are known from the Late Triassic fossil record with presumed ghost lineages extending back to early in the Triassic. Furthermore, early branching members of lineages are often difficult to identify, are fragmentary/controversial, or are already derived anatomically, leaving few clues to their interrelationships. Here, we describe the diverse archosauromorph assemblage from the Middle

Triassic Manda Beds of southern Tanzania, Africa, sampled from expeditions from the 1930s, 1960s, and 2007-onward by our team. The Manda Beds preserve at least two fossiliferous intervals that record archosauromorph diversity in this critical ghost lineage time. The lower part of the upper Manda Beds (Lifua Formation) preserves early members of the archosauromorph clade Azendohsauridae and crown archosaurs from both the pseudosuchian (e.g., Poposauroidea) and Avemetatarsalian (e.g., Aphanosauria) lineages. The more diverse upper Lifua assemblage samples archosauromorphs, stem archosaurs (e.g., *Asperoris*), pseudosuchians including early members of Phytosauria (*Nundasuchus*), Aetosauriformes (new taxon), Erpetosuchidae (*Parringtonia*), Paracrocodylomorpha (*Mandasuchus*, *Mambawakele*, *Stagonosuchus*), and Avemetatarsalia including aphanosaurs, silesaurids (Asilisaurus), and possibly members closer to or within Dinosauria (*Nyasasaurus*). Critically, many of the specimens are represented by cranial and postcranial remains and some taxa are known from ontogenetic series (*Asilisaurus*, *Parringtonia*), helping resolve perplexing character state combinations in previously known taxa and facilitating identification of archosauromorph remains from other Triassic localities globally. Furthermore, these Manda Beds pseudosuchians help resolve deeper relationships within the lineage including phytosaurs, ornithosuchids, aetosaurs (and relatives), erpetosuchids, and paracrocodylomorphs. The diversity of archosauromorphs from the Manda Beds demonstrates that our previous phylogenies correctly predicted broader patterns of the timing of archosauromorph diversification but also demonstrate the ecological differentiation of archosauromorphs likely occurred later in the Triassic.

Funding Sources: National Geographic Research Grant 9606-14, National Science Foundation EAR 1024036

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Ontogeny of plicidentine in varanid lizards and implications for ichthyosaurian dental development and evolution

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Ichthyosaurs were marine reptiles that inhabited Mesozoic seas and displayed a unique dentition characterized by plicidentine, the inward folding of dentine into the central pulp cavity. Plicidentine increases the surface area of attachment and is hypothesized to facilitate a stronger connection to the bone. Plicidentine is not unique to ichthyosaurs but is observed in other living and extinct vertebrates. Given the inferred functional role of plicidentine, these changes may correlate with ontogenetic changes in diet or feeding mode, but this has yet to be investigated in detail for either living or extinct taxa. Because ichthyosaurs are extinct, and ontogenetic series of ichthyosaur specimens are rare, modern analogs provide an opportunity to investigate developmental patterns that help interpretations of fossil taxa. Varanid lizards exhibit plicidentine and share several ecological and anatomical similarities with ichthyosaurs, including reptilian ancestry, aquatic to semiaquatic lifestyles in some species, varied prey preferences, and similar tooth attachment. As extant organisms, varanid lizards allow for the more detailed investigation of developmental and functional significance of plicidentine. Using dry skeletal specimens of varanid lizards and fossil ichthyosaur teeth from museum collections, we used micro-computed tomography (micro-CT) to examine and quantify internal plicidentine morphology across ontogenetic stages. Future work will compare the timing of ontogenetic changes in plicidentine with reported ontogenetic dietary shifts in varanid lizards and functional modelling will be used to test the impact of plicidentine on tooth performance. Insights from the functional and ontogenetic investigation of varanid plicidentine will help to better inform our understanding of the significance of this feature in extinct ichthyosaurs.

Technical Session XIX: Carnivora (Saturday, November 14, 2026, 1:45 PM)

The evolutionary traits of *Adcrocuta eximia* (Hyaenidae, Carnivora) from the upper Miocene localities of Central Asia and Eastern Europe

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Our research on well-preserved cranial, mandibular, and dental material of *Adcrocuta* from well-stratified upper Miocene localities of Tudorovo (Moldova, MN12), Ortok (Kyrgyz Republic, MN12), and Kalmakpai (Republic of Kazakhstan, MN13) confirmed that European and Asian *forms* belong to the same species, *A. eximia*. *A. eximia* is known from the upper Miocene (MN10–MN13) of the Old World and is most abundant in the Mediterranean and Black Sea regions and China. Records from Western Europe, the Middle East, and especially Central and South Asia remain limited. Although *A. eximia* is one of the best-studied Late Miocene hyaenids, its phylogenetic relationships and evolutionary history remain uncertain. While the European and Turkish records generally have reliable stratigraphic context and associated faunas, most Asian occurrences lack precise stratigraphic attribution. Therefore, the studied material from well-dated localities is of particular importance. It spans a broad stratigraphic interval, allowing the tracing of evolutionary changes within the species. Furthermore, the Kalmakpai material represents one of the latest known Asian occurrences of the genus and provides insights into its terminal stage of development. The material was analyzed using morphological, metrical, and dental microwear methods and compared with Eurasian samples spanning the full stratigraphic range of the species.

The results demonstrate considerable variability in several diagnostic characters commonly used in hyaenid taxonomy, including anterior cusps on upper and lower second and third premolars, the presence of the m1 metaconid, the morphology of the posterior crest of the m1 protoconid, and the number of m1 talonid cusps. In contrast, the tooth formula, mental foramina arrangement, mandibular shape, and tooth-row arrangement appear relatively stable. We traced evolutionary trends in the morphology of the upper premolars and the P4 protocone, accompanied by an increase in body size through time. Premolar morphology indicates increasing specialization for bone cracking. Microwear analysis of the Ortok and Kalmakpai material confirmed that the dietary pattern of *A. eximia* was broadly comparable to that of the extant spotted hyena, *Crocuta crocuta*, despite more than 6 Ma temporal gap and significant morphological differences between the two taxa.

Funding Sources: The Center for Integration in Science, Ministry of Aliyah and Integration; The British Friends Graduate Scholarship Fund

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A possible *Orodromeus makelai* (Dinosauria: Ornithischia) parietal from Egg Mountain (Two Medicine Formation, Montana)

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The Cretaceous Two Medicine Formation (TMF; deposited between 82.4 and 74.4 Ma) represents a fluvial-dominated plain environment and preserves a diverse array of non-avian dinosaur taxa. Exposures of the TMF in Teton County, Montana, include the Willow Creek Anticline, a hallmark for paleontology that has yielded the first evidence of colonial nesting and parental care in dinosaurs. Within the Willow Creek Anticline, the Egg Mountain locality preserves theropod eggs, as well as the remains of ornithischians, mammals, squamates, invertebrate traces, and more. As such, it provides a critical window into this Cretaceous ecosystem. On July 29, 2015, K. Chinander recovered a small (~3 cm x 3 cm), crushed fossil from the Egg Mountain Locality that resembled possible dinosaur cranial material. This study focused on diagnosing the taxonomic affinity of this element. Methods used for this project included running a micro-computed tomography scan on the parietal through the MSU Subzero Research Lab. 3D Slicer, a rendering software, was used to analyze and clean the data, where

extraneous material from the CT scan was manually removed with digital tools and segmented. Once the element was finalized in 3D Slicer, it was exported as a 3D model into Blender and compared to other specimens in the Egg Mountain locality from the Museum of the Rockies and scientific literature. These comparisons utilizing the CT scan data, the 3D model, and local specimens aided in determining the element is indicative of a parietal belonging to the ornithischian dinosaur *Orodromeus makelai*. The parietal flares out anterior from a compressed posterior end, providing insight into the size and structure of the braincase. This provides data for future research into ontogenetic development of the brain and skull of orodromine taxa.

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

A digital bonehead braincase: CT evidence for soft-tissue displays in *Bondoceras bulborhynchus* (Biarmosuchia: Burnetiamorpha), and a review of braincase evolution in early synapsids

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Burnetiamorphs are enigmatic early-diverging therapsids and one of the first tetrapod clades to exhibit high degrees of cranial ornamentation and pachyostosis. Understanding the lifestyle and anatomy of burnetiamorphs is essential to illuminating the evolutionary origins of mammals, but their fragmentary fossil record limits understanding of these traits. Here, we present a digital reconstruction of the brain endocast, internal ear, and neurocranial osteology of the burnetiamorph *Bondoceras bulborhynchus* from the middle Permian of southern Zambia and provide new data on neurovasculature associated with its dermatocranium. We find that *Bondoceras* possessed elaborate networks of neurovascular channels penetrating its frontal and postorbital bones, indicating an extensive blood and/or neurosensory supply to the surface of the skull. Nine approximately symmetrical channels in the frontal bone exit to the skull surface through a distinct groove between the frontal and supraorbital bosses, while those in the postorbital bone are more disorganized and cover a broader surface area. We propose that, along with the cranial bosses characteristic of burnetiamorphs, these intricately arranged channels provide evidence for soft-tissue display structures and possible social interactions (e.g., head-rubbing) in *Bondoceras*. Additionally, the well-ossified nature of the skullcap enables us to reconstruct the new details of its braincase anatomy. We present an in-depth description of the burnetiamorph braincase and review the evolutionary development of the ossified neurocranium across early non-mammalian synapsids, from pelycosaurs to therocephalians. We observe that the orbitosphenoid, consisting of a semitubular region and an interorbital septum (mesethmoid?), is extensive and heavily ossified in basal synapsids. In more derived synapsid clades, the semitubular region exhibits reduced length and complexity, while the ossified interorbital septum migrates anteriorly, decreases in size, and loses its ventral keel.

Funding Sources: NSF EAR-1337569

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

What an impression: giving some love and affection to a historic Yale Peabody Museum *Anomoepus* (Dinosauria: Ornithischia) trackway

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The rift valley basins of the Newark Supergroup (eastern North America) offer insights into the paleoecological restructuring immediately following the end-Triassic extinction event (~201.4 Ma), which was caused by intense proximate volcanic activity in the Central Atlantic Magmatic Province. The Newark sediments in the Hartford–Deerfield Basin (spanning central Connecticut and Massachusetts) preserve exceptional fossil

trackways of historic and scientific importance. Here we describe the ichnology and sedimentology of YPM VP 002045, a previously undescribed trackway collected from the Mount Toby Formation (Lower Jurassic: Hettangian) in Franklin County, Massachusetts, and acquired by O.C. Marsh during the mid–late 19th century. Three tridactyl pedal impressions attributable to the bipedal ornithischian ichnotaxon *Anomoepus scambus* Hitchcock, 1848, are preserved in split part and counterpart slabs of siltstone. The best preserved of these tracks on the part (i.e., natural mold) slab includes pedal pads separated by double creases, as well as both claw and scale impressions. Since a complete stride is preserved, we applied three established equations to investigate the potential speed of the trackmaker and explore variation in the resulting speed estimates, with velocities ranging from 0.723-0.895 m/s.

Irregular splitting of the specimen into two slabs revealed several sedimentary structures preserved in multiple horizontal laminae on the part slab, including high-density raindrop impressions across the top layer and, deeper down, undertracks, "underdrops," microbial wrinkles, and faint ripple marks. The presence of microbial wrinkles and ripple marks, coupled with the upper raindrop impressions and dinosaur tracks, indicate periodic aerial exposure. Taken together, these structures are indicative of a seasonally fluctuating lake shoreline. Microbial wrinkles associated with other post-extinction ecosystem recoveries have been interpreted as indicators of reduced invertebrate grazing activity, i.e., that the microbial grazers had yet to reestablish themselves in the ecosystem post-extinction. The evidence gathered here helps elucidate aspects of an earliest Jurassic ecosystem proximal to and immediately following the eruptions of the Deerfield Basalt, and the resultant shift towards dinosaur-dominated ecosystems after the end-Triassic extinction event.

Technical Session XIX: Carnivora (Saturday, November 14, 2026, 1:45 PM)

The human footprint: *Smilodon* hypercarnivory and carnivore guild dynamics at Rancho La Brea

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Recent footprint evidence demonstrates that humans were present in the Americas much earlier than previously believed during the Last Glacial Maximum more than 20,000 years ago (kya). Humans therefore coexisted with megafauna for at least 7,000 years before their mass extinction circa 13 kya, long enough that humans are a plausible evolutionary force on the other carnivores in American ecosystems. The Pleistocene human record of Southern California is notoriously poor, however, so examining animals for whom a good record exists is one way to identify possible human impacts. In this study, we leverage the wealth of *Smilodon* fossils from Rancho La Brea (RLB) in a search for evolutionary change in response to possible human competition.

We examine the shape evolution of the sabertooth cat, *Smilodon fatalis*, first to establish whether evolutionary change occurred, and second to attempt to identify drivers of such change. We utilize a new dataset of morphometric data gathered from high-resolution photographs of both isolated and paired mandibles, greatly increasing sample size over previous studies. The measurements were the lengths of the teeth (or their alveoli), and the overall length and height of the jaw, gathered for cats from Pits 77 (deposited 40–30 kya), 13 (20–19 kya), and 61/67(15–12 kya). Analysis of these data illustrate that *Smilodon* jaw size increases significantly over time. However, we also identify a suite of heterochronic changes in the dentition that indicate that maximum gape size increased significantly, *without* a concomitant increase in tooth size. We interpret this pattern to indicate that *Smilodon* became more specialized toward taking large prey during the RLB pre-extinction interval.

This patten contrasts with that in *Aenocyon dirus.* Dire wolf body size decreases over time, particularly in Pit 13, while it recovers to a smaller body size in Pit 61/67. We attribute this character displacement in *Smilodon* and *Aenocyon* to the demographic structure of human immigration into the Americas. An initial low density, ephemeral occupation began during the LGM, then gave way to higher human population densities just prior to

the extinction interval. This two-wave immigration model is supported by genetic evidence and may explain the asynchronous events at RLB: the directional evolution seen in *Smilodon* and *Aenocyon*, the *Aenocyon* population stress in Pit 13, and the ultimate extinction event preserved in Pit 61/67.

Funding Sources: NSF EAR-SGP 1757236. Collaborative Research: RUI: Chronology and Ecology of Late Pleistocene Megafauna at Rancho La Brea

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Technical Session VI: Dinosauria II: a “bird-hipped” bonanza (Thursday, November 12, 2026, 8:00 AM)

Redefining the mid-Cretaceous ceratopsian record of North America based on new Cenomanian–Santonian ceratopsoid occurrences, with implications for the origin of elaborate cranial ornamentation

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The ceratopsian fossil record of North America is almost exclusively represented by two ecologically distinct lineages—leptoceratopids and coronosaurians. Often distinguished by their ornamentation and mandibular and dental morphologies, both long-lived clades initially diverged in the Cretaceous during a time of hyperthermal greenhouse conditions. Regrettably, the fragmentary record of pre-Campanian euceratopsians has amounted to substantial uncertainty surrounding the origin of Euceratopsia, with phylogenetic estimates ranging from the late Aptian (~119 Ma) to the Cenomanian–Turonian boundary (93.9 Ma). Therefore, biotic and abiotic drivers of elaborate cranial ornamentation (i.e., postorbital horns and an enlarged frill) and their ancestral function remain poorly constrained. Here, we analyze isolated teeth from the mid-Cretaceous of the Western Interior Basin, investigating new and historical records from the Mussentuchit Member of the Cedar Mountain Formation (~99 Ma) and the Straight Cliffs Formation (91–81 Ma) to confirm and constrain the origin of euceratopsian subgroups. We identify at least three new ceratopsian taxa, including Neoceratopsia indet. from the Mussentuchit Member and Ceratopsoidea indet. from both units. We recognize two ceratopsoid morphotypes, the first characterized by a prominent, asymmetrical primary ridge, apicobasally extending secondary ridges, and mesiodistal resorption pits. The second morphotype, represented by at least two teeth from the John Henry Member (Coniacian–Santonian) of the Straight Cliffs Formation and the Mussentuchit Member, is differentiated by a weaker, asymmetrical primary ridge, mesiodistal resorption pits, and basal splitting of crown ridges, hinting at a close relationship to *Diabloceratops eatoni*. Based on these new occurrences, we thus restrict the origin of Ceratopsoidea in North America to the early Cenomanian, rejecting hypotheses of a younger origin for Euceratopsia. These results raise the possibility of an earlier origin of cranial ornamentation than previously appreciated, or, alternatively, a delay in the origin of elaborate cranial ornamentation relative to the origin of Ceratopsoidea. In the latter case, the timing of socio-sexual display structures may represent an evolutionary response to global warming during the peak of the Cretaceous Thermal Maximum hyperthermal event, ~95–94 Ma.

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Interspecific limb allometry in Late Miocene to Early Pliocene giant camels of North America

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As an animal grows larger and subsequently heavier, it must also have limbs suitable enough to support its weight, so the thickness of the limb

should increase allometrically relative to the length of the limb. Normal-sized Miocene camels like *Procamelus occidentalis* evolved to giant camels like *Megacamelus merriami* and *Gigantocamelus spatulus* during the Late Miocene–Pliocene, growing from approximately 1.5 m at the shoulder, to more than 3 m, and from an estimated 70 kg to more than 4,000 kg. We collected measurements from the limb bones (humerus, radius, metacarpal, femur, tibia, and metatarsal) of three different species of giant camels and plotted the slopes of their size change compared to *P. occidentalis*. The slopes were negatively allometric and supported our hypothesis that the limbs became more robust as they evolved.

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Population-level growth reconstruction in the Devonian jawless vertebrate *Protaspis* reveals rapid early growth

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How fast did early vertebrates grow? Growth rates are important for understanding population ecology but remain poorly constrained in early vertebrates. Given their small body size and basal phylogenetic position, it might expect short generation times and rapid population turnover. On the other hand, comparisons with “living fossil fish” used as ecological analogs suggest they may have had relatively slow growth and conservative life histories. However, there is no clear consensus because the structures used to estimate age and growth are either absent or poorly preserved in early vertebrates. In dinosaurs, growth can be reconstructed from bone histology; in many modern fish, age is estimated from otoliths and other hard tissues, but early vertebrates either lacked such structures or were not preserved. It is also rare for a continuous growth series, including juveniles, to be preserved in the fossil record, making quantitative growth reconstruction particularly difficult.

Here, I analyze population-level growth in approximately 450 specimens of the jawless vertebrate *Protaspis* from the Early Devonian Cottonwood Canyon locality of the Beartooth Butte Formation, Wyoming, USA. This material preserves a continuous size series from juveniles to adults. By combining morphological observations, assessment of dermal plate completeness, and a length-frequency method widely used in studies of living fishes but not previously applied to early vertebrates, I reconstruct growth patterns in an early vertebrate fossil population.

The results reveal clear cohort structure in *Protaspis* and indicate relatively rapid early growth. This pattern held even in subset analyses limited to specific species or localities, supporting the reliability of the estimates. Dermal plates fused only late in ontogeny, indicating that juveniles underwent rapid growth before their defensive armor fully hardened. Comparison with extant fish further revealed that *Protaspis* does not cluster with slow-growing, long-lived taxa such as sturgeons and coelacanths, but rather plots closer to small species with relatively high growth rates. These results suggest that a relatively fast life history, characterized by rapid growth and high population turnover, had already evolved in at least some agnathans by the Devonian.

More broadly, this study provides a rare quantitative framework for reconstructing growth in fossil vertebrate populations and reevaluating early vertebrate life histories.

Funding Sources: Sasakawa Scientific Research Grant from The Japan Science Society

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

New zalambdalestid material from the Upper Cretaceous Javkhlant Formation, Gobi Desert, Mongolia

Tsukasa Okoshi[1], Kentaro Chiba[1], Ryuji Takasaki[1], Masahito Natori[1], Takafumi Kato[1], Akio Takahashi[1], Batsaikhan Buyantegsh[2], Buuvei

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Late Cretaceous mammalian fossils from the Gobi Desert of Mongolia are well known for their abundance and have provided key insights into mammalian evolution. These fossils are mainly recovered from the Djadokhta and Baruungoyot formations. These units are dominated by eolian systems commonly linked to arid to semi-arid conditions; their mammalian assemblages are notable for multituberculate dominance. In contrast, mammalian records from the underlying Bayanshiree and Javkhlant formations remain sparse. Recent studies have clarified vertebrate faunas and depositional settings in this interval, but mammalian records from later, increasingly arid parts of the transition, including Javkhlant, remain poorly documented. This gap limits evaluation of faunal composition across non-eolian to eolian-dominated settings.

Here we report a mammalian specimen from the Javkhlant Formation, surface-collected in 2023. The specimen consists of a partial left dentary. Although much external morphology is obscured by adherent mineral encrustations that complicate preparation, X-ray CT imaging reveals key dental features. These include an anteroposteriorly elongated, open-rooted incisor root along the ventral margin of the dentary, a small single-rooted canine, and heavily damaged crowns of the first to third premolars. More posteriorly, multiple roots are interpreted as belonging to the fourth and fifth premolars and the mesial root of the first molar. These dental characteristics indicate that the specimen is referable to Zalambdalestidae, further supported by phylogenetic analyses.

This specimen adds another data point to the limited mammalian record of the Javkhlant Formation. Current records from the Bayanshiree–Javkhlant stratigraphic interval indicate that, with the exception of a single metatherian specimen, identified mammals are eutherians. This pattern suggests that eutherian-centered mammalian assemblages may have persisted through part of the environmental transition recorded in this stratigraphic interval. Although the mammalian sample from the Javkhlant Formation remains very limited, the present specimen is consistent with a fauna that may not have been as multituberculate-rich as those of the Djadokhta and Baruungoyot formations. Given the sparse fossil record, this contrast provides a basis for further testing of mammalian faunal change across depositional settings in the Upper Cretaceous of Mongolia.

Funding Sources: JSPS KAKENHI Grants 24K00162 and 25K01111

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Isotopic methods for assessing spatial fidelity in microvertebrate assemblages

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Understanding spatial fidelity in fossil bone assemblages is crucial to the understanding of ancient ecology. How we interpret ecological data is heavily influenced by the taphonomic processes preceding their discovery. Using a suite of complementary isotopic analyses and dating methods, we examined the spatial fidelity of a modern microvertebrate site along the Pilcomayo River, Paraguay (which we believe will be a good analog for many fossil microvertebrate assemblages), and a comparative fossil dataset from the White River Group of Nebraska. We have developed a $\delta^{18}O$ isoscape across the Pilcomayo Megafan and into its source basin in the Bolivian Andes from both existing and measured precipitation and vegetation sources and a $\delta^{13}C$ isoscape from vegetation data. We also compiled

Pilcomayo $\delta^{87}Sr$ values for the same localities from the literature. Comparing the different isotopic compositions of modern Paraguayan microvertebrate remains to these different isoscapes provides a number of independent approaches to assess spatial fidelity (transport distance prior to burial). The ground-truthing that this modern data provides allows for a much more nuanced interpretation of the equivalent isotope measurements, and hence spatial fidelity from the White River assemblage. The precipitation isoscape across the Pilcomayo Megafan is surprisingly uniform, but vegetation isotopes vary as the megafan surface dries and floral composition changes. $\delta^{87}Sr$ isotope ratios are constant on the fan but variable in the source basin. Modern microvertebrate oxygen isotopic compositions are congruent with the basinal precipitation and 2025 river water values for the Pilcomayo. ^{137}Cs dating suggests that, despite being captured in sediments from ~2023, the microvertebrate remains are older than 1945. This is important because there is limited local surface recharge of the Pilcomayo (in contrast with tributary river systems), so these old fossils have been in the river system, being reworked for an ecologically long time. These combined observations suggest significant transport of microvertebrate remains before their final burial, although $\delta^{87}Sr$ isotope values will test this hypothesis. Sedimentological analyses of White River sediments support comparison with the Pilcomayo assemblages.

Funding Sources: David B Jones Foundation, University of New Mexico, Grand Rapids Public Museum

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Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

3D morphometric analysis of the angular across Therapsida

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Despite the excellent fossil record of non-mammalian synapsids, many basic aspects of their paleobiology remain a mystery. One of the most poorly understood aspects of their anatomy is the reflected lamina of the angular, a plate of bone extending posteriorly near the back of the lower jaw. In eucynodonts, this structure has been interpreted as an anchor for the tympanum, which is its role in modern mammals, but the function of the reflected lamina before the appearance of a tympanum is highly uncertain. Some studies suggest that the reflected lamina was used as part of a mandibular ear in early therapsids, but others have hypothesized that it was a site for jaw muscle attachment. The morphology of the reflected lamina varies widely across therapsids and has only been qualitatively described, so we used a combination of linear measurements, 3D geometric morphometrics, and surface analysis to quantify variation in reflected lamina morphology and its relationship with other parts of the jaw. Phylogenetic Principal Components Analysis and Phylogenetically-Aligned Components Analysis both showed a general alignment between the posterior edge of the reflected lamina and the curve of the surangular and articular, which could support the hypothesis that a precursor to the tympanic membrane spanned the gap between these two edges. Reflected lamina thickness was positively correlated with jaw length, but the coefficient was higher for the ventral edge of the reflected lamina than for the posterior edge. In most therapsids, multiple PGLS regression found no evidence for a trend in surface complexity with jaw length, but in dicynodonts, surface complexity decreased with jaw length, probably reflecting shifts in jaw mechanics within this clade. Biarmosuchians exhibited lower levels of integration between their angular bone and the dentary and postdentary modules, while bidentalian dicynodonts had relatively high integration between their angular and postdentary modules. Overall, these results suggest a complex evolution of reflected lamina structure and function across Therapsida.

Funding Sources: AAUW American Fellowship, University of Washington WRF-Hall Fellowship and Snyder Award, Society of Vertebrate Paleontology Cohen Prize, Paleontological Society

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Out of the Arctic: The high-latitude crucible of Triassic integumentary evolution, the ornithischian crisis, and dinosaurian dominance

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Forty years ago, Olsen and Sues affirmed the end-Triassic extinction (ETE) as a mass extinction on land, refuting an earlier conclusion by the first author. Here we reframe the event in terms of biogeography and the evolution of key innovations. New apomorphic identifications, fossil discoveries, and geochronological improvements reveal a striking faunal pattern: paleotropical Late Triassic assemblages were size- and ecologically dominated by pseudosuchians and small avemetatarsalians, with no dinosaurian herbivores, while higher-latitude assemblages include abundant and diverse sauropodomorphs and large (*Allosaurus*-sized) theropods. Within tens of thousands of years after the ETE, both sweep into the paleotropics while definitive ornithischians appear globally, implying an unfilled ghost lineage stretching back to the origin of Dinosauria. Downregulating metabolism during resource gaps was advantageous under intense tropical climatic unpredictability at high pCO_2, making Triassic pseudosuchian strategies more competitive and excluding large-bodied dinosaurs.

The presence of archosaurs in the vast Late Triassic–Early Jurassic Arctic continent (Siberia + North and South China blocks) is documented only by footprints, yet these show dinosaurs survived polar darkness and freezing winters; mid- and high-latitude body-fossil assemblages are known, but the paleoarctic itself remains unprospected. Insulation was a prerequisite for archosaurian access to seasonally productive Arctic ecosystems. Large pseudosuchians, including fast-growing high-metabolic forms, were nearly eliminated at the ETE; only smaller-bodied (~10 kg or less) plausibly burrowing lineages survived, isolating insulation, not body size or metabolic rate, as the key survival variable. CAMP volcanic winters eliminated non-insulated archosaurs whereas insulated dinosaurs expanded from high-latitude reservoirs into vacated ecospace. At ~200 Ma, the minimal Antarctic landmass makes the Arctic the singular high-latitude terrestrial crucible, with a strong thermal gradient imposing directional selection for insulation and elevated metabolism across avemetatarsalian lineages. An “Out of the Arctic” model resolves the ornithischian ghost lineage, ETE extinction selectivity, and pseudosuchian collapse under a single mechanism; ornithischians were plausibly present in the unprospected paleoarctic throughout. Sampling the Late Triassic–Early Jurassic Arctic provides the critical test.

Funding Sources: Heising-Simons Foundation

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

The oldest sauropod (Early Jurassic) from Madagascar and other associated fauna

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Madagascar has a wide range of unique flora and fauna today and a deep fossil record dating to the Paleozoic Era. One of many substantial gaps in that record spans much of the Late Triassic to the Early Jurassic. The Poamay site in the Isalo II unit, in the island’s central west, appears to fall within that gap. Initially interpreted as Late Triassic in age, based on the presumed occurrence of phytosaurs and aetosaurs, this fauna is now interpreted as Early Jurassic in age, based on reidentifications of some previously reported taxa and new reports of others. Here, we reinterpret the ostensible aetosaur and phytosaur remains as those of crocodyliforms and further identify turtle (i.e., carapace) and presumably dinosaur remains

(teeth, postcrania). We have not identified any diagnostic Triassic-aged taxa from Poamay and thus consider it Early or Middle Jurassic in age. From previously unreported material, we identify a nearly complete sauropodomorph trunk vertebra from the locality, representing the clearest example of a taxon well nested within Dinosauria in the fauna. We scored this vertebra into a phylogenetic analysis broadly sampling sauropodomorphs and, surprisingly, found it well nested with Sauropoda as a non-neosauropod eusauropod possibly within Turiasauria (dorsal centra pleurocoels and intrazygapophyseal lamina). Placement within Sauropoda is supported by numerous characters of the vertebral laminae, and the presence of a clear laminar hyposphene. Some of the character states marking in this new Malagasy sauropod (e.g., the lack of centropostzygapophyseal lamina, and the presence of prespinal and postspinal laminae), also occur in early diverging sauropods such as Tazoudasaurus and closely related taxa. In conjunction with other faunal elements, the assemblage from Poamay supports an Early Jurassic or Middle Jurassic age rather than an older assignment. The dinosaurs from Poamay, including this newly identified sauropod vertebra, represent the oldest confirmed dinosaurs from the island. Thus, the Poamay locality samples a unique time in the history of Madagascar and likely fills a critical gap in the Mesozoic just before Madagascar rifted from mainland Africa.

Funding Sources: The expedition that discovered this material was supported by National Geographic Society Grant 5957-97 and The Field Museum

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Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Exploring the phylogeny of Equini (Perissodactyla) through combined-evidence approaches

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Fossil horses (Equidae) are icons of evolution; since 1870, they have served a central role in the development of modern evolutionary theory as well as in broader efforts to disseminate knowledge of evolutionary biology among the populace. Despite this, the interrelationships of the clade Equini and of *Equus*, the sole extant genus of equid, remain poorly understood. For instance, published phylogenetic analyses vary widely on the monophyly of *Allohippus* and of crown *Equus* with respect to stenonid horses; other questions, such as the monophyly of "Sussemiones" or the basalmost branch of *Equus* sensu lato, have never been examined by any phylogenetic analysis. So complex is the issue that authors do not agree on which taxa should be included in the genus *Equus* proper, even though the monophyly of *Equus* sensu lato is widely accepted. Recent advances in ancient DNA have provided clarity to some long-standing debates in fossil horse phylogeny but have also uprooted much of our understanding of horse relationships as revealed by morphological data. Consequently, a number of recent phylogenetic analyses of equids based on morphology are incompatible with analyses based on molecular data. In order to bridge this gap and investigate the interrelationships of the Equini, I constructed a dataset of 71 morphological characters of 42 fossil and extant equin taxa from the published literature and from collections visits, as well as published mitochondrial genomes from all equin species for which sequence data are available. The resulting data were analyzed with both molecular scaffold approaches and Bayesian total-evidence approaches in order to examine the relationships among Equini. Resulting trees are well-resolved and show broad agreement across approaches. Analyses uniformly show strong support for the monophyly of *Equus* sensu lato, but support for several clades varies among approaches—namely *Equus* sensu Eisenmann, *Allohippus*, and "Sussemiones." This instability is primarily driven by the differential placement of the core "stenonid" clade either outside of crown *Equus* or within *Equus* in a position on the stem of the zebra-ass clade. The unstable tree topology warrants greater examination and suggests that efforts to split *Equus* into multiple genera may be premature. This phylogenetic analysis is the first to integrate molecular and morphological data in this clade and represents a major step towards resolving the phylogeny of Equini.

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

Taxonomy versus ontogeny—Variation in the snout morphology of Early Permian trematopids at Richards Spur, Oklahoma

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Trematopids were an impressive group of Late Pennsylvanian and Early Permian terrestrial temnospondyls from North America and central Germany. These impressive predators have a largely unresolved phylogeny and poorly understood ontogeny due to a lack of substantially informative fossils representing several taxa. Recent discoveries of numerous skulls of trematopids at the famous Richards Spur (Ft. Sill) locality have allowed for the use of noninvasive imaging analysis, known as "neutron-computed tomography" (The Dingo Beamline at ANSTO, Australia), for taxonomic and ontogenetic analysis on these new, well-preserved partial and complete trematopid skulls from the cave infills at the Dolese Brothers Limestone Quarry, Richards Spur, Oklahoma. Hydrocarbon impregnation of these skulls make them ideally suited for neutron tomography, resulting in very high quality data for segmentation. Representing various ontogenetic stages, these skulls can be used to address interesting challenges that can arise from distinguishing ontogenetic variation from taxonomically relevant features. We have already been able to produce detailed anatomical reconstructions of these skulls and have identified features that are both ontogenetically variable and ontogenetically independent among these specimens. This new dataset will create a more accurate representation of both the taxonomy and ontogeny of this clade at Richards Spur. It will also resolve some of the questions regarding whether or not ontogenetically influenced characters were appropriately considered in previous taxonomic interpretations of juvenile and adult specimens of trematopids from this famous locality. Our preliminary data indicate that at least two, possibly three, distinct trematopid taxa can be identified based on the combined features of skull shape, internarial fontanelle size and shape, and the presence of lateral exposures of the palatine and ectopterygoid bones beneath the orbits. This pattern conforms well to the level of taxonomic diversity found among various tetrapod taxa in the Richards Spur terrestrial vertebrate faunal assemblage, including multiple species of dissorophid and amphibamid temnospondyls, recumbirostran microsaurs, acleistorhinid parareptiles, and captorhinid eureptiles.

Funding Sources: NSERC Discovery Grant (#RGPIN-2025-06513)

Technical Session VIII: Fishes (Thursday, November 12, 2026, 1:45 PM)

Insights into the ecological effects of the end-Devonian Mass Extinction from the Famennian–Tournaisian Andreyevka localities of Russia

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The end-Devonian mass extinction (EDME) is one of the largest vertebrate extinction events of the Phanerozoic. Most non-tetrapod sarcopterygians went extinct and the previously diverse placoderms were completely eliminated. Afterwards, actinopterygians, chondrichthyans, and tetrapods underwent substantial radiations. Many investigations detail diversity dynamics during the EDME, but a lack of vertebrate assemblages close to the Devonian/Mississippian boundary has stymied attempts to understand ecological responses. The Andreyevka localities, from the Tula region, Russia, are a rare exception. From a ~2 km stretch along the Tresna River, these localities record shallow-water communities from immediately before and after the Devonian/Mississippian boundary. Here, we

present the first quantitative ecological models of vertebrate communities nearest the EDME. The immediate pre-EDME fauna at locality ANE-1 is of modest diversity (24 species); vertebrates are chiefly sarcopterygian fishes, acanthodians, and placoderms. The immediate post-EDME fauna at ANE-3 is of similar diversity (21 species) but differs drastically in composition. Half of the species are conodonts and the rest are actinopterygians and chondrichthyans; durophagous specialists like dipnoans are absent. The contemporary ANE-6 is similar. In both post-EDME communities, body size distribution and network trophic position values are heavily skewed downwards, reflecting the elimination of larger-bodied, trophically higher guilds, similar to other biodiversity crises that preferentially removed large, high-level consumers. Relative to ANE-1, the number of inter-guild interactions has decreased by almost half. The ratio of actual inter-guild interactions to maximum possible inter-guild interactions is similar in pre- and post-EDME communities, suggesting that while post-EDME communities were smaller and simpler, they were internally connected to a similar degree. These results support the hypothesis that ecological communities optimize for network- or community-level properties, though temporal and environmental bounds of this optimization remain unclear. More work is needed on undescribed Andreyevka specimens to integrate them into a comparative framework spanning communities through the Frasnian–Famennian extinction, EDME, and Mississippian response. Doing so will improve understanding of vertebrate evolution during the Devonian–Carboniferous interval and general principles of ecosystem change in deep time.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Revisiting the inference of the axial position of the brachial plexus suggests conserved cervicodorsal axial patterning in evolution of theropod dinosaurs

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Non-avian theropods appear to have maintained a relatively conserved number of cervical vertebrae in contrast to birds, which exhibit high diversity in this character. Among various features characterizing the cervicodorsal boundary are the forelimb-innervating neurons in the spinal cord and nerves that extend from them and form the brachial plexus. A previous study suggested that non-avian theropods had a longer cervical region than typically considered based on the brachial plexus position inferred from the neural canal size, although the data were not necessarily derived from specimens with reliably identified axial positions of the vertebrae. This study explores the position of the brachial plexus in the context of the evolution of axial patterning. The axial positional relation of various features associated with the cervicodorsal boundary was examined through dissections and CT scanning of modern crocodylians and birds, alongside examinations of non-avian theropod specimens. The cross-sectional area and width of the neural canal, measured using 3D data derived from CT scans, showed a high correlation with the cross-sectional area of the spinal cord, with their maximum values observed adjacent to the thickest spinal nerves of the brachial plexus in extant species, as previous studies had shown. Accordingly, the forelimb-innervating level can be inferred from the changes in neural canal dimensions along the vertebral column and can also be statistically tested based on extant data by using the hidden Markov model incorporating phylogenetic comparative methods. When applied to non-avian theropod specimens with verifiable axial positions of the vertebrae, the forelimb-innervating level was inferred to be located at around the 10th through13th spinal nerves in *Allosaurus fragilis* and *Halszkaraptor escuilliei*, which possess ten cervical-type ribs, and at around the 12th through 15th nerves in caenagnathoids that possess twelve cervical-type ribs. The positional relation among the forelimb-innervating level, change in rib morphology, and those in vertebral pneumatic structures that apparently correspond to the transition from the cervical air sac to the lung are generally consistent among the examined taxa. These results suggest that axial patterning of anatomical structures in the cervicodorsal region has been conserved despite

the evolutionary change in the overall body plan in theropods.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

***Alioramus*: The cranial morphology and taxonomical interpretation of a long-snouted tyrannosaurid**

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Alioramini (*Alioramus remotus*, *Alioramus altai*, *Qianzhousaurus sinensis*), distributed in Asia during the Late Cretaceous, is a unique tribe within the family tyrannosaurids. The members of this clade possess an elongated, low skull as a synapomorphy compared to relatives with a taller skull proportion, such as *Tryannosaurus rex* and *Tarbosaurus batar*. *Alioramus remotus* was described in 1976, based on a poorly preserved holotype, PIN 3141-1. In 2009, another individual was described as *Alioramus altai*, considered a distinct species from *A. remotus*. The specimen TMP2013.010.0007, a cast of a nearly complete cranium of an Alioramin theropod. It was poached from the Nemegt Formation in Mongolia, cast in the USA, but repatriated in the late 2010s. There are morphological features of the cast specimen that are lacking in both *Alioramus* holotypes, and we compared it with the holotypes of Alioramin relatives and other tyrannosaurid theropods. The cast preserves the premaxillae and the sclerotic ring, which are not present in the two holotypes. The cast specimen is ontogenetically sub-adult based on the relative development of ornamentation such as nasal rugosities and lacrimal horns. Compared to the holotypes, the cast specimen represents a smaller individual than *A. remotus* with less developed ornamentation and was larger and had more developed ornamentation than *A. altai* holotype. Furthermore, the cast specimen possesses morphological similarities with both *A. remotus* and *A. altai*. For example, the lateral shallow depression on the lateral process of the Lacrimal is not seen in the holotype of *A. remotus* but is present in the cast specimen and the holotype of *A. altai.* On the other hand, the nasal rugosities of the cast specimen and the holotype of *A. remotus* are similar in number. Some morphological characters that distinguish *A. altai* from *A. remotus* cannot be assessed in the cast specimen, which suggests that morphological differences between the two species might be a misinterpretation. In fact, *A. remotus* holotype is poorly preserved with missing elements, so this research is significant in terms of assessing more specimens to evaluate inter- and intra-species variation and suggesting a new taxonomic relationship within the *Alioramus* clade.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Accessory roots present but uncommon among *Mustela* and *Neogale* lower carnassial teeth from the Quaternary of North America

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Distinguishing species among fossils of Mustelinae (weasels, stoats, polecats, and mink) is challenged by the relative rarity of these species in the fossil record, a high incidence of sexual dimorphism and geographic variation in these taxa, and morphological similarity in the bony features of these taxa. Recent work has described a previously underreported, potentially diagnostic trait among these taxa: accessory roots on the lower first molar or carnassial. Accessory roots have been reported in the ermine (*Mustela erminea*) and occasionally in the least weasel (*Mustela nivalis*), but have only recently been reported in other Mustelinae, such as the American mink (*Neogale vison*). It is not known if this trait is common among any of these taxa, in either past or modern populations. If accessory roots are common in a species or population, it may indicate greater exposure to high mechanical stresses during chewing or prey capture. When present, the number and relative position of accessory roots is different among species of Mustelinae. Here, we report on the occurrences of lower first molar accessory roots in a sample of *Mustela* and *Neogale* fossils from the Quaternary of North America. Fossils were from such sites as: Conard Fissure and Buffalo River, Arkansas, USA; Cumberland Bone Cave, Maryland, USA; and

Aucilla River, Florida, USA. Crania, mandibles, and teeth were imaged using μCT scanning. Out of 50 first molars, three have clear accessory roots present. Among these three, two mandibles possess one buccal accessory root and were found at Conard Fissure. The remaining mandible possesses one lingual accessory root, is much smaller, and was found at Buffalo River. Based on mandibular size and different accessory root positions, these fossils are likely to represent *N. vison* and *M. nivalis*, respectively. These results confirm the presence, but also rarity, of accessory roots on the lower carnassial teeth of Mustelinae. However, accessory roots were only observed in fossils from one region, suggesting that this trait may be much more common in certain populations or environments. Here, the study of accessory roots revealed additional regional morphological variation within these species and highlighted the lability of this trait.

Funding Sources: Stony Brook University Department of Ecology and Evolution G. Williams Award; The Paleontological Society

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Shell-shocker: a case for the de-extinction of *Doedicurus clavicaudatus*

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As ecosystems face widespread degradation, the resilience of remaining species may not suffice to restore ecological balance. With scientific advancement increasing the plausibility of de-extinction, researchers are considering the potential benefits and hurdles of reintroducing extinct species. De-extinction is the concept of resurrecting (restoring) extinct species, and one example is the advances using ancient DNA and CRISPR technology to recreate (rebuild) the woolly mammoth. The mammoth is the first species with plans to be revived and has been examined as a model organism in this field, and there are several other extinct species that are listed as candidates for de-extinction, like the thylacine and the passenger pigeon, and other Pleistocene mammals like the sabertooth cat. However, some ecologically valuable species, which went extinct at the same time as other megafauna (or later), have been largely overlooked. *Doedicurus clavicaudatus* was a large, herbivorous armadillo with a powerful tail club and a tough shell, and it was a dominant grazer in the Pampas grasslands of Argentina before its extinction in the early Holocene. This review uses this animal (which we refer to as a "clubtail armaduro") as a focal species to analyze the challenges of de-extinction, while using knowledge of the woolly mammoth and other established candidates as a comparative reference. A selection process of ten questions from the IUCN Guidelines for De-extinction is analyzed for each of the potential candidate species. This study analyzes published data on the habitat and lifestyle of the armaduro, as well as the current state of their former territory, to explore the reintroduction of *Doedicurus* in the Argentinian pampas, and the potential ecosystem services this species could provide. We propose the inclusion of *Doedicurus* as an additional candidate for de-extinction and discuss the possibility of a more active role for paleontology in restoring living ecosystems, by best recreating the lives and ecologies of recently extinct taxa, and by gathering DNA samples for sequencing. To conclude, we suggest the ability of megafauna and other ecosystem engineers, both living and extinct, to restore ecological balance and potentially remediate climate change.

Funding Sources: Virginia Commonwealth University

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Fleshing out the late Pleistocene large carnivore fossil record in North America

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Three of the best-studied late Pleistocene North American carnivores are the sabertoothed cat (*Smilodon fatalis*), dire wolf (*Aenocyon dirus*), and short-faced bear (*Arctodus simus*). All have continent-wide distributions in the late Pleistocene. *Smilodon* and *Aenocyon* are best known due to their abundance at the La Brea Tar Pits (Los Angeles, California), but this prominence presents a strong sampling bias. 156 published radiocarbon dates on *Aenocyon* arise from ten localities and 152 on *Smilodon* arise from a mere four localities. More than 90% of these dates are from La Brea. In contrast, 51 *Arctodus* are dated broadly across 36 localities. Resources beyond La Brea are needed to flesh out the history of extinct North American carnivores; caves are a great source. The Illinois State Museum has a large collection of midwestern cave faunas, but their preservation quality was unknown and, in many cases, appeared poor. Using single-point near-infrared spectroscopy to quantify collagen in bone, a target for radiocarbon dating, we asked whether sampling would be worth the damage. Of 19 localities, 14 were predicted to have sufficient (> 3%) collagen for dating, including 6 out of 8 sites containing our target taxa. We recommend three new dates, each, for *Aeonocyon* and *Arctodus* from the mid-continent. The sole *Smilodon*-producing cave locality was predicted to yield insufficient collagen. Further work will explore how context and age impact collagen preservation.

Funding Sources: Center for the Study of the First Americans

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

The "lepospondyl" tetrapod fauna from the early Permian Pedra de Fogo Formation of Piauí, Brazil

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Abundant fossils from the Pedra de Fogo Formation (PDF) of northeast Brazil have provided a detailed understanding of the early Permian continental vertebrate communities of northwest Gondwana. Yet some major Laurussian taxa have remained elusive, including the "lepospondyls," a likely polyphyletic group of small-bodied and morphologically disparate forms. We report new fossils from the PDF that represent the first South American "lepospondyl" occurrences: a diplocaulid "nectridean" and a molgophid "recumbirostran." The diplocaulid is small with a basal skull length of about three centimeters and is diagnosable by the presence of short tabular horns, fused midline frontal pair, short nasals, anteriorly flared cultriform process of the parasphenoid, and broad suture uniting the parasphenoid, pterygoid, and exoccipital. A unique condition where the vomerine tooth row is oriented parallel with the sagittal plane distinguishes it from known taxa. The molgophid is represented by an isolated mandible and a partial disarticulated skeleton; the latter is associated with an articulated specimen of the large trimerorhachid *Procuhy* and may represent stomach contents. Holospondylous vertebrae with low neural spines and a ventral keel, a large lateral mandibular fenestra, and a small number of large partially recurved teeth on the dentary diagnose these as molgophid. Six large, recurved teeth in the PDF molgophid suggest an affinity with the Carboniferous–Permian *Brachydectes newberryi* and contrasts with molgophids from early Permian localities in Oklahoma and Texas, which typically have 10–12 small conical dentary teeth. A conserved fauna of diplocaulids, molgophids, trimerorhachids, eobrachyopids, and gnathorhizid lungfishes, all seasonal wetland specialists, is widespread and abundant in North America but rare or entirely absent in Europe. The presence of all elements of this assemblage in the PDF implies similar paleoenvironmental factors shaping vertebrate community assembly in northwest Gondwana during the early Permian. This

contrasts with the absence of other characteristic North American and European taxa (e.g., diadectomorphs, eryopoids, dissorophoids), which are abundant and readily identifiable throughout Laurussia. This hints at an emerging pattern of complex faunal exchange across early Permian Pangaea, shaped by physiology, paleoclimate, and incumbency.

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Late Oligocene–Late Miocene fossil camels from the John Day Basin, north-central and eastern Oregon

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The camels from the John Day Basin in central Oregon have long been confused and misidentified, both because they are rare and highly fragmentary, and because North American camelid systematics has been chaotic for more than a century. With the new revision of North American camels, it is now possible to correctly identify the higher-quality specimens. Contrary to the internet and all the literature for more than a century, there are no fossils referable to the Orellan–Whitneyan High Plains camel *Paratylopus* anywhere in the late Oligocene–Early Miocene John Day Formation. In the Arikareean (Turtle Cove and Kimberly members of the John Day Formation), the most common camel is the nothokemadine *Gentilicamelus sternbergi*, which has been placed in several invalid genera over the past 150 years. From the latest Arikareean Haystack Valley Member and higher members, we describe a new genus and species of long-snouted floridatraguline. This is the first published occurrence of the floridatragulines outside the Gulf Coast region, previously known only from Florida to Texas to Mexico to Panama. The enigmatic camel from the John Day Formation that was long misidentified as "*Paratylopus*" *cameloides* is actually a primitive protolabine, now assigned to *Michenia cameloides*. It is rare but found in the late Arikareean to Hemingfordian parts of the section. The John Day camels are all unusual, with almost none of the Arikareean and Hemingfordian camels found in the High Plains, such as the stenomylines, miotylopines, miolabines, oxydactylines, or other taxa found across most of North America. Instead, it is dominated by two unusual and rare groups, the floridatragulines and the nothokemadines, which were previously only known from the Gulf Coast of Florida, Texas, and Central America. The literature and the Paleobiology DataBase (PBDB) and MIOMAP are grossly outdated concerning John Day camels and must not be relied upon for information concerning their taxonomy or distribution.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Embryos and meteoric iron, footprints and feathers: Rare states of high-quality preservation found within various specimens recovered from the Early Cretaceous "Middle Dome" sites in central Montana

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Since 1994, William and Kristen Parsons have conducted yearly field research at sites within the Early Cretaceous, Cloverly Formation "Middle Dome" region of central Montana. Their first presentation on this research was at the 2000 SVP conference in Mexico City, shortly followed up by the peer-reviewed publication of the description of the nodosaurid, *Tatankacephalus cooneyorum*. Other papers followed. From the very first days, small fragile fossils as well as small metallic meteorites were collected each year as well as the specimens of primary concern. Along with other interesting specimens, a certain number of isolated fossil eggs were recovered. Thus far, we have presented three such eggs, two of which (a troodontid egg/embryo and a pterosaur

egg/embryo) contained extensive soft tissue preservation. Upon further lab-based X-ray fluorescence imaging at the Cornell High Energy Synchrotron Source (CHESS) of the troodontid egg/embryo, remnant iron particles were discovered. Initially, we were looking for trace evidence of hemoglobin to substantiate the identification of a small mass of soft tissue within the upper thoracic region as the heart. We did find a small deposit of iron that correlated with the heart region. Beyond that, all along one side of the embryo there appeared to be quite a number of small particles of iron and nickel. Almost 40% of the images of iron particles were closely aligned with nickel particles. This ratio of nickel to iron is similar to the nickel/iron ratios within some metallic meteorites. Given the recent research by others regarding iron as a catalyst for the preservation of a variety of soft tissues, we are reviewing many of our specimens that possess high degrees of soft tissue preservation, looking for evidence of any further direct correlations between meteoric iron and fossilized soft tissues. Thus far, we only have one specimen exhibiting such a direct correlation. This line of research is in a very early stage, but we are hopeful that what with the extensive meteoric iron found within a number of our sites as well as several examples of fossilized soft tissue, further examples of possible iron catalyst preservation will soon emerge. If successful, we understand that further organic chemical analysis of such specimens could prove to be interesting. Included here are a few more images of fossil feathers, trackways, and further new embryos that may deserve similar forms of detailed analysis.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Implications for osteoderms as a major component of Late Triassic fossil assemblages

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Osteoderms are elements of the dermal skeleton found in a sleuth of extant and extinct tetrapod lineages. Commonly interpreted as “dermal armor,” osteoderms are often structurally durable, and can make up a major component of the skeleton. These two characteristics uniquely prime osteoderms for preservation in the fossil record. Osteoderms are especially common in Late Triassic fossil assemblages, as the dominant clade at the time, the archosaurs, had multiple lineages of osteoderm-bearing taxa. This is the case with the fossil assemblage of the Hayden Quarry (Late Triassic, Chama Basin, New Mexico). Previous studies have documented that osteoderms are overrepresented in the fossil record of other extinct clades (e.g., in squamates) when compared to their utilization in phylogenetic studies. Likewise, osteoderm characters generally only make up 1–3% of characters used in archosaur and archosauromorph phylogenetic matrices. If osteoderms do make up a majority of the fossils found for Late Triassic fossil assemblages, then osteoderms would be considered an overrepresented and underutilized aspect of the fossil record in Late Triassic groups as well. To assess the degree of osteoderm skeletal preservation bias, we quantify the parts of the skeleton preserved in various tetrapod clades from the Hayden Quarry. We binned specimens (n = 14,659) by 1) taxonomic identification and 2) general anatomical region. When considering taxonomic diversity, phytosaurs make up the majority of identified fossils in the assemblage (43%), followed by dinosaurs (17%) and aetosaurs (10%). The highest percentage of fossils collected from this site are vertebrae (22%), followed by osteoderms (16%). For the groups found at the Hayden Quarry with osteoderms, osteoderms make up a small component of the characters used in their phylogenetic analyses. A notable exception to this trend is seen with species-level aetosaur data matrices. Osteoderm characters in these matrices make upwards of 37% of all characters. Furthermore, osteoderms make up 72% of the aetosaur fossil record. Tests of phylogenetic signal for osteoderm characters in aetosaurs show that these elements have extremely high levels of phylogenetic signal. The discrepancy between the available fossil data, and the underuse of these data in current phylogenetic analyses, warrants consideration of how osteoderms can be

incorporated to better infer evolutionary relationships of Late Triassic tetrapods.

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

From forests to farmhouses: Cenozoic synanthropy of the middle Mississippi River Valley

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Animals that thrive in human-engineered ecosystems, synanthropes, have adapted to anthropogenic novelty over a short period of time relative to their appearance as species. In response to anthropogenic resource introduction, these taxa may specialize within, expand, or shift their original ecological niches. These transitions have been studied in the Old World, where interactions between *Homo* species and native animals have a long history. They are less well understood in the Western Hemisphere. The middle Mississippi River Valley preserves a rich archaeological and paleontological record spanning the middle and late Holocene. Using carbon and nitrogen stable isotope analysis of these materials, as well as historical and modern collections, four species of modern-day synanthropes, raccoons (*Procyon lotor*), Virginia opossums (*Didelphis virginiana*), fox squirrels (*Sciurus niger*), and eastern gray squirrels (*Sciurus carolinensis*), are being investigated for isotopic niche changes alongside known human cultural and technological shifts over the past 8,500 years.

Among raccoons, isotopic evidence indicates progressive incorporation of anthropogenic resources due to agriculture and irrigation, forest clearing, the Green Revolution, and urbanization. Mean $\delta^{13}C$ values increased through time from -21.5‰ at 8,500 yr BP to -16.4‰ in modern individuals, comparable to isotopic shifts observed in local human populations following the increasing cultivation of maize, a ^{13}C-enriched C_4 crop, by Indigenous and later Euro-American communities. The $\delta^{15}N$ values of raccoons decreased from 8,500 yr BP to 2,000 yr BP, increased from 2,000 yr BP to the 1970s, and then decreased again to the present. These trends are consistent with the introduction of irrigation and nitrogen-fixing plants (beans), manuring, and industrial fertilizers, respectively. Meyer Cave, a paleontological site, serves as a comparative control against which the archaeological sites can be evaluated. The Apple Creek Indigenous site (2,000 yr BP) exhibits evidence of niche specialization, with an isotopic niche that is smaller than and nested within that of the Meyer Cave control population. Early European settlement data and historical collections show a partial niche shift toward anthropogenic resources, whereas modern raccoons have fully shifted their isotopic niche relative to Meyer Cave. Study of niche shifts in the remaining three species is ongoing and may reveal patterns in synanthropization.

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Growing insights from the long continental Permo–Triassic record of Zambia: dinocephalians to dinosauriforms

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Terrestrial sedimentary sequences spanning tens of millions of years serve as invaluable datasets for understanding localized faunal turnovers and ecosystem evolution. Such sequences are rare during the geological interval in which tetrapod ecosystems were established, leaving our understanding geographically limited. A classic Permian example is the lack of temporal overlap between the Red Beds of Cisuralian low-latitude Texas and Oklahoma and the Guadalupian–Lopingian high-latitude Beaufort Group of the

Karoo Basin, South Africa. In fact, for decades, the Karoo Basin has served as the one laboratory available for interrogating detailed questions of tetrapod food webs, clade/assemblage turnover, and the dynamics of the end-Permian mass extinction and subsequent recovery. Though the Karoo is invaluable, it represents just one spatial point on the Pangean supercontinent.

For the last 17 years, including 2025 and 2026 expeditions, our group has been rigorously collecting fossils from the Zambezi and Luangwa basins of Zambia with the aim of building a complementary sequence to test dynamics gleaned from the Karoo Basin. The Zambian basins are transtensional rift basins with cyclical fining-upward sequences that can be tied back to the relatively continuous sedimentation of the Karoo retroarc foreland basin via vertebrate biostratigraphy. We can now confidently map familiar vertebrate assemblages, though often with the taxonomic idiosyncrasies expected from an enlarged regional scale. Within the middle and upper Madumabisa Mudstone Formation, the Zambian sequence consists of a Guadalupian horizon with tapinocephalid dinocephalians in the Zambezi Basin and a series of Lopingian assemblages containing hallmark therapsids (*Endothiodon*, *Gorgonops*, *Daptocephalus*, *Dicynodon*, *Theriognathus*) across both the Zambezi and Luangwa basins. The Middle–?Late Triassic formations of the Luangwa Basin preserve a sequence starting with “classic” Middle Triassic taxa (*Cynognathus*, *Kannemeyeria*), overlain by assemblages containing cynodonts and archosauromorphs (rhynchosaurs, ornithodirans).

Despite the clear parallels to the Karoo, we are finding the Zambian record has details unique to itself (earlier and more diverse lystrosaurids) and more akin to other areas of Pangea in the Permian (India, Russia) and Triassic (Brazil, Tanzania). Ongoing work will refine any Permo–Triassic boundary assemblages and pursue absolute dating to constrain the clear biostratigraphic correlations.

Funding Sources: National Geographic Society 158R-18

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Mammuthus columbi **from Pratt, Kansas**

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In the fall of 1999, the Sternberg Museum of Natural History was made aware of a mammoth (*Mammuthus columbi*) find in Pratt, Kansas. In November, a four-day excavation was conducted. However, the deposit was extensive, so the site was covered with plastic sheeting and dirt in anticipation of a summer excavation the next year.

The crew returned in summer of 2000. A grid was established and excavation resumed. There was a great deal of public interest in the excavation, and an almost continuous stream of visitors came to the site. This allowed museum staff to develop education visuals to help explain what was happening.

As elements were identified and outlined in the dig, each element was mapped using a surveying total station. Distance, angles to the specimens, and vertical differences were all recorded, allowing all elements to be related to each other in three-dimensional space. Tying the dig site to a benchmark at the airport allowed us to plot the entire site in real-world coordinates. One of the most striking features at the site was an observed paleosol that immediately underlays the bones. This surface was also mapped.

Interspersed with mammoth bones were numerous *Bison* teeth. Most were isolated, but a full dentary was collected. The presence of *Bison* confirms a Rancholabrean age for the site. The topography of the paleosol formed a gully. No bones at the site were in articulation and were sometimes found in odd associations, such as an upside-down lower mammoth jaw laying across a tibia. A single tusk was recovered. It appears to have acted as an impediment to the mass movement of the sediment, helping to keep elements from being washed away.

The encasing matrix was poorly sorted hard gray clay which included sand and clasts up to several centimeters in size. An x-ray diffraction of the clay showed that a major component is gismondine, a zeolite mineral associated with weathered volcanic ash.

We interpret that the mammoth died nearby given the number of associated elements that remain, and that they were entombed by the poorly sorted clay. The density of the slurry pouring down the gully was such that it could move mammoth bones and sweep in *Bison*, but apparently the mass movement was short lived. The Pratt Mammoth is one of the most complete specimens of *Mammuthus columbi* from the state of Kansas.

Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Evidence for seasonal impact on fetal growth and extensive gestation period in elasmosaurs from the Lopez de Bertodano Formation (Maastrichtian) on Seymour Island, Antarctica

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In this study, we describe the histology of a sub-adult elasmosaur specimen recovered from the Maastrichtian-aged Lopez de Bertodano Formation of Seymour Island, Antarctica. Although small, indeterminate, pedomorphic elasmosaurs are known from this region, previous histological work has been limited to a mature individual exhibiting secondary remodeling of the propodial cortex. In contrast, the element described here is a femur that preserves primary cortex with distinct growth features.

Thin-section analysis reveals a clear Kastchenko's Line marking the boundary between the endosteum and periosteum-derived primary cortex and defining the perimeter of the original cartilage of this bone. The cortex exhibits plexiform vascularity, unlike the radial vascularity observed in polycotylids from warmer latitudes. A distinct birth line separates this from a denser postnatal cortex characterized by radial vascularization. Two Lines of Arrested Growth (LAGs) are present in this cortical region, one of which is perimortem. The pre-birth primary cortex also preserves three cyclical growth bands defined by changes in vascularity and bone density. Together, these features suggest that the individual experienced six growth cycles, four of them in utero. Furthermore, secondary osteons indicate some degree of bone remodeling in this animal while alive.

The duration represented by these growth cycles remains uncertain. During the Late Cretaceous, the Antarctic Peninsular region and its associated near-shore marine environments experienced cool temperate climates with pronounced seasonality, as evidenced by fossilized tree growth rings and seasonally adapted flora. If the observed resource cycles reflect annual environmental forcing, gestation may have approached four years, which is unprecedented among modern reptiles. Alternatively, more frequent resource fluctuations (e.g., biannual) would yield shorter gestational period of two years. Regardless of cycle duration, body size at birth was evidently substantial; this is consistent with evidence from another neonate specimen, although unresolved alpha taxonomy limits definitive inference. These results demonstrate the potential of integrating histology, stratigraphic context, and paleoenvironmental proxies to investigate questions about elasmosaur life history and imply that seasonal environmental pressures may have strongly influenced reproduction in viviparous animals.

Technical Session XIV: Return of Reptile'O'Rama: Triassic time (Friday, November 13, 2026, 1:45 PM)

A new, well-preserved silesaurid taxon from the Boren Quarry (Late Triassic: early Norian) of Texas highlights high variability in early dinosauriforms

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The phylogenetic relationships of silesaurid dinosauriforms have been contentious in recent analyses. Silesaurids are either recovered as a clade sister to Dinosauria or fall out as a paraphyletic grade of early ornithischian dinosaurs. Consequently, the set of homologous character states that diagnose Dinosauria, as well as the date of their divergence, has been highly deliberated. Silesaurids are represented by ~15 taxa, but most are known from disarticulated, isolated elements from a single individual, limiting the ability to code character data. Furthermore, it is difficult to assess individual or ontogenetic variability among the group when most taxa have a small sample size, excepting *Silesaurus opolensis* and *Asilisaurus kongwe*. Here, we present a well-preserved new silesaurid taxon from the Boren Quarry (lower Cooper Canyon Formation; Dockum Group) of Late Triassic (early Norian) Texas, USA. The accumulation comprises at least three individuals, with most portions of the skeleton represented, including: dentary; vertebrae from the cervical, dorsal, and caudal regions; well-associated and articulated pectoral and pelvic girdles; forelimb elements; well-articulated hindlimbs; and the first instance of preserved gastralia in a silesaurid. We used computed tomographic (CT) data and digital segmentation software to model and describe this new material. The taxon can be distinguished from all other silesaurids by the presence of a boot on the distal end of the pubis. Phylogenetic analysis recovers the new taxon with *Silesaurus opolensis* and later-diverging North American silesaurids (e.g., *Kwanasaurus williamparkeri*, *Eucoelophysis baldwini*). Furthermore, the close association of the remains allows evaluation of the variability within this single taxon, which shows similar variation to *Silesaurus opolensis* and *Asilisaurus kongwe* in features like the presence of bone scars among individuals, suggesting silesaurids have high intraspecific variation throughout the group. Our results reveal one of the most complete and well-articulated silesaurid taxa, expands known phylogenetic data within Silesauridae, and further suggest that high variability was common among early dinosauriforms and likely ancestral to Dinosauria.

Funding Sources: National Science Foundation EAR 1943286

Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

Amphibians from the Denver Formation of Colorado, USA, show extinction resilience at the end Cretaceous mass extinction

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The Denver Basin of Colorado continues to provide pieces to the puzzle of ecosystem and organismic responses to the Cretaceous–Paleogene mass extinction (K–Pg) event. Studies of Denver Basin paleofauna have shown a significant decline in diversity and community reorganization across the boundary for mammals and squamates. To date, the amphibians of the Denver Basin have received little attention. Here, we present pre- and post-K–Pg fossil amphibian communities from the West Bijou study area in Colorado. The West Bijou study area contains a remarkably complete and uninterrupted record of latest Maastrichtian through early Danian (Lancian and Puercan North American Land Mammal ages, NALMAs) sediment packages that represent slow-flowing meandering rivers, oxbow lakes, and floodplains, and that include ash layers and a K–Pg boundary section providing a geochronological framework. We analyzed three amphibian communities, the latest Maastrichtian DMNH 3648 and the early Danian DMNH 2560 (Puercan 1 NALMA) and DMNH 21663 (Puercan 2 NALMA) localities. We found relatively high taxonomic diversity in all three localities. DMNH 3648 contains at least ten operational taxonomic units (OTUs)—one anuran and nine urodeles—from ca. 50 ka before the K–Pg. DMNH 2560, ca. 130 ka after the extinction, preserves the same nine urodeles. DMNH 21663, ca. 600 ka after the K–Pg, contains five urodeles. Statistical evaluation of the three communities

suggests additional diversity for DMNH 21663 and complete sampling for the two older localities. The DMNH 3648 amphibian community is not dominated by individual OTUs, whereas DMNH 2560 is dominated by the batrachosauroidids *Opisthotriton kayi* and *Prodesmodon copei*, suggesting this clade bloomed shortly after the K–Pg. DMNH 21663 is dominated by *O. kayi* and the scapherpetontid *Scapherpeton tectum*. Analysis of trends in size of individual amphibians reveals a dip in overall size of large-bodied amphibians (e.g., scapherpetontids) shortly after extinction. By the Puercan 2 DMNH 21663 body size of these large organisms had rebounded, indicating that healthy freshwater ecosystems were reestablished. There is no noticeable change in batrachosauroidid body size, further highlighting the clade's resilience to the widespread ecosystem disruption associated with the K–Pg event. Our results add to the growing evidence from studies on crocodilians and turtles that freshwater ecosystems were buffered against the K–Pg event.

Funding Sources: NSF-FRES-2317666

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Bite marks discovered on a frontoparietal dome of a Pachycephalosaurid from the Late Cretaceous Hell Creek Formation of South Dakota, United States

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Bite marks have been well documented across multiple fossils showing unique interactions between predatory organisms and their prey or attempted prey. Here, we describe a partial frontoparietal dome of a Pachycephalosaurid from the Hell Creek Formation of South Dakota, which features several depressions on the dorsal surface hypothesized to have been caused by a predator. This was determined by external observation of the specimen and through the use of micro-CT scanning. A digital imaging program was used to provide an in-depth view of potential pathologies on the fossil. Several pachycephalosaur domes have shown pathologies linked to intraspecific combat—with this specimen, we find evidence indicative of potential antagonistic predator–prey interaction.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

The strange and unusual taphonomy in the fossils found in the Upper Hornerstown Formation, New Jersey

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The fossils found in Upper Hornerstown, New Jersey, have been documented to be Late Cretaceous to Early Cenozoic in age, with the range being 66–61.6 Ma. While looking at the fossils that were recovered from Upper Hornerstown and brought to the Edelman Fossil Park and Museum, a few strange features were discovered on these specimens, the first being on a skeleton of *Euclastes* that was observed. Our observations have found a few distinctive features, the first being the obvious pathologies on the shell of this *Euclastes*. These pathologies are almost perfect circles that pass through the shell completely. However, the bone in these areas shows obvious signs of bone growth and repair. This means the animal was still alive while there were deep holes present. In certain areas of the shell where these pathologies are found, there is bone that has grown under its usual placement, thus forming a crater, perhaps in response to whatever has caused the holes to form. It is important to note that the pathologies observed do not match any other descriptions of pathologies currently described. The other notable feature on the *Euclastes* specimen is an unknown tooth that was observed in the bone, but it may have been embedded there after the animal's passing. The next specimen we looked at was *Hyposaurus rogersii*. More specifically, we observed the vertebra and related skeletal elements. These fossils were found with remarkable preservation. With its high-quality preservation, we were able to

gather a vast amount of information about this animal. We found that the bones showed obvious signs of predation that either resulted in the death of this animal or happened right after death. The strange features are apparent when comparing these scoring marks to one another. It almost appears in every other vertebra, with one showing heavy scoring marks, then the next showing almost no marks to no marks at all. Along with the scores, there were more than a couple punctures on the fossil that could also point to signs of predation on this animal as well. Comparing these two fossils does not reveal any similarities between the unknown pathologies found in *Euclastes* and the scores and punctures found on *Hyposaurus rogersii*. We continue to observe fossils found in this formation that will hopefully lead to a probable cause for both the unknown pathologies and the scores and punctures found on these remarkable fossils.

Funding Sources: Edelman Fossil Park and Museum of Rowan University, Geology department of Rowan University

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Fossil Anurans from the Early Miocene of Florida: Fossils from the Miller Site

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Fossils from the Florida Miocene have been well documented in the literature, yet anuran (frogs and toads) records remain largely underreported in comparison to other vertebrate groups. The oldest records of anuran fossils are from Oligocene sites like the I-75 site (~30 Ma), Brooksville 2 (27–25 Ma), and Live Oak SB-1A (25–23 Ma). The most extensively studied Early Miocene site is Thomas Farm (~18 Ma), which leaves a substantial gap of at least five million years in the anuran record from the Late Oligocene to the Early Miocene (18 Ma). The Miller Site is a recently discovered Early Miocene site along the lower Suwannee River. The site is 19 Ma, which is the same age as fossil localities from the Cucaracha Formation in Panama that have comparable mammalian fauna; it begs the question, “How do these two anuran faunas compare?” Here we document anurans from the Miller Site to better understand past dispersal and diversification of North American frogs and investigate any potential similarities with frogs from the Caribbean and Central America. More than 110 fossils, including ilia, humeri, urostyles, and sacra, indicate that there were four families: Hylidae, Bufonidae, Ranidae, and Scaphiopodidae. We also find numerous specimens of previously undescribed morphotypes of Hylidae and Bufonidae. The new Hylidae morphotype contains ilia, humeri, and urostyles, and the new Bufonidae morphotype contains two ilia. Our goal is to further categorize these taxa through morphological comparison to a larger comparative sample. We do this through descriptive morphology and comparative osteology with disarticulated skeletons and CT-derived images of 33 living species from North and Central America and the Caribbean.

Our results demonstrate that the new Hylidae and Bufonidae morphotypes share similarities with some Central American frogs and toads. The fossils from the Miller Site represent the oldest record of the family Bufonidae in North America and have a taxonomic composition different from that of the Oligocene, highlighting the absence of other anuran families like Rhinophrynidae and Eleutherodactylidae. Our upcoming work will include body size estimations of the Miller Site frogs and comparisons to other Miocene and Oligocene fossils, which would help us make inferences about the climate and paleoenvironment of ancient Florida.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Description of titanosaur specimens from the base of the Javelina Formation

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Since the naming of *Alamosaurus sanjuanensis* in 1922, many of the Maastrichtian titanosaur material found in the southern United States has been assigned to the genus. The assignment of these specimens to *Alamosaurus* has been called into question because of little overlap with the holotype and the holotype itself being fragmentary. A small number of specimens were excavated from a locality in Big Bend National Park, TMM 40597, by Wann Langston and later Thomas Lehman. Those specimens, consisting of a sacrum articulated with both ilia, a third ilium, a pubis, rib fragments, and a caudal vertebra, come from the base of the Javelina Formation, stratigraphically much lower than most other specimens of *Alamosaurus*. The material from TMM 40597 was noted by Lehman to have morphological differences from other Big Bend titanosaurs, such as a more dramatic lateral flare of the ilia. Because of the unique morphology and lower stratigraphic placement of the specimens from TMM 40597, I prepared a description and comparison with other titanosaurs to assess the possibility of a new taxon. Preliminary data does not support the erection of a new species.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Behavioral, ecological, and allometric drivers of chiropteran middle ear morphology and acoustics: an evolutionary framework

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The vast majority of extant bats (Mammalia: Chiroptera) are capable of complex echolocation, making them unique among mammalian orders. A great diversity exists among living bats with respect to their sophistication of high frequency echolocation, diet, and foraging methods; however, variations in middle ear morphology remain poorly understood given the limitations presented by their extremely small size and biases toward genetic and inner ear studies. We examined more than two dozen species of bats across the order alongside eulipotyphlan outgroup species to broadly encapsulate the diversity of morphology, behavior, and dietary categories within Chiroptera. Micro-CT scans were used to collect morphological data, while phylogenetic relationships, the primary diet component, primary foraging strategy, and call frequency data were obtained from existing literature. Among other key findings, tympanic ring shape and acoustic frequency were most closely correlated to diet ($p < 0.05$). Foraging strategy also appears to influence shape. Although global middle ear areas were shown to follow typical body size scaling constraints, the area of the tympanic ring could not reliably predict the stapes footplate area after accounting for body size. Our results further understanding of the evolution of middle ear structures in relation to phylogenetic constraints and ecological pressures. This project lays the groundwork for future studies comparing these results with extinct species to assess the interplay between the same structural, behavioral, and functional relationships throughout bat evolution.

Technical Session XVIII: Paleontological Practices: Education & Outreach (Saturday, November 14, 2026, 1:45 PM)

The question behind the paper: What drives public engagement with paleontological research?

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Public understanding of science plays an important role in building trust in scientific evidence and reducing vulnerability to misinformation. Consequently, many paleontologists now communicate their research through social media, newsletters, podcasts, and video platforms. Understanding how audiences engage with paleontological research may help scientists communicate evidence more effectively and foster lasting engagement with science. To explore patterns of audience engagement, I analyzed 113 vertebrate paleontology and Earth history stories published through Climate Ages, an independent science communication platform reaching more than 21,000 readers across Medium, Substack, and LinkedIn between 2024 and 2026. Stories were categorized according to topic, narrative framing, and the extent to which they focused on a

specific publication versus a broader scientific question. Audience metrics included presentations, views, reads, read-through rates, newsletter open rates, engagement rates, and subscriber growth. Topic and framing influenced audience discovery on Medium. Deep-time stories converted presentations into views at significantly higher rates than non-deep time stories (16.0% versus 8.9%; Mann-Whitney U test, $p < 0.05$), and several title-framing variables also showed significant effects on story discovery. In contrast, newsletter open rates on Substack varied little across topics and narrative frames. Together, these patterns suggest that topic and title framing play a larger role in attracting new audiences than in maintaining engagement among established subscribers. A qualitative review of the highest-performing stories revealed a recurring pattern: the stories were rarely about the paper itself. Instead, research papers were used as evidence to explore broader questions about evolution, extinction, climate change, adaptation, and the history of life. Conventional distinctions such as mystery versus explanatory framing produced comparatively modest differences in audience engagement. These observations suggest that audiences engage most strongly when individual studies are presented as evidence contributing to larger scientific questions rather than as isolated discoveries. Effective paleontological outreach may therefore depend less on simplifying research findings and more on helping audiences understand how scientific evidence contributes to our understanding of life and Earth history, fostering trust in scientific conclusions.

Funding Sources: Public donations through Climate Ages Supporting Members

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A large specimen of *Tyrannosaurus* from the lower unit of the Hell Creek Formation, Montana

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Despite being known to science for more than a century, *Tyrannosaurus rex* (Dinosauria: Theropoda) remains a subject of ongoing fascination and study. A large sample of *Tyrannosaurus* from the Hell Creek Formation (HCF) of Montana and surrounding regions permits detailed studies of this taxon's paleobiology, with recent analyses examining its growth, behavior, and evolutionary history. Subtle variations between individuals from different stratigraphic levels of the formation have previously been suggested to be taxonomically informative. As such, ongoing studies of specimens with associated stratigraphic data are critical to assessing variation within these Cretaceous carnivores and testing evolutionary hypotheses.

In 2000, the partial skeleton of a large *Tyrannosaurus* (Museum of the Rockies specimen 1128; "G-Rex") was discovered in the lower unit of the Hell Creek Formation in Garfield County, Montana. Despite its inclusion in several histological studies, a detailed description of this specimen has, to date, not been conducted. Much of the skeleton of MOR 1128 is represented ($n >$ 39 bones), including the left femur, left tibia, pedal phalanx, pubes, vertebral elements, partial scapula, ribs, partial left dentary and teeth. The rostroventral margin of the dentary exhibits highly rugose surface texture. The dorsal ribs preserve evidence of pathologies. The femur is robust and measures 1,279 mm in length, indicating that MOR 1128 is among the larger *Tyrannosaurus* specimens uncovered in the HCF (comparatively, FMNH PR 2081 ["SUE"], one of the largest known specimens, has a femoral length of 1,321 mm and CM 9380, the holotype, has a femoral length of 1,300 mm). Ongoing comparisons with other specimens and assessment of ontogenetic features will provide a detailed view of MOR 1128's skeletal morphology and help to anchor comparative studies of *Tyrannosaurus* throughout the HCF.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

How to move Leviathan: Transferring the type specimen of *Llanocetus denticrenatus* from New Zealand to Washington, DC, USA

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The type specimen of *Llanocetus denticrenatus* (Mitchell 1989, USNM PAL 183022), consists of a large cranium (~2 m long), mandibles, and postcrania that were collected from the latest Eocene La Meseta Formation on Seymour Island, Antarctica, over the course of separate field seasons in the 1970s and 1980s. For nearly 40 years, most of the specimen was stored in the University of Otago's Geology Museum in Dunedin, New Zealand, where it underwent preparation, molding, casting, and study. In 2022, plans were initiated to transfer this specimen from New Zealand to the Smithsonian Institution National Museum of Natural History (NMNH) in Washington DC, USA. This transfer unites the specimen with the original jaw fragment and endocast material at the Smithsonian Institution. Planning included inventory, condition assessment, photography, compliance with import/export regulations, and total volume and weight estimates to undertake subsequent planning for packing and shipment. Crates and internal shelves were constructed by a local New Zealand company using heat-treated lumber and plywood conforming to New Zealand export standards. Packing and crating of specimens took place at two locations on the Otago campus: the basement of the Geology Museum and the Otago Repository for Core Analysis. Small to medium objects were wrapped in paper packing materials and contained in cardboard boxes, while larger objects, including the cranium, mandibles, and blocks of matrix and rib bones, were packed into form-fitting cavity mounts carved in dense polyethylene foam, with paper packing materials used for additional padding and support. Packing materials and methods were selected and utilized to facilitate pest control treatment in a CO_2 chamber upon delivery to NMNH. Success of this work was enabled by the following: 1) long-term planning and collaboration between institutions, including advance site visits and involvement of a knowledgeable team, 2) adjustments to standard packing methods for oversized objects to account for future CO_2 treatment, and 3) availability of resources at both the sending and receiving institutions to ensure continuity of work.

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Intraspecific variation over 10 million years shows potential effects of mass extinction and recovery on sex and age demography in the Permian stem-mammal *Diictodon feliceps*

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Intraspecific variation through time can result from environmental adaptation and/or reproductive selectivity. Demographic changes (e.g., percent of younger/older or male/female individuals) are potential species responses to long-term ecological processes, such as environmental stress and faunal turnover during mass extinctions. A sample of the middle–late Permian (~262–252 Ma) South African dicynodont *Diictodon feliceps*, totaling 718 measured crania, records potential anagenesis and demographic changes over 10 million years. We recorded linear measurements, which were paired with categorical variables to estimate demographics. Sex is diagnosed by presence or absence of canine teeth, though we also find evidence for sexual size dimorphism, with toothed individuals (presumed males) being ~18% larger than toothless ones (presumed females), with normal distributions of sizes in each sex, evidence against the morphs being ontogenetic stages. Each morph is found to co-occur in ~99% of localities with at least 5 individuals, and the two morphs also co-occur separately in Zambia and China, evidence against the morphs being separate species. *D. feliceps* survived the Capitanian Mass Extinction (CME), with pre-/post-

extinction and post-faunal recovery subsamples available for study. Relative abundance of *D. feliceps* changes throughout its range, increasing from ~10–40% of collected fossils over biozones following the CME, and decreasing from ~40–10% after faunal recovery, indicating a "disaster-taxon-like" species history. Average basal skull length (BSL) increased by ~10% following the CME and decreased by ~20% at the abundance decrease. Individuals from smaller bodied assemblages also have proportionately larger orbits, suggesting size shifts reflect changing age demographics, as previously observed in *Lystrosaurus* following the end-Permian Mass Extinction. Male-to-female ratios vary through time, with the percentage of males decreasing from ~2:1 to 1:2. The proportions of the orbit and the preorbital region also differ between assemblage zones, with differences between males and females being larger in the lower relative abundance, lower BSL intervals. Regardless of whether the morphs represent sexes, individuals with teeth become less common, possibly indicating changing importance of a social trait through time. These results indicate that in stressful periods near a species' extinction, larger, older, and possibly male individuals may be selected against.

Funding Sources: Geological Society of America Graduate Student Research Grant; National Science Foundation Graduate Research Fellowship I.D. 2024375753 to J.L.P.; NSF-2325381 to A.K.H.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Fossil storks (Aves, Ciconiidae) from the Late Miocene of Florida

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Extant storks are a modestly diverse group of large wading birds specialized for hunting fish, small reptiles, and invertebrates in the shallows of still or slow-moving bodies of water and are characterized by long necks and long, robust bills. They include 17 species in Sub-Saharan Africa and Eurasia and three species in the Americas. New World storks include: the Maguari Stork, a species of *Ciconia* (six Old World species) from South America; *Jabiru*, a monospecific genus ranging from Mexico to Argentina; and the Wood Stork, a species of *Mycteria* (three Old World species) native to North America. While the fossil record of storks in Florida spans the Late Miocene into the latest Pleistocene, relationships to modern taxa are poorly understood. New fossils recovered from the latest Miocene (~5.86 Ma; late Hemphillian) Montbrook fossil site (MFS) in northcentral Florida allow for reevaluation of the earliest records. The MFS is a paleofluvial deposit with a diverse avifauna consisting of multiple land and waterfowl taxa, including a giant stork. The sample includes a mostly complete tarsometatarsus and associated distal tibiotarsus and is identified as stork by the following characteristics: tarsometatarsus with two distinct hypotarsals separated by a single groove and lacking a proximally situated medial trochlea; tibiotarsus with a deep circular anterior intercondylar fossa dorsally bordered by a large central tubercle for the *tibialis anticus* and a distinctive ridge above the lateral condyle. Features characteristic of *Mycteria*, such as a narrow intercondylar sulcus of the tibiotarsus, are absent from the MFS sample which shares some characteristics, like a flat *fossa supratrochlearis plantaris* of the tarsometatarsus, with the South American natives, suggesting that the MFS sample might represent an early record of that broader clade in North America. Other Late Miocene storks from Florida include fossils from the Love Bone Bed (9–9.5 Ma, Clarendonian) and McGehee Farm (8–9 Ma, Hemphillian), which are more similar to those of the extant Wood Stork; and the Bone Valley Palmetto Fauna (4.5–5 Ma, Hemphillian), which shares a few characteristics with Jabiru and Maguari, as with the MFS sample. All three New World stork genera may have been present in the Late Pleistocene of Florida (e.g., the Ichetucknee River), indicating that their paleobiogeography before and after the Great American Biotic Interchange is more complicated than previously appreciated.

Funding Sources: Montbrook excavations funded by NSF award 1645530 and grants from the

Felburn Foundation; NSF grant 1756306 provided funding for specimen curation and preparation

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

The International Taphonomy Reference Collection (ITRC): a new Symbiota-based online data portal

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Fossil and modern bones and bone assemblages featuring a variety of taphonomic damage features are used as comparative materials to help paleontologists, zooarchaeologists, ecologists, and forensic scientists interpret evidence of taphonomic processes. However, current information systems used for managing and sharing museum specimen data often lack the necessary structure for clearly documenting associated taphonomic information. Consequently, important taphonomic collections may be invisible to the scientific community or underutilized in their host institutions. In addition, the vocabulary used to describe taphonomic features can vary between reference textbooks, datasets, researchers, and institutions. In order to address these issues and increase the discoverability and visibility of collections with taphonomic information, we have established the International Taphonomy Reference Collection (ITRC) and made it globally accessible via a Symbiota-based online data portal (https://taphonomy.symbiota.org), which has specimen and locality information as well as customized data entry formats for taphonomic traits. The Symbiota portal currently incorporates partner collections maintained by the Smithsonian National Museum of Natural History and the National Museums of Kenya. As of May 2026, the portal contains 11,152 specimen records viewed by more than 400 web users between 4/1/26 and 5/13/26. Recent additions to the online portal include individual specimens documenting taphonomic processes from Amboseli National Park, hyena den collections from Masai Mara National Reserve and Hell's Gate National Park, and bone assemblages from ethnographic habitation sites near Lake Turkana. In the coming years, we plan to expand the ITRC via partnerships with other institutions and taphonomy collections from across the globe. The collaborative nature of the Symbiota community will help to promote standardized curation practices and shared stewardship of taphonomy collections as well as providing accessible reference materials for taphonomic research, education, and outreach. Specimen-based research is essential for taphonomic interpretations, and a central goal of the Symbiota ITRC portal is to make the paleontological community aware of these reference collections to motivate and facilitate in-person research at the host institutions.

Funding Sources: Leakey Foundation, Smithsonian Institution Life on a Sustainable Planet, NMNH CORE, NMNH William J. Graham Fund

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Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

A hidden northern route? Ecological niche models test a dispersal corridor along the shore of the north Paratethys in Miocene Europe

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During the Miocene, major climatic fluctuations and repeated reorganizations of the Paratethys Sea profoundly reshaped terrestrial landscapes and the configuration of dispersal pathways across Eurasia. Although southern routes through Anatolia are commonly reported in the literature, a potential east–west corridor along the northern margin of the Paratethys has been proposed but seldom tested quantitatively, particularly for ectothermic vertebrates. Here, we evaluate the plausibility of

this north Paratethyan dispersal route using ecological niche modeling (ENM) for the reptile families Anguidae, Lacertidae, Natricidae, and Varanidae, and the mammalian family Moschidae, incorporating new fossil occurrences from three Middle Miocene localities in southern Poland (Kielce area, Chmielnik Formation). We calibrated MaxEnt models using MioMIP1 paleoclimate simulations and time-slice-specific land masks for the Early, Middle, and Late Miocene. Across taxa, model projections consistently reveal a belt of high environmental suitability concentrated in lowland regions fringing the northern Paratethys and adjacent basins, indicating recurrent windows of east–west connectivity across central-eastern Europe toward western Asia. The inclusion of the new Polish occurrences significantly alters Middle Miocene suitability reconstructions for several groups, reinforcing the inferred continuity of this northern corridor. Overall, our results support the northern margin of the Paratethys as a credible dispersal pathway for thermophilic reptiles and forest-dwelling mammals during warm phases of the Miocene, complementing the better-documented southern routes.

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Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

An unusual vertebrate microfossil bonebed from the Oldman Formation preserving an early occurrence of *Habrosaurus* and environmentally informative records of trematode-infected molluscs

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Across the fossil record of western North America, vertebrate microfossil bonebeds have proven invaluable for reconstructing paleocommunity dynamics and recording the presence of poorly preserved small-bodied animals. The discovery of a new, laterally extensive vertebrate microfossil bonebed in the upper Oldman Formation of the Belly River Group in southern Alberta, Canada, could provide a new link between the more well-drained, inland sites in the underlying Oldman Formation and the more coastally influenced sites in the overlying Dinosaur Park Formation. The site is taphonomically similar to most Belly River Group vertebrate microfossil bonebeds preserved in crevasse splays, suggesting a similar formational history and suitability for ecological comparisons with previously described sites. This new site hosts an unusual fossil assemblage characterized by a low abundance to near absence of taxa like *Myledaphus*, turtles, and small theropods, while preserving high abundances of teleost fishes, amphibians, and lizards. In addition, this site hosts several rare taxa, including the recently described teleost, *Acronichthys*, and the potentially earliest occurrence of the sirenid amphibian *Habrosaurus*. Cluster analyses and other ecological ordinations position the site as transitional in relative abundance community composition between the more terrestrial assemblages of the Oldman Formation and more coastal assemblages of the Dinosaur Park Formation. Along with the unusual assemblage of vertebrate microfossils, the site is particularly notable in hosting a large diversity of gastropods and an abundance of trematode-infected bivalve shells. These represent one of the few records of such infections in the Mesozoic, and the second such example documented from the Late Cretaceous of western North America. Comparisons to similar Cenozoic and modern sites with similarly high abundances of such infections, combined with the described lithology of our site, suggest that these shells may provide an important indicator of the initial phases of regional sea-level transgression, and provide further support for the transitional nature of the paleocommunity and environment of this site.

Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

Comparing ceratobranchial and limb osteohistology in *Nanotyrannus lancensis*

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Accurately estimating ontogenetic status is essential for testing hypotheses related to taxonomy, life history, evolutionary processes, and ecosystem dynamics. One widely used approach, though complicated by intraskeletal variation, is skeletochronology, the process of estimating growth stage via cyclical growth marks (CGMs) preserved in bony tissues. Among large-bodied theropod dinosaurs, most skeletochronological studies rely on weight-bearing limb bones, which preserve extensive growth records and yield comparable estimates. Recent research proposed that the ceratobranchial (hyoid) could also serve as a reliable element for estimating maturity in tyrannosauroid dinosaurs, specifically via the degree of remodeling, presence of endosteal lamellar bone, and number and spacing of CGMs. Here, we test this approach with the first intraskeletal osteohistological comparison between an associated hyoid, femur, and tibia in a tyrannosauroid specimen (NCSM 40000, *Nanotyrannus lancensis*). Femoral and tibial osteohistology of NCSM 40000 documents initial phases of CGM compaction (incipient EFS development) and a high number of CGMs (25 in the femur), confirming near skeletal maturity. By comparison, the number and spacing of CGMs in the NCSM 40000 hyoid are challenging to interpret. Primary tissue is nearly obscured by several generations of secondary osteons that extend centrifugally to within 50 μm of the periosteal surface, and large erosion rooms excise the section. Where visible, we observe 25+ potential CGMs in the outermost 800 μm, although, as observed in limb histology, a large percentage of these likely do not correspond to annual markers. Moreover, hyoid CGMs in NCSM 40000 are less well-defined than in the limb bones, lacking pronounced tissue compaction and exhibiting an irregular, diffuse, and “hummocky” appearance, making them more challenging to trace and problematic to discretize into annual cycles. Although we see evidence that potential CGMs become increasingly compact at the periosteal surface, tight spacing of markers across observable transects resulting from slower growth rates in non-tyrannosaurines, coupled with near-complete remodeling of the primary tissue, renders identification of an EFS in the hyoid of NCSM 40000 uncertain. In short, despite the presence of general histological indicators of relative maturity, we find hyoid osteohistology insufficient for determining entry into the asymptotic growth phase in NCSM 40000.

Funding Sources: Donors to the Friends of the North Carolina Museum of Natural Sciences

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Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Geographic dynamics, body size, and genetic variability as factors in intraspecific variation

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Geographic variation within a species, whether it be genetic or phenotypic, arises from an often-unknown combination of standing genetic variance, gene flow, geomorphology, and the history by which the species came to occupy its range. Understanding geographic variation is fundamentally important for paleontologists because of its relevance to making alpha-level taxonomic determinations of fossils; however, it is also of interest because the fossil record, combined with records of paleoclimatic, paleoenvironmental, and geomorphic change, offers an avenue for studying the historical and spatial processes by which geographic variation arises (or is lost). Here, I first use computational modeling to show how genetic and phenotypic variability, trait complexity, metapopulation dynamics, geographic range expansions and fragmentations, and geographic barriers (partial and complete) combine to produce patterns from nearly homogeneous phenotypes across the entire geographic range of a species to clinal patterns to highly fragmented mosaics. I also show how body size, because of its links to dispersal, gene flow,

and the permeability of geographic barriers, can produce strikingly different patterns of variation in two species of different sizes in the same geographic space. Also with modeling, I show how changing climate, environment, and topography drive species range changes that produce patterns that are different yet again from those that emerge in a static environment. Finally, I analyze empirical data from living and fossil samples of three mammalian clades with different body sizes and dispersal rates (the *Sorex araneus-arcticus* group shrews, the marmots, and vespertilionine bats) to understand how Quaternary glacial-interglacial cycles have combined with the above factors to produce geographic variation and speciation. In the shrews, small body size and limited individual dispersal combine with metapopulation dynamics to produce greater differentiation between local populations than between different parts of the range or even between different species, whereas in the larger or more mobile marmots and bats, the pattern is the opposite. Furthermore, univariate traits like body size tend to form clinal patterns across entire geographic ranges whereas complex multivariate traits like skull shape produce more patch-like patterns that are conditioned by historical range dynamics and geographic barriers.

Technical Session VI: Dinosauria II: a "bird-hipped" bonanza (Thursday, November 12, 2026, 8:00 AM)

Preliminary glimpses into the growth and life history of the Late Jurassic dinosaur *Stegosaurus* from Dinosaur National Monument and the Colorado Plateau of the western United States

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The Late Jurassic age Morrison Formation is the geographically largest and longest studied dinosaur-bearing formation in the North American West, and while many iconic vertebrates have been documented, unanswered questions remain, including the life history and ontogeny of the thyreophoran dinosaur *Stegosaurus*. Though an important and distinctive member of Morrison ecosystems, there are currently no known hatchlings or embryonic remains, and few immature specimens of this genus. However, a very well-preserved immature postcranial skeleton is known from Dinosaur National Monument, Utah (DINO). While most mature adult specimens fall into the 6.0-m body length range, with the largest specimen (FHPR 1095) estimated to be 7.2 m, the DINO specimen has an estimated body length of 1.8 m, making this specimen ideal for ontogenetic study. We selected two elements, the humerus (DINO 2447) and femur (DINO 2453), for osteohistological sampling. Cortical tissue is composed of woven-to-fibrolamellar bone. Vascular canals are dense and highly organized, plexiform to reticular in orientation, and grade into radial in some areas, especially along the medial side of the femur. The bone lacks secondary osteons, endosteal bone, an external fundamental system (EFS), and lines of arrested growth (LAGs) or annuli. Additionally, no structures interpretable as hatching lines are discernable, despite the relatively small medullary cavity. These appendicular elements also lack the pervasive bundles of Sharpey's fibers visible in previously sampled *Stegosaurus* osteoderms.

Slow growth rates in *Stegosaurus*, when compared to other non-avialian dinosaurs, have been suggested in previous studies. Indicators of slow growth include a combination of randomly distributed longitudinal primary osteons, demonstrating poor vascularization, with more highly organized lamellar or fibrolamellar tissue. A decrease in mid-cortex vascularity has been suggested to denote the onset of sexual maturity. The DINO specimen shows none of these traits and is more consistent with the fibrolamellar bone and radial and reticular vascular network seen in the dermal bone of a smaller, immature specimen (DMNH 33359). The osteohistology of the DINO *Stegosaurus* does not support previous suggestions of slow growth, rather the combination of osteohistological features suggest relatively active growth in a juvenile thyreophoran.

Technical Session XIX: Carnivora (Saturday, November 14, 2026, 1:45 PM)

Who ate Rudolph? Reindeer taphonomy and dog domestication at the late Pleistocene site of Předmostí, Czech Republic

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Předmostí, a Gravettian site in the Czech Republic, provides the most robust evidence for dog domestication among pre-Last Glacial Maximum sites. There, independent morphological, isotopic, and dental microwear analyses have sorted a ~26,000–29,000-year-old assemblage of *Canis* fossils into two morphotypes, which some interpret as a sympatric mix of wolves (*Canis lupis*) and early dogs (*Canis lupus domesticus*). The dog morphotype presents with a reduced cranium and shorter, broader snout with tooth crowding, a reindeer-based diet, and evidence of greater hard-part consumption that was interpreted as more tooth-on-bone contact during feeding. The wolf morphotype fed on mammoth and experienced less tooth-on-bone contact. Others, however, attribute these differences to natural morphological and behavioral variation among wolves. We introduce a fourth line of evidence to this debate: taphonomy. We hypothesized that wild carnivorans would not have chewed bones in situ at this open-air, year-round occupational site, such that tooth-marked bones would support the presence of dogs. Based on the isotopic data, we tested this using Předmostí's reindeer (*Rangifer tarandus*) assemblage.

Of 1,274 reindeer bones and antlers, 16.2% were butchered and 4.4% were carnivore modified. This level of carnivore modification is low compared to captive wolves, while wild wolves vary in bone modification frequency and intensity. Comparable feral dog studies are lacking. However, carnivore modification percentages were higher for certain elements: femur (15.7%), radio-ulna (11.3%), indeterminate long bone fragments (8.6%), and tibia (7.4%). Importantly, 7.9% of the antlers were gnawed. This suggests boredom chewing, as observed at wolf den sites and by domesticated dogs. Boredom chewing would not be expected from wild canids scavenging at a human habitation site.

The assemblage is heavily root-etched, and a conservative approach was taken in identifying all marks such that overall recorded tooth (and butchery) mark numbers may be artificially low. Future taphonomic studies will include musk ox, horse, and mammoth to further determine what level of involvement carnivorans, inferred here as potentially early dogs, had at Předmostí.

Funding Sources: 2021 Smithsonian National Museum of Natural History Small Grant to KP, BP, and JP and by the Royal Belgium Institute of Natural Sciences to MG

Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

Lance Creek Formation microsites update the diversity of tooth replacement in Maastrichtian squamates

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The Lance Creek Formation of Wyoming has served as a historic source of vertebrate microfossils from the Maastrichtian, acting as a key study system to assess faunal diversity leading up to the Cretaceous–Paleogene (K–Pg) mass extinction. While the mammalian and dinosaur fauna of the formation have received extensive attention, the squamate fauna remains relatively unexamined save for inclusion of individual Lance Creek specimens in broader, multi-formation, end-Cretaceous studies. As such, the diversity of

specifically Lance Creek squamates has the potential to provide updated geographic and temporal data for this key vertebrate group whose members from this place and time largely went extinct at the K–Pg extinction.

Over the course of four consecutive field seasons in southeastern Wyoming, we have collected 15 new specimens of lizard jaws. Our sampling of squamate material lends itself to examining additional anatomical details captured by high-resolution micro-computed tomography. We evaluated the mode and frequency of tooth replacement within Polyglyphanodontia, Lacertoidea, and Anguimorpha. Evidence of replacement was determined based on 1) resorption pits, 2) developing crypts, and 3) relative degree of ankylosis. Although some specimens exhibited active replacement, most demonstrated little to no evidence of replacement—standing in contrast to the high frequency of replacement in modern squamates. Mode of replacement revealed two patterns: 1) Polyglyphanodontia and Lacertoidea replacement teeth develop lingually to functional teeth and are associated with resorption pits, whereas 2) anguimorph replacement teeth develop interdentally and move from a distal position to resorb the functional tooth.

These findings indicate that Maastrichtian squamates exhibited modes of tooth replacement similar to those of modern groups, but at lower frequencies when compared to most extant lizards. Given the diversity of phenotypic combinations present in our sample, it is evident that neither dietary specialization nor phylogenetic placement provided a clear survival advantage. The extinction of almost all sampled genera at the K–Pg boundary indicates a loss of phenotypic diversity in frequency of tooth replacement that may have ultimately constrained these phenotypes in modern squamates. Continued descriptions and collections will further our understanding of geographic, temporal, and phenotypic evolution in these squamate groups.

Funding Sources: David B Jones Foundation, Loyola University Chicago Biology Fellowship

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A putative *Tenontosaurus* (Dinosauria: Ornithopoda) jaw from the Lower Cretaceous Antlers Formation of Texas, USA

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Ornithopods are one of the most common ornithischian dinosaurs of the Cretaceous nearly worldwide. Here, we describe a partial specimen from the Lower Cretaceous (Aptian–Albian) Antlers Formation of Texas, USA, which is catalogued as PMNS 8386 at the Perot Museum of Nature and Science in Dallas, Texas, USA. The specimen is interpreted to be the mid-section of the left maxilla, measuring approximately 5 cm in height and 9 cm in anteroposterior length, and preserves at least two rows of teeth, including unerupted replacement teeth. Based on external and radiographical (computer tomography-based) observations, there are at least 10 teeth present in the specimen. Although most teeth are incomplete, the best-preserved tooth exhibits coarse denticulation along the mesial and distal margins of the crown, reminiscent of some ankylosaurian and *Tenontosaurus* teeth. However, some unerupted teeth show a slight, gentle tapering of the root with very little constriction at the crown-root junction, unlike ankylosaur teeth that typically have a strong constriction of the root immediately below the crown. Instead, the teeth in PMNS 8386 resemble those described for *Tenontosaurus*, and the specimen is therefore tentatively referred to *Tenontosaurus*, a taxon known to have reached 7 m or more in length. However, it is uncertain whether it can be confidently referred to either of the two known species of the genus, *T. tilletti* and *T. dossi*. The teeth of PMNS 8386 are much smaller than previously described for *Tenontosaurus* spp.; thus, this *Tenontosaurus* individual was likely a small individual, potentially a juvenile, that must have been no more than 4 m in length. Even though ornithopods are common in the dinosaur fossil record, PMNS 8386 is significant because it may represent the smallest known *Tenontosaurus* individual known to date.

While multiple *Tenontosaurus* individuals are known from sites in the Twin Mountains Formation of Texas and the Antlers Formation of Oklahoma, this specimen also represents a rare record of *Tenontosaurus* in the Antlers Formation of Texas.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Measuring mosasaur mandibles: mandibular ecomorphology of the Mosasauridae (Reptilia: Squamata) from the Smoky Hill Chalk of Kansas

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The Mosasauridae are a group of large, predatory aquatic squamates that existed during the Late Cretaceous. Mosasaurids are particularly abundant in the Smoky Hill Chalk Member of the Niobrara Formation in Kansas, including the common genera *Clidastes*, *Plesioplatecarpus*, *Platecarpus*, and *Tylosaurus*, which varied in size, snout morphology, and tooth shape. Here, we investigate whether differences in the mandibular morphology of these taxa translate to biomechanical differences indicative of niche partitioning. Biomechanical studies on mosasaurids have largely focused on teeth, while comparatively few studies have been devoted to the jaw bones. We performed beam theory analysis (BTA) on the mandibles of mosasaurid specimens from the Smoky Hill Chalk Member of Kansas. BTA is a method used to calculate the resistance to bending at a specified point along an object modeled as a beam and was here used to determine dorsoventral and mediolateral bending strength at the first and last tooth positions and the midpoint between them on mosasaurid mandibles. We found that, overall, the shape of both the dorsoventral and mediolateral force profiles is similar, with bending strength increasing posteriorly along the anterior mandibular unit in both dorsoventral and mediolateral directions. Bending strength at any given landmark generally increases with the absolute size of the mandible, suggesting greater bite force in larger individuals. The low ratio of dorsoventral to mediolateral bending strength at mid-dentary suggests that much of the length of the toothrow was used to capture struggling prey. Despite the findings of previous work based on tooth morphology and stomach contents suggesting these mosasaur taxa had different prey preferences, this study finds that the mechanical performance of their mandibles was similar. Future work can assess whether differently shaped force profiles are observed in more aberrant taxa such as *Globidens*.

Funding Sources: Fort Hays State University Graduate Scholarly Experience grant program

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Technical Session XIV: Return of Reptile'O'Rama: Triassic time (Friday, November 13, 2026, 1:45 PM)

New specimens from the Upper Triassic (Rhaetian) Redonda Formation of New Mexico support large body size and macrocarnivorous habits in *Vancleavea*

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Vancleavea campi is a small (< 1 m), semiaquatic stem archosaur from the Late Triassic of North America. *V. campi* has a distinctive cranial morphology that suggests trophic specialization, but the dietary ecology of this species remains unexplored. Here we report on three new partial dentaries, and several associated osteoderms, referable to *Vancleavea*. Isometric scaling of the dentaries indicates that the largest individual (MCCDM 1745) may have reached a total body length of 3.7 meters, which is more than three times the size of the largest individual previously reported (GR 138). The other specimens may have reached total body lengths of 1.47–1.67 meters. In light of this large size, several previously described features of the skull of *Vancleavea* are recontextualized as specializations for hunting large prey. Digital 2D measurements, obtained via high-resolution photographs of MCCDM 1745, GR

138, and several other near-crown archosauromorphs, bolstered by data originating from various extant mammals and reptiles, shed additional light on the feeding guild of this animal. We ultimately suggest a macrocarnivorous lifestyle for *Vancleavea* and consider its implications for the trophic ecology of lacustrine environments in the Late Triassic of southern Laurentia.

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

3D Reconstruction of the small North American tanystropheid *Tanytrachelos ahynis* (Reptilia: Archosauromorpha) revelas morphological innovations in Tanysauria

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The tanystropheid *Tanytrachelos ahynis* is known from more than 380 associated skeletons from the Late Triassic Cow Branch and Lockatong formations of the eastern USA. The sample, one of the largest for any Triassic tetrapod species, preserves evidence of variation and dimorphism, including the presence of large neomorphic post-cloacal elements positioned posterior of the sacrum in half of individuals, a possible example of sexual dimorphism. As with many tanystropheid taxa, almost all *Tanytrachelos* specimens are taphonomically flattened on slabs, obscuring morphology and thus ecological and functional inferences. We three-dimensionally reconstructed the skeletal anatomy of *T. ahynis* using micro-CT data from multiple individuals, revealing novel anatomical features unknown in other tanysaurians or indeed any other reptiles.

The skull has a short and tapered rostrum, very large orbits, and small conical teeth. At least three cervical vertebrae, including C2–4, are tightly articulated and likely fused into an elongate syncervical, differing greatly from the anteroposteriorly short syncervicals known in some fossorial and aquatic amniotes. The associated cervical ribs are fused into ventrolateral ridges. Thus, the anterior one-third of the neck was likely rigid and inflexible, contributing to stabilization of the neck. Its unique morphology makes its function unclear. This extreme of rigidity is a unique configuration among tanysaurians, a clade with many members already possessing elongate and inflexible cervical vertebrae.

The anterior six caudal vertebrae bear wide transverse processes. These are highly reduced in the seventh vertebra and completely absent in the remaining 25 caudals, suggesting that much of the longitudinal tail musculature and thigh retractors were restricted to the anteriormost portion of the tail. This would be followed an elongate, transversely narrow segment further posteriorly. Autotomy septa are present throughout the posterior segment of the tail, supporting the presence of such septa in some other tanystropheids. The transverse processes of caudals 4–6 articulate with the medial post-cloacal elements, suggesting extremely limited mobility of those neomorphs within the tail. This articulation does not support the hypothesis that these elements contributed to everting, squamate-like hemipenes. These new data expand the known disparity of skeletal morphologies in early archosauromorphs.

Funding Sources: Project supported by the Luck Companies Foundation and the Virginia Museum of Natural History Foundation

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Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

The evolution of North American camels: implications for paleontological databases

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Camels were one of the most common and diverse endemic mammals in the Oligocene through Neogene of North America. Yet their systematics have been a shambles for more than a century due to the lack of any comprehensive revision of the overall group—even though there are huge unstudied collections, such as the 20,000 specimens in the Frick Collection in the American Museum of Natural History in New York, that have been available for study since the 1970s. We have just published a complete systematic review of the entire group, and an updated cladogram and temporal and geographic range information of all the valid genera and species of North American camels. The old literature had more than 60 named genera and more than 200 named species. By contrast, we recognize only 40 valid genera of North American camels, with 79 valid species. Only one rare genus occurred in the late Uintan (late middle Eocene), then camels were completely unknown in the Duchesnean (latest middle Eocene), and relatively rare and low in diversity in the late Eocene (Chadronian). Only a handful of genera are known from the early Oligocene (Orellan to Whitneyan). By the late Oligocene (early Arikareean), camels began to diversify with *Miotylopus*, the gazelle-like Stenomylinae, plus primitive nothokemadines. In the early Miocene (latest Arikareean–Hemingfordian), camels underwent substantial diversification, with *Oxydactylus*, several genera of floridatragulines, miolabines, protolabines, and primitive aepycamelines, resulting in 15 genera in the late Hemingfordian, and 19 genera of camels in the late Barstovian–Clarendonian (middle Miocene), before reducing in diversity in the late Clarendonian–Hemphillian (late Miocene) and Pliocene. Only three genera remained in North America by the end of the Pleistocene, all of which vanished during the end-Pleistocene megafaunal extinction. Despite this absence of valid taxonomy, numerous studies have tried to draw paleoecological conclusions about Miocene land mammal communities with one of the most important groups missing or inaccurately represented. The diversity curves drawn from outdated taxonomic sources are completely different from the true diversity curve, based on our current research. Many online databases, such as the Paleobiology DataBase (PBDB) or MIOMAP are grossly outdated their information about camels, with many invalid taxa. As long as research is based on these inaccurate taxonomic sources, the results are “garbage in, garbage out.”

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

In Lockley’s Footprints: a diverse and extensive ichnofossil layer from Late Triassic Chinle Formation of Colorado

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Recent fieldwork by Colorado Northwestern Community College has relocated a Triassic-aged ichnofossil-bearing layer, previously described by Dr. Martin Lockley as his “Vermillion Creek” locality. The ichnofossil-bearing layer is located within the Chinle Formation of northwestern Colorado. The current known extent of the horizon is ~2.6 km in length, with portions eroded by Vermillion Creek and covered by alluvium. Three different fossil-bearing horizons were noted within the layer, all containing large amounts of in situ and ex situ ichnofossils. Sedimentary structures found at the sites include oxidation spots, mud cracks, asymmetrical ripples, and raindrops. On several collected blocks, multiple sedimentary structures are present, sometimes with tracks. The layer’s lithology is primarily a reddish-gray siltstone. All evidence suggests a low-energy environment that is not conducive to preserving body fossils, even though trackways are prolific throughout the area. The two primary localities collected from are “Jen’s Tracks” and “Over the Border,” though other localities exist between them and extending further west. During the 2025 field season, 84 specimens were collected, with a further 200+ being recorded in the field.

Ichnofossils include vertebrate tracks—representing amphibians, lepidosaurs, crocodylomorphs, turtles, and archosaurs. Both individual tracks and trackways are preserved. Invertebrate tracks and burrows are also present. The vertebrate tracks are primarily tetradactyl, with two different gaits, and some with tail and pedal claw drag marks. One pentadactyl track was collected, though its ichnotaxonomic identity is currently uncertain. There are also several tridactyl tracks from the site, five of which are currently identifiable as *Grallator*. Of these, two distinct sizes of *Grallator* are present, with four smaller specimens around 6.5 cm long, two of which are preserved on the same slab. The fifth *Grallator* track is larger at 14.6 cm long. Noteworthy among the archosaur tracks is one seemingly *Grallator* track that preserves a hallux impression. This new material helps fill in the ecology and environment present during the Late Triassic in poorly explored northwestern Colorado. Future fieldwork is planned, as more specimens would be informative for studies of Triassic paleoecology.

Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

The Garita Creek Gala: a diverse microvertebrate assemblage from the Upper Triassic of eastern New Mexico reinterprets correlations of the Garita Creek Formation

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The American Southwest has yielded a spectacular array of Late Triassic vertebrate taxa, with many high-yield localities across Texas, New Mexico, and Arizona. However, this diversity has been sampled to varying extents across the region, resulting in uncertain spatiotemporal ranges of these taxa and potential regional miscorrelation of stratigraphic units. Correlating strata in eastern New Mexico with major microfossil assemblages from the Dockum Group (Texas) and the Chinle Formation (Arizona) is particularly difficult due to sampling of relatively few, mostly large-bodied taxa in the region. Here, we report the most diverse microvertebrate assemblage known so far from eastern New Mexico, the Homestead Site at Garita Creek. Previous work on the Garita Creek Fm. identified a small assemblage of lungfish, metoposaurids, phytosaurs, *Postosuchus*, and multiple aetosaurs. We revisit these specimens and expand upon the identifications with microvertebrate material representing a minimum of 25 taxa in the Garita Creek Fm. In addition to lungfish, we identify coelacanths, various actinopterygians, and the chondrichthyan *Reticulodus*. We report new metoposaurid material, some likely from *Apachesaurus*; other jaw material suggests the presence of a much smaller temnospondyl, and assorted limb and pelvic elements represent early salientians. Phytosaur material is fragmentary and not assignable to genus, and we identify only one aetosaur, *Typothorax*, from fragmentary osteoderms. A new rauisuchid quadrate and teeth are also present. Homestead is the only site yielding the drepanosauromorph *Unguinychus onyx* and marks the easternmost occurrence of the drepanosauromorph *Fabanychus monos* and trilophosaurid *Trilophosaurus phasmalophos*. Other taxa include lepidosauromorphs and archosauromorphs such as dinosauromorphs, tanystropheids, and crocodylomorphs. Historically, the Garita Creek Fm was considered Adamanian in age, yet *Reticulodus*, *Trilophosaurus phasmalophos*, and *Fabanychus monos* have only been found in Revueltian deposits in Petrified Forest National Park; we have not identified any Adamanian index taxa. In tandem with U–Pb ages of detrital zircons, we conclude that the Garita Creek Fm is younger than previously estimated and that Homestead is a Revueltian paleocommunity. The use of microvertebrates is essential to correlating geographically disparate localities, with some highly diagnostic microvertebrate taxa having geographic ranges spanning hundreds of kilometers.

Funding Sources: NSF

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Systematics of the Western and Central Anatolian three-toed horses of the Hipparionini (Mammalia, Equidae)

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Anatolia has played a crucial role in faunal interchange, mostly between Asian, African, and European faunas during its paleogeographic history. Western and Central Anatolian faunas represent abundant fossil records and are worth studying to understand the migration, dispersal, and evolution of mammals. The Late Miocene is one of the significant epochs in equid evolution since open grasslands favored cursorial and grazing adaptations. Hipparionini was one of the most dominant groups during the Late Miocene, exhibiting high species diversity.

The main objective of this study is to conduct morphological and biometric analyses to describe the hipparion specimens from Western and Central Anatolia. Biometric measurements and morphological analysis of upper teeth series, two partial cranial specimens, and an almost complete cranium from Ankara Sinap (AS, MN 9) and Mugla Serefkoy (MYSe, MN12) were conducted and compared with material from well-known Eurasian localities. Principal Component Analysis (PCA) showed that MYSe specimens were categorized as small and large species, whereas AS specimens were described as medium and large species. PV-1317 and PV-1318 from MYSe were defined as *Cremohipparion matthewi*, and PV-1132, PV-1170, PV-1288, and PV-2002A were categorized as *Hippotherium brachypus*. A nearly complete cranium from AS displayed significant similarity with *Hippotherium giganteum*, a robust and large hipparion species. These findings indicate that the MYSe, Western Anatolia, and AS, Central Anatolia, had a similar paleoecology to some Greek localities, having similar hipparion species, which were specialized for open grasslands. More research is needed to understand the significance of Anatolian Hipparionini in the Old World *Hipparion* evolution.

Technical Session VIII: Fishes (Thursday, November 12, 2026, 1:45 PM)

An Early Devonian fish from China provides new insights into the origin of sarcopterygian characteristics

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As the ancestral stock of all land vertebrates, early sarcopterygians occupy a pivotal position in vertebrate evolutionary history. Yet the relationships among the earliest sarcopterygian lineages, and the sequence of character acquisition during their initial diversification, remain subjects of long-standing debate. Here, we report a new large-bodied sarcopterygian from the Lower Lochkovian (Early Devonian) of Guangxi, China, represented by exceptionally well-preserved and articulated cranial and postcranial remains. The specimen, approximately one meter in total length, is among the most complete Early Devonian sarcopterygians known and provides a rare window into the earliest stages of lobe-finned fish evolution. The new material displays a striking mosaic of features otherwise characteristic of different stem sarcopterygian groups. It possesses a cosmine covering on the dermal bones and scales, three pairs of coronoids, two pairs of fangs on the symphysial plate, at least two median gulars, and rhombic scales. The presence of vomerine fangs is shared with *Powichthys*, *Youngolepis*, porolepiforms, and osteolepiforms. In contrast to *Styloichthys* and *Youngolepis*, however, it exhibits a distinct cheek morphology characterized by subdivided cheek plates. It further shares with porolepiforms the presence of submandibular bones posterior to the jaw articulation and multiple independent branchiostegal rays, whereas it resembles osteolepiforms in possessing basal scutes, a bar-shaped preopercular, and lateral-line canals that do not traverse the parietals.

This unique combination of characters underscores the complex and mosaic nature of early sarcopterygian evolution. Preliminary observations suggest that the new taxon may represent a deep-branching member close to the common ancestry of tetrapodomorphs and dipnomorphs. Although its precise phylogenetic position awaits detailed systematic investigation, the discovery provides a critical new source of anatomical information for resolving the early radiation and evolutionary history of sarcopterygians.

Funding Sources: National Key R&D Program of China (2025YFF0811700)

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Descriptive and Comparative Analysis of Elasmobranch Teeth from the southwestern late Cretaceous limestone of Puerto Rico

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Fossil elasmobranchs from the Late Cretaceous of the Caribbean have a relatively scarce fossil record. Here, we report novel collections and previously undescribed elasmobranch remains from the El Rayo Formation and the Parguera Limestone in southwestern Puerto Rico. These formations represent marine depositional environments along the southern edge of the island during the Late Cretaceous. Within these units, we recovered isolated elasmobranch teeth that exhibit several diagnostic features indicative of lamniform and myliobatiform affinities, despite their fragmentary condition. Owing to these assemblages, we can gain a more comprehensive understanding of Cretaceous Caribbean marine ecosystems and biogeography, indicating a complex and dynamic marine ecology with the presence of generalist sharks and durophagous rays.

Funding Sources: Funding was provided by the University of Puerto Rico Mayaguez (Geology Department)

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Reassessment of the anatomy and phylogenetic relationships of *Pabwehshi pakistanensis* (Archosauria: Crocodylomorpha) from the Late Cretaceous Vitakri Formation of Balochistan, Pakistan

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Notosuchia is a highly diverse clade of terrestrial and semiaquatic crocodylomorphs that reached peak diversity in the Late Cretaceous of Gondwana and persisted through the Cretaceous–Paleogene (K–Pg) extinction into the Miocene. The evolutionary relationships of Notosuchia have been the subject of considerable debate, particularly regarding the phylogenetic placement of clade Sebecidae, thus far known primarily from Europe and South America. Resolving this issue requires renewed attention to fragmentary and historically problematic taxa. Here, we reanalyze and rescore the holotypic and referred specimens of *Pabwehshi pakistanensis*, from the Late Cretaceous Vitakri Formation of Pakistan, using micro-computed tomography data. We rescored *Pabwehshi* in two recent character-taxon matrices representing the primary competing hypotheses for sebecid relationships: the “sebecosuchian hypothesis,” which states that sebecids are sister-taxon to baurusuchids within Ziphosuchia, and the “sebecian hypothesis,” which states that Sebecidae and Peirosauridae form the sister clade to the remaining notosuchians. Using a matrix representing the sebecosuchian hypothesis, *Pabwehshi* is recovered as the immediate outgroup to Sebecosuchia (Baurusuchidae + Sebecidae). In contrast, a matrix representing the sebecian hypothesis recovers *Pabwehshi* within Sebecidae. These results differ from initial interpretations of *Pabwehshi* as a baurusuchid. Interestingly, the results align with the initial assessment that *Induszalim bala*, a Vitakri crocodylomorph specimen very closely resembling *Pabwehshi*, is a sebecosuchian. Whether

interpreted as a sebecid or the immediate outgroup to Sebecosuchia, the placement of *Pabwehshi* suggests that sebecid-line crocodylomorphs may have obtained a wider geographic distribution than previously recognized, possibly suggesting their presence on other southern landmasses, such as Africa and Madagascar. More broadly, these results contribute to our understanding of Gondwanan faunal connectivity prior to the K–Pg boundary and provide new insight into the endemic crocodylomorph fauna of the Indian subcontinent.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A curious case of a tyrannosaur toothache: feeding and mechanical implications to consider in the first described tooth abscess in a tyrannosaurine

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A number of oral paleopathologies are exhibited by the holotype specimen of the tyrannosaurine theropod *Daspletosaurus wilsoni* (Badlands Dinosaur Museum [BDM] 107, discovered 2017, Judith River Formation [JRF], northwestern Montana). First, although most of the alveoli of the right maxilla bear in situ teeth, the 13th alveolus is conspicuously plugged by a mass of porous fibrous bone. Computed tomography (CT) images show a broken tooth crown and root beneath the porous plug, suggesting the plug is an immune response to a crown root fracture. The CT scan also shows swelling around alveolus 12 and 14, affecting adjacent alveoli with consequent eruption displacement of replacement teeth. Second, bony outgrowths or "skirting" are emergent from the alveolar margin and surround the basal. These are most strongly developed in both premaxillae where skirts project 0.5–2 cm, and to a lesser extent in the right maxilla (scant -0.5 cm). Although etiologies of paleopathologies are notoriously difficult to establish, the "skirts" may possibly form from BDM 107 changing eating mechanics secondary to the tooth abscess. This specimen represents the first described tyrannosaurine tooth abscess. It provides new insight into how adaptable tyrannosaurs were at persisting in difficult environments and highlights the need to further study the feeding biomechanics that caused such an injury in the first place.

Funding Sources: Montana Bureau of Land Management, City of Dickinson, ND, Dr. Craig & Destiny Wolf, CHI St. Alexius Health Dickinson, ND, TC Energy & employees

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

First non-dental dromaeosaurid dinosaur specimen from the Lower Cretaceous Antlers Formation of Texas, with recognition of tooth scoring and possible implications

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Deinonychus antirrhopus (Dinosauria: Theropoda) is a medium-sized dromaeosaurid known from Lower Cretaceous (Aptian–Albian) terrestrial deposits in the USA, such as the Antlers Formation of Oklahoma and the Cloverly Formation of Montana and Wyoming. Despite its wide geographic distribution and significant public and scientific interests, the species remains poorly represented in the fossil record. Whereas teeth referred to Dromaeosauridae have been commonly reported from the Cretaceous of Texas, reports of post-cranial material have been exceptionally rare and limited to Late Cretaceous (Campanian) indeterminate dromaeosaurids. Here, we report the first occurrence of a non-dental dromaeosaurid specimen from the Antlers Formation in Cooke County, Texas, consisting of a partial right humerus. Despite being incomplete, this humerus shares several unique characters with previously described humeri of *D. antirrhopus*, including a distal expansion of the deltopectoral crest (DPC) relative to other dromaeosaurids and a broad ridge on the lateral side of the DPC extending parallel to its distal margin. Although isolated teeth possibly

attributable to the genus *Deinonychus* are also collected from the same locality, we conservatively refer to this humerus as cf. *Deinonychus* sp. because of its incomplete preservation and the small number of diagnostic characters. Nevertheless, this report represents the first report of likely *Deinonychus* non-dental remains from Texas. More significantly, we identify markings on the surface of the shaft which strongly resemble previously reported serrated velociraptorine tooth scores that have been interpreted as evidence of feeding behaviors.

Funding Sources: The Department of Biological Sciences and the College of Science and Health at DePaul University

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

An extraordinary accumulation of carpal and tarsal elements of proboscideans from Quaternary deposits in the Gulf Coast Plain of Texas

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We evaluated a large collection of proboscidean material collected by John Baskin and colleagues from the Late Pleistocene at the Wright Materials Sand and Gravel pits along the Nueces River, west of Corpus Christi, Texas. They are part of the Nueces River Local Fauna. The material was transferred to the Vertebrate Paleontology Lab at the J.J. Pickle Research Campus in 2015, curated under locality number 43059. There are three proboscideans known from the site—*Mammut*, *Mammuthus*, and *Cuvieronius*—based upon recovered fossil teeth. The teeth appear in different relative abundances with hundreds of mammoth teeth, five mastodon teeth, and four gomphothere teeth.

Specimens were collected in the field from a conveyor belt feeding a rock crusher. We sorted through 10.3 tons of material to separate and analyze proboscidian carpal and tarsal elements. The specimen yield is among the largest for those elements from any locality in North America. There are eight scaphoids, 92 lunars, 57 cuneiforms, three pisiforms, six trapeziums, five trapezoids, 85 magnums, 78 unciforms, 68 calecanei, 86 astragali, 26 naviculars, 35 cuboids, and 11 ectocuneiforms. No mesocuneiforms or entocuneiforms were recovered. The relatively low numbers of scaphoids, pisiforms, trapezoids, trapeziums, ectocuneiforms, mesocuneiforms, and entocuneiforms may be because those have fewer articulation facets and are smaller in size than the other elements, and more closely resembled stones as they move along the conveyor belt. We are documenting variation in the sample of each element by recording size of elements, variation in the morphology of articular facets, and overall morphology of the bones, including taphonomic variants. Those data yield new insights into the morphology of carpal and tarsal elements in proboscideans from North America and may help us to identify morphological features that can be used to separate carpal and tarsal elements among the three proboscidean groups present at the site.

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Defining the dietary niche: from intraspecific variation to fossil inference

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The dietary habits of a species are central to understanding its biology. Yet diet is a multidimensional trait that can have high amounts of intraspecific and intra-individual variation, making defining it and measuring it conceptually complex. Furthermore, for extinct organisms, diet

is reconstructed using a wide variety of methods that are central to functional morphology, macroecology, and paleoecology. Reconstructing diet from other traits or measurements adds a layer of complexity, as reconstructions always involve a degree of error, and proxies represent the diet of an organism along different time scales. How do we rectify our understanding of diet and the numerous ways we estimate it with our desire to ask meaningful scientific questions? Ecological niche theory provides a template for aligning dietary data and theoretical concepts for a clearer and richer understanding of ecological and evolutionary processes. However, dietary niche concepts are often applied inconsistently across studies and without clearly articulating how dietary data translates into abstract niche dimensions. Defining the dietary niche is not just a theoretical exercise; definitions provide the backbone for hypothesis refinement, study design, and clear communication across studies and disciplines. We draw from niche theory to explicitly define fundamental, realized, potential, and tolerance dietary niches by aligning properties of food, consumer energetic costs and benefits, and ecological constraints on food consumption and availability. Different data types and proxies map onto different niche components, which can inform what inferences can be made. For instance, reconstructions from morphology are more closely representative of the tolerance dietary niche, as they are often based on traits that suggest whether an organism could mechanically collect and consume something. Dietary niche concepts also provide a framework for linking intra-individual and intraspecific variation to larger emergent patterns that exist in the fossil record. In sum, the appropriate framing of niche space allows for more accurate interpretations and richer discussions of the interplay between diet, environmental variability, and evolutionary pressure.

Funding Sources: NSF Postdoctoral Research Fellowships in Biology Program Grant No. 2209402 and the University of Florida Biodiversity Institute Interdisciplinary Seed Grant

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A hatching line? An intraskeletal osteohistological assessment in a neonatal *Alligator mississippiensis*

William Reyes[1], Christopher T. Griffin[1]
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Our inferences of the growth dynamics in extinct taxa are anchored by our understanding of skeletal growth patterns in extant vertebrates and how they are reflected in their osseous tissue architecture. Historically, our osteohistological assessments of extant crocodylians, specifically *Alligator mississippiensis*, have served as the main referent for our proxies of the growth dynamics in their extinct archosaurian relatives. Yet, given their utility as modern comparative analogues, we have a limited understanding of their histological growth patterns during the early phases of their ontogeny; notably, there is little data on the hatching phase. Because appendicular long bone osteohistology is regarded as the golden standard for assessing the skeletal maturity and growth history of tetrapods, we histologically sampled various appendicular elements of a one-month-old *Alligator* to assess how the action of hatching is reflected in the skeletal tissue—specifically, is there a hatching line? Our results indicate that the sampled elements bear a large medullary cavity that composes ~75% of the cross-sectional area. The embryonic tissue is characterized by a parallel-fiber bone matrix with oblong lacunae, low concentration of primary osteons, and, in some cases, reticular canals. Our osteohistological assessments revealed that the action of hatching is not recorded as a hypermineralized dark line that characterizes lines of arrested growth (LAGs). Instead, it is reflected as a hatching “zone” in which the outer extent of the embryonic cortical tissue gradually darkens periosteally and forms a sharp margin that differentiates the embryonic growth from the succeeding period of posthatching growth. These results provide novel insight into the tissue architecture during the earliest interval in the post-hatching ontogeny of crocodylians.

Funding Sources: Presidential Postdoctoral Fellowship

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

The first Mesozoic mammal from Zimbabwe

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The fossil record of Mesozoic mammals from mainland Africa is sparse, despite its comparatively rich record of fossil reptiles. This is especially true for the Cretaceous Period, with only a handful of dentigerous mammal specimens known to date. Here, we report the discovery of the first Mesozoic mammal from Zimbabwe—an isolated, left lower second molar (Lm2) from the White Sandstone Member of the Gokwe Formation in the Midlands Province, northwestern Zimbabwe. A small population of Cretaceous-age grains from pilot U–Pb detrital zircon geochronology analysis supports an Early Cretaceous or younger age for the White Sandstone Member. The Lm2 comes from the Masawi Microsite locality, located ~30 km southeast of Gokwe town. We underwater screenwashed ~25 kg of a deflation lag topping a fossiliferous conglomerate in the field, with follow-up matrix sorting at the University of Michigan. The tooth is roughly circular in occlusal outline, small (length = 0.96 mm, width = 1.05 mm), and with all cusps exhibiting heavy occlusal wear; it otherwise represents a complete crown. Two mesiodistally oriented cusp rows are separated by a deep central valley that is closed mesially by three small cuspules and open distally. The buccal row exhibits four cusps, and three cusps are present on the lingual row. Buccally, the mesial-most cusp is slightly larger than the distal three cusps, all of which are subequal in circumference. The four cusps together form a gently convex, parabolic curve along the buccal margin of the crown. Lingually, the mesial-most cusp is largest in circumference, roughly 3 times as large as the second cusp, the latter of which is roughly 1.5 times as large as the third cusp in the row. The second and third lingual cusps are twinned, clearly separated from the first cusp, and the lingual row tapers distobuccally as the cusps reduce in size. This suite of characters indicates affinities with Allotheria, and it especially resembles specimens assigned to the early-diverging multituberculate groups Paulchoffatiidae and Hahnotheriidae from the Middle–Late Jurassic of Eurasia. Forthcoming study of this specimen using micro-computed tomography and scanning electron microscopy should clarify its exact taxonomic affinities. The discovery of this specimen doubles the dentigerous fossil record of mammals from the Cretaceous of southern Africa and heralds the promise of screenwashing for yielding additional Mesozoic mammal fossils from continental Africa.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

A new genus of omomyid (Mammalia: Primates) from the Smiley Draw local fauna in the Great Divide Basin, Sweetwater County, Wyoming

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Omomyidae (Mammalia: Primates) is a family of Eocene crown-clade primates known from North America, Asia, and Europe. Omomyids appear in the fossil record shortly after the Paleocene–Eocene Thermal Maximum and are often associated with the base of the haplorrhine clade. Here we report a new genus of omomyid from the unusually diverse omomyid fauna recovered from the early Eocene (~53 Ma) Smiley Draw local fauna in the Great Divide Basin of southern Wyoming. The Smiley Draw local fauna is a fluvial sandstone locality that has produced numerous high-quality fossils, including three omomyids belonging to previously described genera: *Anemorhysis, Arapahovius,* and *Tetonius*. A fourth, yet undescribed omomyid belongs to a new genus that is likely within the tribe Trogolemurini. Trogolemurini is present in the North American fossil record from the early Eocene (~53 Ma) to the late Eocene (~38 Ma). The tribe includes several genera, two of which have already been identified

in the Smiley Draw fauna, *Anemorhysis* and *Arapahovius*. The new genus resembles earlier members of Trogolemurini, sharing an ancestral dental formula and many ancestral dental characteristics. However, the new genus has several autapomorphies that distinguish it from closely related taxa, including a bilobed P2 root, a strong hypoparacrista on P3–4, and p3–m1 paracristids that are tall and mesiodistally elongated. The unusual paracristid morphology is potentially indicative of a dietary change in this new genus that could separate it from the frugivory commonly associated with early Eocene omomyids. This research includes a maximum-parsimony phylogenetic analysis of the tribe Trogolemurini, comprising 15 taxa and 52 dental characters. Preliminary analyses indicate that the new genus is the sister taxon to the *Arapahovius gazini* and *Arapahovius advena* clade.

Funding Sources: National Science Foundation-BCS-160460, NSF-Grant ECCS-2025462, David B. Jones Foundation, KU Biodiversity Institute and Natural History Museum

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Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

Institutional Knowledge Exchange: a networking model for fostering collections care around the globe

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In 2025, Yale University's Office of International Affairs launched the Yale and the World Partnership Fund to strengthen international collaborations that advance research, education, and practice on issues of global significance. A joint proposal written by the Vertebrate Paleontology Collection Manager and the Natural History Conservator at the Yale Peabody Museum is partnering with colleagues at La Plata Museum and Bernardino Rivadavia Natural Sciences Argentine Museum (Argentina), and Arroyo del Vizcaino Collection at the Autonomous University Service and Center for Paleontological Studies, (Uruguay). This project unites curators, collection managers, technicians, and students through seminars, workshops, and tours of laboratories, collections, and exhibits. Phase one was dedicated to defining project goals, outlining local challenges, planning travel logistics, and sharing existing collections protocols. Phase two involved visits to South and North America, where we addressed the topics of field collecting, data management, digital asset storage, preparation and conservation treatments, molding and casting, 3D scanning/printing, specimen labeling, specimen housings, environmental storage assessments, and archive preservation, as well as conventions for handling historic collections. The value of in-person partnerships has been pivotal to inspiring creativity using the available materials within each country. For example, laboratory techniques included gap filling (glass microballoons mixed with Paraloid B-72 in acetone) and the application of fresh pineapple juice for removal of old epoxies from fossil bone joints. Collections topics focused on troubleshooting approaches to historical catalog number series and how to create archival housing supports without the use of paper trays to mitigate mold growth in high humidity storage environments. Ultimately, the goal of this skill sharing project is to disseminate expertise more broadly through a bilingual publication in English and Spanish that summarizes our collective efforts to elevate collections care practices. The three-fold project structure of 1) planning and strategizing, 2) on-site exchange seminars, workshops, and tours, and 3) writing and publishing a bilingual paper is a model we hope inspires other museums and universities with natural history collections to scale and adapt in their regions of the globe.

Funding Sources: Yale and the World Partnership Fund; Doneghy Vertebrate Paleontology Endowment

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Buried in burrows: two new assemblages from the Arroyo Formation, Texas, illustrate wider morphological diversity in early Permian lysorophians

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Lysorophians (Molgophidae) are a clade of elongated Pennsylvanian–Permian tetrapods with poorly understood morphological diversity. The last revision of the group's taxonomy noted only three species have associated material complete enough and with characteristics distinct enough to be used for diagnosis. Further work found proposed diagnostic features more likely represent ontogenetic change rather than interspecific variation and suggested the only diagnosable lysorophian taxon may be *Brachydectes newberryi*. Vertebral counts also were suggested as a diagnostic feature; a lack of described associated crania and postcrania, with complete vertebral columns, makes identifying a pattern of vertebral counts difficult. Therefore, most lysorophian material is of uncertain identity. We report two new lysorophian assemblages from the early Permian (Leonardian) Arroyo Fm., Baylor County, Texas. Both preserve hundreds of lysorophians in potential estivation burrows and share a common stratigraphic sequence: a low-energy channel sandstone followed by an infill pond mudstone deposit with remains of *Eryops*, *Trimerorachis*, and plant material, overlain by the burrow-bearing soil horizons, indicating the burrows were produced by lysorophians as ponds dried. A detailed examination of lysorophians in the upper deposit using CT data reveals each burrow preserves at least one individual with high completeness and articulation, including crania, axial segments, and limbs, in a partially coiled position. Vertebral counts are within the range of those reported for lysorophians, though not all burrows are complete, so full counts cannot be made for every specimen. The postparietal is sharply angled, thus is most comparable to that of *B. newberryi*. Some features of the Arroyo lysorophians are unique: the anterior process of the squamosal extends further anterolaterally than in other lysorophians, and the limbs are notably robust relative to the skulls as compared to proportions of other described remains and counter to limb loss in earlier members of the clade (i.e., *Nagini mazonense*). Thus, preliminary evidence suggests at least one new taxon is present in this deposit. The stratigraphic context of these burrows provides a robust sample to test patterns of diversity in a restricted geographic context over time. Anatomical nuances illustrate a wider range of variation in Permian lysorophians than previously noted and greater diversity in this enigmatic group.

Funding Sources: Virginia Tech Department of Geosciences

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A regional comparison of large herbivore turnover and extinction selectivity in response to late Neogene cooling and aridification in North America

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North America's herbivore guild reached its highest diversity during the Middle Miocene (~15 Ma). As global climate cooled after ~15 Ma, this diversity waned through a series of extinctions. The largest of these extinction events occurred during the latest Hemphillian North American Land Mammal Age, which spanned the Miocene–Pliocene boundary and culminated ~4.6 Ma. This turnover resulted in the loss of the rhinoceroses, protoceratids, and dromomerycids, with significant declines among horses, pronghorns, and gomphotheres. This extinction has been attributed to Messinian glaciation, aridification, and a global expansion of C4 grasses, with selection against browsing taxa. However, the tempo and mode of this turnover are poorly understood across the continent, with much of the research being focused on the Great Plains. Paleofloral and vertebrate fossil records suggest that North America was regionalized during the latest Miocene and early Pliocene. This regionalization can be attributed to variable local moisture regimes during this period of global aridification and presents a compelling question—how does turnover of large herbivores vary across diverse regional environments in response to global climatic forcing? We address

this question by comparing the turnover of large herbivores between the Gulf Coast and Great Plains regions to test for variation in the pattern, magnitude, and selectivity of faunal change. We used taxonomic turnover metrics, with occurrences sampled from the MIOMAP and FAUNMAP databases. The Great Plains records (Texas and Nebraska) show greater faunal turnover during the Hemphillian than the Gulf Coastal fossil record (Florida). Faunal change in the Great Plains was driven almost entirely by species replacement, with only a minor contribution of richness differences. However, the Florida record documented a greater degree of species loss relative to replacement. Future work will include an analysis of functional turnover to determine regional variation in extinction selectivity and the drivers of the turnover event.

Funding Sources: Tampa Bay Fossil Club, University of Florida (College of Liberal Arts and Sciences, Department of Geological Sciences, Land Use and Environmental Change Institute)

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Fossorial lizards (Squamata, Amphisbaenia) respond to climate change across the Paleocene–Eocene Thermal Maximum in the Bighorn Basin, Wyoming

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The Paleocene–Eocene Thermal Maximum (PETM; ~56 Ma) was an interval of global warming with temperatures rising ~5°C resulting from a rapid release of greenhouse gases into the atmosphere and can serve as a model for understanding vertebrate responses to rapid environmental change. Results from Species Distribution Models suggest that extant burrowing rhineurids are particularly sensitive to soil hydrology. Because of well-documented aridity changes across the PETM, we might expect to see a strong response among burrowing squamates, including amphisbaenians. Although mammalian and floral responses have been studied extensively in the Bighorn Basin (BHB) of Wyoming, the early Cenozoic fossil record of amphisbaenians has been limited because of their small size and lack of comparative framework. To address this, we used CT scans to generate a detailed comparative cranial and vertebral atlas for extant amphisbaenians allowing for study of amphisbaenian-bearing microsites from the BHB spanning the latest Paleocene (Cf-3), the PETM (Wa-0), and the earliest Eocene recovery interval (Wa-1). Two latest Paleocene localities immediately preceding the PETM yielded the youngest known occurrence of *Oligodontosaurus wyomingensis*, previously known only from jaws. Newly recognized vertebrae have neural arch linea characteristic of rhineurids, supporting referral of *Oligodontosaurus* to Rhineuridae. Six PETM localities yielded abundant vertebrae and jaws referable to *Anniealexandria gansi*, exhibiting vertebral morphology most consistent with that of Blanidae/Bipedidae. Two localities immediately following PETM yielded both large-bodied and small-bodied rhineurids, including a new species of *Spathorhynchus*. These records demonstrate family-level turnover associated with the PETM. Rhineurids dominate latest Paleocene (Cf-3) assemblages, are extirpated at the onset of the PETM, and reappear immediately following the PETM, whereas a taxon with closer affinities to blanids/bipedids is known only from the PETM interval. This pattern is consistent with modern distributions, where rhineurids occupy wetter subtropical-like environments and blanids and bipedids occur in comparatively warmer, arid regions. Additionally, *A. gansi* has been recovered from post-PETM localities in France, suggesting an intercontinental dispersal. These results represent the first documented squamate response spanning the PETM and the first associated evidence of family-level turnover in squamates.

Funding Sources: NSF Grants: EAR-0720268, EAR-0717892, EAR-0718740, EAR-0719941, EAR-0640076, EAR-2422839, EAR-2422838, EAR 2422840. BLM collecting permits: PA04-WY-113, PA10-WY-185.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

If these jaws could talk: Piecing together a new nyctithere (Mammalia: Nyctitheriidae) from North America, with implications for dispersal patterns in an enigmatic group of early Cenozoic mammals

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Nyctitheres are small, extinct insectivorous mammals known from the middle Paleocene to middle Oligocene (~61–28 Ma) of Laurasia. Known primarily from fragmentary fossil material and generalized "insectivore" dentition, evolutionary relationships and paleobiogeographic histories of nyctitheres remain relatively understudied since there have not been many robust phylogenetic analyses of nyctithere morphology. The oldest nyctitheres are known from the middle Paleocene of North America, but the nyctithere subfamily Asionyctiinae—which has been recovered as the basal lineage of nyctitheres in phylogenetic analyses—is only described from the late Paleocene of Asia (Gashatan Asian Land Mammal Age). Therefore, current phylogenetic hypotheses suggest nyctitheres originated in Asia and then radiated across North America and Europe.

Here, we describe five specimens from the Saddle Locality of Wyoming, USA (Tiffanian-2 North American Land Mammal Age), representing a previously undescribed species that closely resembles the morphology of asionyctiines such as *Asionyctia* in lacking a metaconid on p4 and *Edzenius* in possessing a p4 with a low paraconid. Older than all other known asionyctiine nyctitheres, the presence of this asionyctiine-like taxon in North America during the late Paleocene challenges the notion that nyctitheres originated in Asia. Rather, nyctitheres may have originated in North America and subsequently spread into Asia and Europe. Three total nyctithere taxa have been recovered from Saddle Locality, including the asionyctiine-like taxon. Future work will include these taxa in a phylogenetic analysis to assess their placement within Nyctitheriidae and evaluate hypotheses about nyctithere biogeography and evolution. This work expands the known diversity of nyctitheres near the beginning of their evolutionary history and provides new evidence for patterns of dispersal within the group.

Funding Sources: Bureau of Land Management Permit PA15-WY-234 and the David B. Jones Foundation

Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

Ailing tyrants: a quantitative survey of northern Laramidian tyrannosaurid pathologies

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An effective way to better understand an extinct animal's lifestyle and behavior is to study the diseases and injuries it accrues over its lifetime. This information can give context to not only an individual species or larger clade, but to overarching phylogenetic trends. The goal of this survey is to create a well-defined quantitative dataset of northern Laramidian tyrannosaurids which dominated the landscape during the Campanian and Maastrichtian. Data collection employed a veterinary primary survey to measure and compare pathological elements with non-pathological elements to form differential diagnoses. The types of pathologies used in the differential diagnoses could be broken up into major categories of diseases, including: trauma (injuries such as fractures), infection/inflammation, neoplasia (cancer), metabolic (such as gout), degenerative (osteoarthritis), and congenital. Data was collected and categorized by skeletal element for pathology type and frequency. A total of 913 tyrannosaurid skeletal elements from 31 individuals were used in the survey comprising albertosaurines and tyrannosaurines with the majority of specimens belonging to *Tyrannosaurus rex*. Out of the 913 elements, 75 elements were observed with pathologies. The data shows trends in the frequency of pathologies within different areas of the skeleton. The use of global (chi-squared test), diagnostic (standardized residuals),

and pairwise (Fisher's exact test) statistical analyses were employed to interpret trends in the data. By skeletal region, the cranial and axial regions showed statistical significance for pathology. Specifically, the mandibular elements showed overrepresentation of pathology, while the vertebral elements were underrepresented. Only three categories were assigned primary diagnoses: traumatic injury (47 primary diagnoses), infection/inflammation (23 primary diagnoses), and degenerative disease (5 primary diagnoses). Other interesting results from this research included stronger support for the protozoan infection *Trichomonas* over traumatic injury in tyrannosaur mandibles. Also, degenerative osteoarthritis was favored as a primary diagnosis in appendicular elements such as metatarsal V and the metacarpals, which is rarely observed in tyrannosaurids. Pathological frequency is remarkably similar across the genera and through ontogeny. These observed patterns give insight into the immunology, lifestyle, and behavior of the Tyrannosauridae.

Funding Sources: Graduate School at Montana State University Jack Horner Paleontology Scholarship

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Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Intrapopulation variability in the bony labyrinth of two wild pig (Suidae) species

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The bony labyrinth is a hollow cavity that encapsulates the inner ear. It has frequently been used in ecomorphological and phylogenetic studies, but some aspects are prone to intraspecific variation, particularly in slow moving taxa such as sloths. Ontogeny also affects this morphology. To better understand the range of variation present in wild pigs (Suidae), we investigated the intrapopulation variability of the bony labyrinth in two species, one extinct and one extant. Our sample consisted of 23 "*Kolpochoerus*" *phacochoeroides* specimens from the late Pliocene–early Pleistocene Ahl al Oughlam locality in Morocco and 21 wild *Sus scrofa* specimens from Tautavel, France. The *S. scrofa* sample comprises 8 males and 13 females, and 12 of the specimens were juveniles, allowing us to also test for ontogenetic and sex-based differences.

We used visual observation and 3D geometric morphometrics to study variation. The general morphology of the bony labyrinth was similar between the two species, but they were clearly separated along PC1 in the results of our principal component analysis. In general, *S. scrofa* had a longer cochlea and "*K.*" *phacochoeroides* had relatively larger semicircular canals. The posterior semicircular extended more ventrally and laterally in "*K." phacochoeroides*, whereas the lateral semicircular canal was slightly more elongate in *S. scrofa*. The anterior and lateral semicircular canals formed an approximately 90° angle in "*K.*" *phacochoeroides* while they were typically less than 90° in *S. scrofa*. "*Kolpochoerus*" *phacochoeroides* also had significantly more morphological disparity than *S. scrofa*. Within *S. scrofa*, sex- and age-based variation appear to be negligible; there were no significant differences in disparity, and all specimens occupied the same part of the morphospace. Most variation in "*K.*" *phacochoeroides* came from the amount of cochlear coiling, the angle between the anterior and posterior semicircular canals, and the length of the common crus, with a lesser extent being the amount of sinusoidal curvature in the anterior semicircular canal. The same was true for *S. scrofa*, indicating that the ways intraspecific variation manifest are similar in populations of both species. Documenting not just the presence of such variation but also its pattern across taxa is key to informing how bony labyrinth morphology should be used in ecomorphological and phylogenetic studies and for species determination in the fossil record.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Non-mammalian vertebrate microfossils from the Lower Cretaceous Gokwe Formation of Zimbabwe

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The Gokwe Formation, located in the Midlands Province of northwestern Zimbabwe, is a fluvio-lacustrine deposit that has been known to be productive for vertebrate fossils since the 1960s. Yet, because most of its hosted vertebrate remains are highly fragmentary and weathered, it has received little paleontological attention since the 1990s, with a limited understanding of its geologic age. Moreover, the majority of Gokwe vertebrate discoveries consist predominantly of larger, surface-collected remains. As such, its vertebrate faunal constituency is incompletely known. Here, we report preliminary results from our summer of 2025 field excursion to revisit exposures of the Gokwe Formation near Gokwe town, with the specific aim of screenwashing for vertebrate microfossils and collecting rock samples for geochronological analyses. A small population of Cretaceous-age grains (130.14 ± 3.5 Ma) from a pilot U–Pb detrital zircon geochronology analysis supports an Early Cretaceous or younger age for the upper White Sandstone Member of the Gokwe Formation. We bagged and underwater screenwashed ~200 kg of deflation lags from ledge-forming rip-up clast conglomerates in the White Sandstone Member, which were the predominant vertebrate-hosting facies in the area. The coarse fraction of the washed matrix was sorted in the field, with the fine fraction picked in the laboratory at the University of Michigan. Although much of the surface float is fragmentary and unidentifiable, the screenwashed sediment is producing an array of relatively well-preserved vertebrate microfossils. Consistent with previous studies of the Gokwe Formation, we have recovered teeth from large theropods (e.g., abelisaurids—large denticles and without wrinkled enamel), bone fragments from titanosaurians, teeth and osteoderms from crocodyliforms, and two turtle taxa (indicated by shell fragments with distinctly different ornamentation). New to the Gokwe Formation record, however, are: amiiform fish, represented by two tooth crowns with keeled ridges; ?cladistian fish, represented by an enameled midline scale; squamates (?Paramacellodidae), represented by thin, keeled osteoderms and two dermal/cranial elements; ?Hybodontiformes, represented by protruding dermal denticles; and two, likely different, unidentified taxa known from tubular teeth with sloping wear facets. This short field excursion and focused effort on microvertebrate site development constitutes proof of concept.

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

A light in the night, or just a photon in the dark? Predicting fossil primate activity pattern from relative depth of the maxilla

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Among primates there is a well-established relationship between relative orbit diameter and activity pattern (AP). Nocturnal primates have relatively large orbits while diurnal primates have relatively small orbits. Relative orbit diameter has thus been used to infer AP in extinct taxa. Unfortunately, this method of inferring AP is inadequate for many fossil specimens due to a dearth of fossil crania with well-preserved orbits. Accordingly, many questions remain about the evolution of AP in primates, including the plesiomorphic condition for crown primates and the timing of the transition to diurnality in haplorhines. Here, I introduce a novel metric for predicting AP in fossil primates based on maxilla depth relative to molar area. My analysis of 930 individual crania of 151 extant primate species, (including most strepsirrhine genera, all tarsier genera, and most anthropoid genera) shows that among extant taxa, diurnal and nocturnal primates exhibit consistent differences in the relationship between maxillary depth versus maxillary molar area. Linear models

show that there are significant relationships between maxillary depth and both eye and orbit diameter. Bivariate plots of maxillary depth and molar area show that diurnal species tend to have relatively deep maxillae, while nocturnal species tend to have relatively shallow maxillae. Cathemeral species are indistinguishable from diurnal species. A random forest classification analysis was conducted to make predictions of AP of fossil specimens from measures of maxillary depth and molar area. Accuracy rates of the models range from 3.12%–7.02%, with most of the error from misclassification of cathemeral specimens as diurnal. Application of the random forest models to fossil specimens supports previous findings for most taxa that AP has been previously inferred based on relative orbit diameter (except *Catopithecus browni*). The random forest analysis finds that most omomyids (except *Hemiacodon*) are predicted to be nocturnal. Most stem and crown anthropoids and adapids are predicted to be diurnal, except for the oligopithecid *Catopithecus browni* and the adapid *Cantius ralstoni*. Prediction of *Catopithecus* as nocturnal deviates from previous inferences made from estimates of both orbit diameter and skull length from crushed crania. The data provided here for one of the most basal and earliest occurring adapids *Cantius ralstoni* as nocturnal provides new evidence for a nocturnal origin of primates.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

A preliminary taphonomic analysis of Early Cretaceous (Aptian–Albian) Antlers Formation fossil sites

Garrett A. Rogers[1], Katharine Loughney[1]
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The Trinity Group of Texas, Oklahoma, and Arkansas offers an intriguing opportunity to examine Early Cretaceous coastal ecosystems in the United States. Within Texas, the Trinity Group consists of the Twin Mountain, Glen Rose, and Paluxy formations, with the Antlers Formation being a lateral equivalent of the Texas formations located primarily in Oklahoma. The Antlers Formation represents fluvial, deltaic, and strand plain environments occurring within a transgressive–regressive sequence during the expansion of the Gulf of Mexico and Atlantic Ocean. The taphonomy of individual specimens and sites in the Antlers Formation has been previously evaluated but a formation-wide comparison of taphonomic characteristics has not yet been conducted. Antlers Formation sites produce organisms of varying size, ranging from mammals to large dinosaurs that inhabited terrestrial and freshwater to marginal marine environments. Preliminary findings show that teeth and jaw fragments of triconodont and multituberculate mammals, crocodyliforms, lissamphibians, chondrichthyians, and pycnodont and ceratodontid fish make up most of the material, typical of Early Cretaceous microsite assemblages. Testudines shell material and osteichthyan scales are extremely abundant at sites as well. Dinosaur and pterosaur material display varying levels of weathering, abrasion, and crushing, with concentration and condition of site material possibly varying per stratigraphic location. Post-cranial dinosaurian material is dominated by ornithopod and sauropod elements, which display lower quality preservation than microvertebrate material. Sauropod limb bones display higher degrees of rounding, abrasion and fragmentation. Ornithopod material varies in condition from moderately abraded, angular bone to heavily abraded and uniformly rounded. Articulation is observed in both ornithopod and sauropod material. The taphonomic features of aquatic, semiaquatic, and terrestrial faunas in Antlers assemblages help paint a picture of the accumulation processes in Mesozoic coastal ecosystems. This work also increases our understanding of the paleoenvironmental context of the Antlers Formation, allowing comparison to other Early Cretaceous faunas, such as the Cloverly Formation.

Funding Sources: Watershed Studies Institute

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Calibrating the Campanian (Late Cretaceous) terrestrial fossil record of the Western Interior

Basin: Insights and updates from the Two Medicine and Judith River formations of Montana

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Continental strata of Campanian age in the Western Interior Basin of North America are ideally suited for long-time frame studies of vertebrate faunal change, particularly in relation to dinosaurs, which exhibit peak diversity during the Campanian, and mammals, whose distinctive teeth are abundantly represented in many Campanian microvertebrate localities. Over the past several years, a focused collaborative effort to date and correlate Campanian continental units using CA-ID-TIMS U–Pb geochronology has resulted in a calibrated stratigraphic framework that advances efforts to document patterns of faunal change and evaluate evidence of paleobiogeographic provinciality. Two richly fossiliferous units in Montana that span ~8 million years of Campanian time were included in this collaborative geochronological endeavor: the Two Medicine Formation (TMF) of northwestern Montana and the Judith River Formation (JRF) of north-central Montana. A stratigraphic model developed in the TMF–JRF record based on shifts in facies architecture, which are linked to basin-wide changes in accommodation, allows for more precise correlation between the two units within Montana. A through-going discontinuity that punctuates the TMF–JRF interval referred to as the "Judith River–Belly River discontinuity" extends to southern Alberta and Saskatchewan and allows for correlation and comparison with world-renowned fossil occurrences in the Oldman and Dinosaur Park formations.

Different modes of fossil preservation and uneven sampling intensities characterize the units under consideration, and this, in turn, has led to different reconstructions. For example, four newly calibrated dinosaur assemblage zones are recognized in the Campanian record of southern Canada, with durations of ~700–600 kyr or less. These assemblage zones are characterized by numerous discrete occurrences of well-diagnosed specimens. Dinosaur occurrences in the correlative TMF and JRF also exhibit stratigraphic distributions suggestive of potential biozonation, but arguably, too few stratigraphically discrete occurrences are currently documented to establish comparable assemblage zones. This new suite of high-precision CA-ID-TIMS U–Pb ages also bolsters efforts to refine and objectively correlate Late Cretaceous North American Land Mammal Ages (NALMA). NALMAs can now be more effectively integrated with other terrestrial biochronologic records, including the aforementioned dinosaur assemblage zones and pollen biozones.

Funding Sources: Funding: U.S. National Science Foundation EAR 1424892

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Reexamining chondrichthian species variation in Maastrichtian–Thanetian Hornerstown and Vincentown Formations at the Edelman Fossil Park in Mantua, New Jersey

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The Inversand Company Mine (now the site of the Edelman Fossil Park & Museum quarry) was an active open-pit glauconite mine from the 1920s until 2016. Mining operations exposed multiple strata, including sections of the Vincentown, the Hornerstown, and uppermost sections of the underlying the Navesink Formations. These formations represent a gradually receding sand-dominated shallow marine setting deposited across the Cretaceous–Paleogene (K–Pg) mass extinction. The Navesink Formation occurs throughout New Jersey, and one of the more common shark fossils recovered from this formation include *Scapanorynchus* (goblin shark) teeth. These are elongated narrow teeth with distinct striations found running vertically on the lingual side. Recently, teeth morphologically similar to goblin sharks have been found in NJ strata;

however, close inspection of these teeth suggest they may belong to the genus *Striatolamia*, an extinct relative of sand tiger sharks. This genus is common in later Paleocene and Eocene strata, with current research placing their origins around the end of the Danian. The potential presence of this shark within the Lower (Danian) Hornerstown Formation of the EFM quarry suggests that these sharks might have first appeared much sooner after the K–Pg than previously thought. Nine teeth have so far been collected from the EFM quarry, with one additional nearby tooth found in another Hornerstown locality along a tributary of Big Timber Creek in Camden County, New Jersey. Teeth from the EFM tend to be tan in coloration with most missing their roots, while the tooth found in Camden County was much darker in color. The anteriorly positioned teeth have elongated crowns and strong striations on the lingual side with a recurve of most blades present. Three of the teeth, likely being laterally positioned, are mesio-distally wider with weaker striations not extending the full blade surface. Two of the three teeth with near complete roots have cusplets proportionally small compared to tooth size and morphologically consistent with *Striatolamia*. If the majority of these teeth morphotypes belong to *Striatolamia*, it is possible this genus could have overlapped with shallow water goblin sharks like *Scapanorhynchus*, potentially competing for niche space as both populations tried to survive in the marine ecosystems following the K–Pg mass extinction.

Funding Sources: Edelman Fossil Park & Museum of Rowan University

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Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Revealing sauropod turning, gauge variability, and lateralized gait at the West Gold Hill Dinosaur Tracksite, Upper Jurassic Bluff Sandstone, Colorado, USA

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The West Gold Hill Dinosaur Tracksite, in the Upper Jurassic Junction Creek Member of the Bluff Sandstone near Ouray, Colorado, preserves an exceptionally long sauropod pes trackway with a near-complete looped turn. Earlier work described only five short acetate-traced segments, leaving trackway-wide variation in turning, gauge, and gait unresolved. We reanalyzed the full succession using UAV photogrammetry, digital landmarking, and scripted per-step spatial analysis. Of 134 footprints previously reported, 131 were confidently identified along a 95.5 m path. The trackway forms a near-complete anticlockwise loop of approximately 340º. Conventional end-to-end tortuosity, calculated as direct distance divided by path length, produced a moderate value of 0.462. By contrast, incremental tortuosity analysis isolated a fully looped subsection between tracks 38 and 83, where direct distance was only 5 mm over a 34.825 m path, giving a tortuosity value of 0.0001. This demonstrates that global tortuosity can obscure extreme local curvature in long trackways.

Gauge also varied substantially within the same trackway. Using a single representative pes width, gauge averaged 32.2%, consistent with wide gauge; however, footprint-specific gauge ranged from 23.1% to 71.0%, spanning wide, medium, and narrow classes. This variability cautions against treating gauge as a fixed trackmaker attribute or as a sole ichnotaxonomic criterion.

Significant lateral asymmetry was detected between and left and right sides. Left-to-right paces and steps longer by 3 cm than right-to-left equivalents ($p = 0.001$ and $p = 0.008$), central trackway width was greater ($p = 0.043$), and pace angulation was lower ($p = 0.040$). These patterns are consistent with modest right-side load avoidance during walking akin to a limp, although habitual laterality remains a viable alternative. The trackmaker was a small sauropod, with an estimated hip height of 1.47 m, moving at a walking gait. The West Gold Hill trackway shows that full-sequence digital analysis can reveal

behavioral signals—turning dynamics, gauge variability, and lateralized gait—that are diluted or missed in segment- and average-based ichnological assessment.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

The mechanics of plain field and computed tomographic radiography, semantics, and misconceptions in their application to analyses in the paleontological record

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Application of radiologic techniques to paleontological specimens has become common practice and routine utilization is recommended. As with any technique, it is helpful to understand the technical principles and premises upon which their application is based. Different tissues can be distinguished according to how they block (attenuate) x-rays. Penetrating an object with an x-ray beam requires that a sufficient number of x-ray photons penetrate the object to expose the detector. Voltage (KVP) determines the intensity of the x-ray beam and its ability to penetrate the specimen. The current-time index determines the number of photons and therefore the radiation exposure. Photon-responsive screens magnify cathode ray tube effectiveness tenfold. All x-ray photons do not penetrate the specimen. Some are deflected. These deflected x-ray photons may still strike the film, but in a position disparate from the x-ray beam projection. This results in a fogged or distorted image. The advantages of plane film radiology are its greater accessibility (even can be performed fluoroscopically in real time) and resolution. CT can perhaps resolve to 0.5 to 0.75 line pairs/mm, contrasted with 2.5 to 4.0 line pairs/mm with standard x-rays. Plain film (film-screen as opposed to cardboard technique) radiography potentially offers tenfold augmented resolution beyond that available by standard CT. Density and contrast can be altered subsequent to image procurement with CT; window settings and resolution, not so much and limited by pixel size (especially with reconstruction). As the latitude of shades available on a CT monitor are limited, the "grayscale" can be set to "window" the desired range (that which gives the best resolution of the area of interest). However, artifacts persist: Beam hardening and photon starving that produce streaks and partial volume averaging which actually creates erroneous images. One of the challenges of incorporating techniques developed by other specialties relates to the language common to both, but with very different connotations. Exemplified by spiculated periosteal reaction, medical application describes phenomenon present on top of cortical bone. The term spiculated reaction has been applied paleontologically to a phenomenon occurring within cortical bone. The former describes a pathologic condition; the latter, physiologic. Conversancy with technology and shared, though not necessarily equivalent, vocabulary is the goal.

Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

A comprehensive revision of North American ornithomimid taxonomy reveals new insights into the evolutionary relationships of Ornithomimidae and Ornithomimosauria

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Ornithomimids have been found in the Cretaceous deposits of North America for more than a century. While periodic new discoveries have shed light on the diversity of North American ornithomimosaurs, the alpha taxonomy remains uncertain. Since *Struthiomimus altus* was originally named as a species, it has not received a comprehensive osteological description. In order to remedy this discrepancy, the hypodigms of *Ornithomimus* and *Struthiomimus* are reevaluated through an extensive anatomical survey of sampled ornithomimid material. The anatomy of *Struthiomimus altus* is revisited, and new diagnostic characters are identified to distinguish it from other ornithomimid genera. To further clarify the evolutionary relationships of ornithomimids and ornithomimosaurs, a cladistic analysis was done using a newly developed character matrix of 140 morphological characters. A diversity of new

ornithomimosaur OTUs that were previously unevaluated were included in the analysis. Within the hypodigm of *Struthiomimus*, a probable species complex was identified within the genus. A stratigraphically distinct species of *Struthiomimus* from the Horseshoe Canyon Formation of Alberta is recognized that differs from *S. altus* in cranial and postcranial characters. "*Struthiomimus*" *sedens,* which is often regarded as a separate species of *Struthiomimus* from the late Maastrichtian deposits of North America, is also recovered as a new genus based primarily on unique cranial characters as well as differences in forelimb anatomy. In our reappraisal of *Ornithomimus* taxonomy, *Dromiceiomimus brevitertius* is a valid taxon that is distinct from *Ornithomimus edmontonicus* based on an array of cranial and postcranial characters. Based on cladistic analysis, *Struthiomimus* is recovered in a clade with *Dromiceiomimus* and an unnamed ornithomimid from the Dinosaur Park Formation. *Ornithomimus* is recovered in a novel clade with *Rativates evadens* and an unnamed ornithomimid from the Kaiparowits Formation of Utah. Ornithomimids were present in North America earlier than previously thought, based on a Coniacian-age specimen from Utah, recovered as an early-diverging ornithomimid. Additionally, ornithomimids and ornithomimosaurs likely had a more complex evolutionary history than currently believed. Our results add to the broader framework of understanding North American ornithomimids during the Late Cretaceous period and clarify our understanding of the evolution of these unique theropods.

Funding Sources: Canada Graduate Scholarship - Master's (NSERC)

Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

Protracted dental replacement and life history across the mammaliaform transition

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Living small-bodied mammals experience rapid life histories over short lifespans, with somatic maturity and diphyodont replacement of teeth attained well within the first year of life. Although miniature sizes were the predominant Bauplan for Mesozoic mammaliaforms, it is unclear whether this was due to similar growth trajectories and related life history traits. Evidence from fossilized dental cementum (the bony attachment tissue between tooth roots and the periodontal ligament) suggests that mammaliaforms (stem mammals) and early crown mammals were physiologically different to extant taxa, with longer lifespans, lower growth rates, and a more protracted life history. Here we use synchrotron radiation x-ray tomography (SRXTM) to resolve dental cementum records preserved circumannual cementum increments in teeth of both taxa along their respective tooth rows in two derived probainognathid cynodonts that evolved proximal to, but predating, the Mammaliaformes node: *Brasilodon quadrangularis* and *Riograndia guaibensis* from Late Triassic Brazil. Specifically, we test whether the different physiological life history in mammaliaforms reflects a departure from previous patterns of physiological refinement across non-mammaliaform synapsids or a lower than previously expected physiological baseline across preceding cynodonts. Counts of increments along the tooth row suggest an unexpectedly slow replacement rate in these polyphyodont (multiple replacement teeth) taxa, with high increment counts (as much as five years for Riograndia and six years for Brasilodon) and differences of up to three years between anterior and posterior teeth. In-line with previous findings based on relative replacement patterns, we find a posterior-to-anterior replacement pattern. But such prolonged

rates of replacement across multiple radiations of teeth suggest extended longevity and an anomalous life history schedule to comparably sized living mammals. These results indicate that extended lifespan and slow life history were not unique innovations of Mammaliaformes but were already present among closely related non-mammaliaform probainognathids. Our results suggest that long lifespan and reduced growth rates thus appear to have preceded the origin of definitive mammaliaforms and that miniaturization was not associated with the development of rapid life histories characterized by extant small-bodied mammals, but instead with reduced chronological growth rates over long lifespans.

Funding Sources: Natural Environment Research Council (NERC) NE/K01496X/1

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

An articulated mammal postcranium from the late Early Miocene of the Chucal Formation, northern Chile

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The South American mammal record of the late Early Miocene is well-sampled in high latitudes, due largely to the abundantly fossiliferous Santa Cruz Formation (SCF) of Argentina and its temporal equivalents in Chile. Faunas of this age from the northern two-thirds of the continent remain poorly understood, however, obscuring how mammal communities differed across these regions. Chucal in northern Chile (~18°S), approximately 3,500 km N of SCF localities (~47°S), is one of the few late Early Miocene sites from lower latitudes of South America. Member M3 of the Chucal Formation, a green mudstone deposited in a fluvio-lacustrine environment, has yielded specimens of small-bodied mammals and frogs almost exclusively. Nearly 90% of its identified mammal specimens pertain to the chinchillid rodent *Miochinchilla surirense*. Most specimens are craniodental, but some disarticulated postcrania have been described. Here, we describe an articulated partial skeleton from Member M3 (SGOPV 4125), which includes the posterior vertebral column, pelvis, partial left and largely intact right femora, right tibia and fibula, both calcanei, various tarsals, most metatarsals, and assorted phalanges. A computed tomography (CT) scan (imaged at the American Museum of Natural History MIF) was used to study this specimen non-invasively. Because SGOPV 4125 lacks teeth, femur length (30.6 mm) was initially used to narrow possible candidate taxa by body size. This value is similar to that of the extant rodents *Microcavia niata* (34.1 mm) and *Ctenomys opimus* (30.9 mm), suggesting it represents a species of 200–300 g and ruling out referral to the most common taxon in Member M3, the larger *M. surirense* (47.4 mm). Elsewhere, late Early Miocene terrestrial mammals of this size are limited to Rodentia, Paucituberculata, and Microbiotheria. The morphology of the calcaneus, which bears a relatively short and broad body, nearly confluent ectal and fibular facets, square and prominent peroneal and sustentacular processes, and an angular calcaneo-cuboid facet, suggests that it pertains to a rodent. Two octodontoid species have been reported from Chucal, to which the specimen might pertain. Few postcranial remains of small rodents have been described from the late Early Miocene, and to our knowledge, these are the first articulated remains reported. Further analysis of this important specimen should provide insights into the systematics, biogeography, and functional morphology of this taxon.

Funding Sources: US National Science Foundation grant DEB-0317014 (to JF and AW), with additional support from our home institutions and the Field Museum

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Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

The evolution of the reptile palate

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The osseous palate is a major structure of the amniote skull that separates the oral and nasal spaces and is essential to both respiration and feeding. In synapsids, the evolution of the palate is well-known to have taken a linear trajectory involving formation of the secondary palate and loss of separate ossifications. Despite two centuries of anatomical work, however, a comparable understanding has not been reached for reptiles, with prior studies limited to discussion of clade-specific features.

Here I present a comprehensive study of the evolution of the reptile palate. This effort employs analysis of an unprecedented sample of manually segmented palatal complexes from both extant (n = 313) and extinct (n = 309) reptile species. The palates of hundreds of extant species and dozens of fossil species were figured and reconstructed for the first time in the course of this work. Qualitative morphological analysis of all taxa was paired with quantitative 3D geometric morphometric analysis of a subset of representative palates.

I discovered that, in sharp contrast to the early-canalized palates of synapsids, reptiles have repeatedly evolved highly divergent palatal morphologies. Radical and convergent reorganizations of the palate, which I hypothesize have been driven by both dietary and respiratory evolutionary pressures, have been remarkably commonplace in reptilian evolutionary history. For example, such pressures appear to have driven the independent evolution of divergent secondary palate types amongst nearly a dozen lineages. Likewise, repeated losses of elements of the palatal complex have been rampant, with numerous (>50) instances of the loss of palatal teeth and several losses of the ectopterygoid occurring across the reptilian tree.

Taken together, these findings reveal that the striking lability of the ancestral reptilian palate enabled selective pressures to drive a wide array of disparate evolutionary paths in reptilian palatal morphology. Targeted investigation of these myriad trajectories will illuminate not only the evolution of respiratory and feeding function in the reptile tree but also will help to resolve longs-tanding phylogenetic questions in lepidosaurs, crocodilians, and paravian dinosaurs. This unprecedented dataset, made available as a resource to the paleontological community, will serve as a beachhead for years of future investigation into this previously underappreciated aspect of reptilian morphology.

Funding Sources: Yale Institute of Biospheric studies small grant

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A new ornithopod with possible elasmarian affinities from the late Aptian Chickabally Member of the Budden Canyon Formation represents the first dinosaur from northern California

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Elasmaria is a clade of small to medium-bodied ornithopod dinosaurs found only in Gondwanan strata. Thus far, the northernmost report of an elasmarian is *Tietasaura derbyiana* from Bahia State, Brazil. Here, we report an ornithopod (SC VRO4) with possible elasmarian affinities from the late Aptian Upper Chickabally Member of the Budden Canyon Formation in Shasta County, California. This represents one of the only reported dinosaur fossils from northern California, and the first Early Cretaceous dinosaur from the state. SC VRO4 is represented by a tibia, fibula, and partial pes. While material is sparse, it is exceptionally well preserved, with little to no taphonomic distortion and minimal erosion. A preliminary phylogenetic analysis recovers it as the sister taxon of *Talenkauen santacrucensis* within Elasmaria. A position within Elasmaria is supported within the analysis by the lateral condyle of the tibia being subequal to or larger than the posterior condyle, and phalanges which are short but uncompressed (both shared with *Talenkauen* and *Isasicursor santacrucensis*). A close relationship with *Talenkauen* is further supported by a flat or

convex proximal surface of the tibia and a distal tibia which is considerably less expanded than the proximal tibia. Additionally, it shares with *Talenkauen* an unusual combination of pedal phalange proportions, with a robust but relatively long PIII-1 alongside a markedly shortened PIII-3.

Early results suggest that this position is relatively consistent across multiple independent analyses, but we plan to code this specimen in additional phylogenetic matrices under Parsimony and Bayesian models in order to confirm these results. Furthermore, we plan to perform multiple statistical analyses to test the validity of some proposed autapomorphies of Elasmaria. If a position within Elasmaria holds true, this specimen would be the northernmost occurrence of the clade, and the first outside of Gondwana, potentially extending the range significantly. Regardless of its phylogenetic affinities, SC VRO4 is a highly important specimen in understanding the Mesozoic fauna of the westernmost extents of North America, particularly during the Early Cretaceous.

Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

Nondestructive collagen prescreening using near-infrared spectroscopy and ethical destructive sampling in the late Quaternary of North America

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In North America, poor collagen preservation in Late Pleistocene and Holocene bone, dentin, antler, and tusk has impeded radiocarbon dating, stable isotope analysis, and, more recently, paleoproteomic work. The burgeoning field of paleoproteomics has driven a notable increase in destructive sampling requests received by museum professionals, yet those professionals have few reliable tools to evaluate the preservation state of a bone when considering such requests. Near-infrared spectroscopy is a nondestructive, rapid, and portable technique that can be implemented on a large scale to quantify the amount of remaining collagen in a specimen, informing sampling decisions. The primary advantage of near-infrared spectroscopy over other spectroscopic techniques is the penetration depth of near-infrared light, which reaches up to one centimeter into a matrix compared to microns in Fourier transform infrared spectroscopy. Here, we discuss the use of a portable desktop LabSpec 4 Standard Resolution Near-Infrared Spectrometer outfitted with a fiberoptic probe, which measures reflectance from 350–2500 nm in approximately 3–5 seconds. Near-infrared spectroscopy has been applied to Late Pleistocene and Holocene specimens from Africa, Eurasia, North America, and South America as a prescreening tool and is currently being used to identify well-preserved specimens for building a robust radiocarbon chronology of the North American Late Pleistocene megafaunal extinction. Spectra collected during this project are archived and shared with contributing museum professionals, documenting the preservation of specimens and creating a resource for future visiting researchers. Incorporating nondestructive near-infrared prescreening into destructive sampling workflows benefits both external researchers and museum professionals alike, as finite funding is concentrated on well-preserved specimens, destructive analyses are more likely to yield results, and unnecessary destructive sampling is reduced, protecting the collections for future study.

Funding Sources: The Wenner Gren Foundation; the Leakey Foundation

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Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14,2026, 8:00 AM)

The art of field notes: the need for analog records in a digital world

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Field notes are critical to the chain of custody in paleontological collections management. Field notes bridge the relationships among fossil,

geologic, and geographic data, and also connect collecting events to the legal permission to collect. Complete field notes are more than a geographic point record. Stratigraphic position and rock descriptions are critical data. Stratigraphic positions measured against a benchmark and rock descriptions sufficient to distinguish fossil-bearing rock from other units should be enough to reidentify a collecting site. Born-digital geographic data (photographs, GPS) improve field data quality but should not replace written field records. Data should be checked and vetted for accuracy. Errors with settings and calibration of a GPS device, for example, can produce spurious data. Best practice for GPS is that digital data are downloaded, sites are plotted using those recorded coordinates, and the resulting map's accuracy is then confirmed by field collectors. Written field records augment GPS and other digital data by providing context. Good field notes include small narratives of events, personalities, and other items of human interest outside of the confines of geological science. Those contextual clues in field narratives can later help connect partial field data collected by different field crew to paint a more complete picture. Field narratives can provide reasoning for decisions made in the field, observations not directly related to collecting sites, suggest promising areas for future work, and other geologic insights.

When fossils are collected for a repository, there should be associated field notes for each locality. Those field notes belong with the fossil, not the fossil collector. Best practice would have copies of field notes sent daily to the fossil repository, and the physical field notebooks archived in the fossil repository at the end of the field season. This redundancy of physical records and digital information provides both corroboration of site data and independent mechanisms for backing up critical data. Professional paleontologists often bring aspiring paleontologists into the field. The responsible educator should set an example by properly recording data with new and standard methods. Such training provides future paleontologists with a full suite of tools to collect quality data regardless of the technology at hand.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

New titanosaurian remains from the Upper Cretaceous Quseir Formation of Egypt and implications for sauropod morphology and diversity in North Africa

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The Upper Cretaceous (Campanian) Quseir Formation in the Egyptian Western Desert has yielded key titanosaurian dinosaurs, including *Mansourasaurus shahinae* and *Igai semkhu*. However, anatomical overlap among named Quseir titanosaurs remains limited because their holotypic materials are fragmentary and largely non-equivalent. Previous work has also reported isolated titanosauriform and titanosaurian elements, but these specimens provide limited insight for assessing diversity within the unit. We describe new and associated titanosaurian remains from a recently discovered Quseir Formation locality near Kharga Oasis. The material includes a large, nearly complete femur, with a total preserved length of 118 cm, representing the most complete sauropod femur yet reported from the Quseir Formation, and a well-preserved scapulocoracoid that constitutes the most complete sauropod pectoral girdle material known from the unit. The femur exhibits mediolaterally expanded proximal and distal ends, a pronounced lateral bulge, an eccentric shaft cross-section, and a reduced, posteromedially positioned fourth trochanter. These features support referral to Titanosauria. The scapulocoracoid preserves much of the scapular blade, including its posterior termination, a region not preserved in known *Mansourasaurus* material. The scapula and coracoid are unfused, and the coracoid foramen is fully enclosed by bone and positioned anterior to the scapulocoracoid suture. Comparisons with *Mansourasaurus* and *Igai* reveal broadly similar coracoid morphology, particularly in the form and

position of the coracoid foramen. Reexamination of the *Mansourasaurus* coracoid indicates that the foramen does not contact the scapulocoracoid suture, contrary to previous interpretations, and is fully enclosed by bone, as in *Igai* and the new specimen. The preserved scapular blade resembles the corresponding region in *Mansourasaurus*, whereas the newly preserved posterior end provides novel information on scapular proportions in Quseir titanosaurs. The large size of the femur and scapulocoracoid indicates an individual broadly comparable in size to *Igai* and distinctly larger than *Mansourasaurus*. These remains expand anatomical overlap among Quseir titanosaurs and provide new data for refining interpretations of titanosaur morphology in the formation. However, additional overlapping material is needed to determine whether the new specimen pertains to *Igai*, *Mansourasaurus*, or a third, as-yet unnamed taxon.

Funding Sources: Mansoura University (Fieldwork grant 2024); Ohio University (OURC/Baker Fund 2025)

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Systematics and paleoecology of extraordinary new embrithopod fossils (Mammalia, Afrotheria) from Gorongosa, Mozambique

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Mammalian fossils recovered from estuarine sediments in the Mazamba Formation in Gorongosa National Park comprise an afrothere assemblage including hyraxes, embrithopods, and a sirenian. Embrithopod skull, teeth, and postcrania are the most common elements in this assemblage. Morphometric study of the new embrithopod specimens, in comparison with embrithopods from Afroarabia and Eurasia, identifies two species, *Namatherium blackcrowense*, and *Arsinoitherium* sp. from a higher level in the sequence. Arsinoitheres were widely distributed throughout Afroarabia during the late Eocene–Oligocene with a last appearance at 27–24.5 Ma at Losodok, Kenya; namatheres were previously reported only from the biochronologically-dated Middle Eocene site of Black Crow, Namibia. Namatheres dominate the Gorongosa embrithopod sample and include a remarkable collection including elements unknown in the Black Crow sample, such as anterior premolars, canines, incisors, and the first dentaries and lower dentition of *N. blackcrowense*, confirming a dental formula of 3.1.4.3, present in all embrithopods. Unworn incisors exhibit distal series of tubercles also seen in Eurasian Eocene-aged palaeoamasids and a size progression of I/i1 > I/i2 > I/i3 typical of other embrithopods. Cranial remains of Gorongosa namatheres closely resemble Black Crow specimens with a flared zygomatic. Namatheres share with palaeoamasids the retention of protocones, brachyodonty, strong incisor size heteromorphy, ornamentation, a styliform configuration, a hypoconulid lobe, and overall premolar and molar morphologies. They share with arsinoitheres inferred possession of cranial horns, loss of independent hypocones, loss of upper molar centrocrista, a weak paroccipital process, foramen magnum formed dorsally by exoccipitals, and features of the ear region. Thus, namatheres are included in Arsinoitheriidae but are more primitive (smaller and less hypsodont). Phylogenetic study indicates that namatheres are stem arsinoitheriids with palaeoamasids and stylolophids (Early Eocene, Africa) as successive embrithopod outgroups to arsinoitheriids. Although it has been hypothesized that arsinoitheres fed on specific parts of plants, perhaps bulky fruits, a browsing, folivorous diet can be inferred from the low-crowned molars of namatheres with their transverse lophs and shearing crests.

Funding Sources: Paleo-Primate Project Gorongosa, ICArEHB-Interdiscipl. Center for Archaeol. and Evol. of Human Behav. (Portuguese Foundation for Sci. and Technol., UIDP/04211/2020)

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Dietary adaptations of sympatric large herbivores across the Mio-Pliocene boundary at Lothagam (West Turkana, Kenya)

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The expansion of C_4-dominated environments during the Late Miocene and early Pliocene marked a profound transformation in the structure of eastern African terrestrial ecosystems. Numerous studies have shown that many families of large eastern African mammalian herbivores adopted C_4 diets during this time, including those from the Lothagam sequence (West Turkana, Kenya), which spans the Late Miocene to the Pliocene (~7.5 to 3.5 Ma). However, our understanding of how ecosystem changes influence herbivore community ecology, including resource competition, adaptation to vegetation changes, and coexistence strategies, remains limited. Here, we investigate the relationship between body size, dietary ecology, and dietary shifts in large herbivores at Lothagam from the Late Miocene to early Pliocene. We combined carbon stable isotopes ($\delta^{13}C$) of tooth enamel with reconstructed body mass to test two hypotheses: (1) herbivores partitioned their niches by body mass within grazing, mixed-feeding, and browsing dietary guilds, and (2) herbivore taxa displayed significant shifts towards greater C_4 consumption through time. Our findings indicate significant diet overlap across body masses, with no significant relationship between body size and diet among Lothagam herbivores as predicted by ecological theory (e.g., Jarman–Bell). Several taxa show significant dietary changes at the Mio–Pliocene boundary, but the direction of change varied. The rhino *Ceratotherium* and suid *Nyanzachoerus syrticus* increased their reliance on C_4 grasses in the early Pliocene, whereas Bovini consumed more C_3 vegetation in the Pliocene than in the Late Miocene. These shifts in $\delta^{13}C$ values are interpreted as a complex dietary response reflecting evolutionary strategies among herbivore lineages to minimize competition following significant turnover in vegetation structure that began in the Late Miocene.

Funding Sources: Graduate Research Support Program (GSG) at ASU

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Maximizing fossil yield by minimizing concentrate: a chemical process to remove diagenetic selenite from screenwash concentrate from the Upper Triassic Downs Quarry (Adamanian) of Arizona

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Screenwashing fossiliferous sediments is one of the best ways to recover tiny fossils (e.g., microfossils/vertebrate microremains/microvertebrates), but not all rocks are amenable to breakdown in water alone. We are working with concentrate collected by the Field Museum in 1983 from the Upper Triassic (Adamanian) *Placerias*/Downs' quarry in Arizona, arguably the most productive Triassic locality in North America. We have >50 kg of screenwash concentrate that includes abundant selenite (K_2SO_4). Through diverse protocols, we tried to optimize the selenite dissolution, with minimal risk to the fossils. Visual analysis indicated that the concentrate contains ~37% selenite ($CaSO_4$), so removing it would reduce volume, and thus picking time, by ~35%. We developed protocols for screen washing 100 g batches of concentrate in DI H_2O (control), 5% NaCl, 10% NaCl, and 5% K_2CO_3 (potassium carbonate) solutions, each for 3–4 wash and dry cycles. The K_2CO_3 treatment is clearly superior, removing ~50% of the concentrate after 4 cycles compared to ~20% for the others. We suspect that all treatments reduced ~20% of the concentrate that was clay minerals and that the K_2CO_3 removed another ~30% of the selenite. None of the treatments appear to have damaged the fossils. The K_2CO_3 treatment also bleached the unfossiliferous concentrate white, in contrast to the

black fossils. Thus, we expect picking to go more than twice as quickly.

The K_2CO_3 process is a simple displacement reaction—the K_2CO_3 dissolves, causing the selenite to go into solution. The reaction forms potassium sulfate as an aqueous product and calcium carbonate as a precipitate: $K_2CO_3(aq)+CaSO_4(s)->K_2SO_4(aq)+CaCO_3(s)$. The process requires a dilute acetic acid (vinegar) rinse between washes, where the $CaCO_3$ and acetic acid react and produce aqueous calcium acetate and aqueous bicarbonate ions: $CaCO_3(s)+CH_3COOH(aq)->Ca(CHCOO)_2(aq)+HCO^-_3(aq)$. Because calcium sulfate (136 g/mol) and potassium carbonate (138 g/mol) have nearly identical molecular weights, the selenite dissolved in each cycle should match the K_2CO_3 used, assuming that the components fully react.

We scaled up the K_2CO_3 protocol to process 1,000 g batches and are striving to determine how many washes work best to optimize both reagent costs and student effort and maximize fossil recovery. Preliminary data from “experiments” with student volunteers in “Finding Fossils on Friday” indicate that picking treated concentrate is more efficient.

Funding Sources: Undergraduate research assistantship and the university’s Office of Student Research

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

How did rhinoceros grow? A systematic analysis of growth pattern in North American rhinoceros

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Rhinoceros growth and development is not fully studied as a group. Despite the numerous fossil specimens available for research, it is not fully understood whether isometric or allometric growth takes place during their ontogeny (over the course of their lifetime) or phylogeny (over the course of their evolution). To get a good idea across the different groups across their ontogeny, I measured the limb bones of two species: the most robust of the group, *Teleoceras proterum,* as well as the most gracile, *Menoceras arikarense*. We measured diaphyseal length (minus the epiphyseal caps) and midshaft circumferences of the humerus, radius, femur, and tibia of both rhinos from several museum collections. We calculated the reduced major axis (RMA) slope for their growth, using PAST software. The slopes for most of the *Menoceras* limbs were slightly greater than 1.0 (slightly gracile), while most of the *Teleoceras* limbs had slopes less than 1.0 (slightly robust). However, these slopes are not significantly different from the isometric slope of 1.0 because the error estimates in the slope are large. This is consistent with the data from Kilbourne and Makovicky (2012), who found that even graviportal animals like the black rhinoceros (*Diceros bicornis*), as well as elephants and hippos, showed isometric growth in most of their limbs, despite their large body masses. In addition, I conducted a separate analysis to see how *Teleoceras* limb bones evolved over time as their limbs got more and more stumpy. As predicted, the later species of *Teleoceras* show negative allometry, consistent with the idea that the limbs are growing thicker faster than they are growing longer. However, since these interspecific comparisons can use only means of species samples, there are only a handful of data points, so the correlation coefficient is quite low, and these results were not significantly distinct from the isometric slope of 1.0.

Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

Design and implementation of paleontological resource monitoring strategies to promote stewardship, science, and protection for National Park Service fossils

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The monitoring of non-renewable paleontological resources is specifically mandated in Section 6302 of the Paleontological Resources Preservation Act of 2009 (16 U.S. Code 470aaa-1). The National Park Service (NPS) Paleontology Program defines monitoring as the assessment of the stability and condition of in situ fossils and fossil localities. In 2003, the NPS presented an initial blueprint for defining a conceptual framework for paleontological resource monitoring as a basic resource management activity involving fossils. Several case studies involving paleontological resource monitoring are presented here to demonstrate the variety of resource-specific strategies that have been developed for each situation. During 2009, the NPS, in partnership with the Utah Geological Survey, piloted a fossil monitoring project at Glen Canyon National Recreation Area, Arizona and Utah, to evaluate factors potentially impacting vertebrate ichnofossils along the shoreline of Lake Powell. This research documented both natural processes (rise and fall of lake levels) and anthropogenic activities (theft and vandalism) impacting in situ fossils and demonstrates fossil management strategies that can apply to other shoreline parks. At George Washington Birthplace National Monument, Virginia, storm activity and rising sea level on the Potomac River Estuary have resulted in rapid erosion of fossiliferous strata exposed along the shoreline. Fossils are also impacted by unauthorized visitor collection at the monument. In dry caves at Grand Canyon National Park, Arizona, temperature and humidity monitoring have been undertaken in cave passages where the fragile remains of desiccated ("mummified") bats from the Pleistocene were discovered. These strategies can be applied in monitoring fossils in other caves and different cave environments. Fossils impacted by a series of widespread fires within Santa Monica Mountains National Recreation Area, California, have been documented through post-fire resource assessments. This monitoring serves as a pilot for understanding wildland fire impacts on fossils and informs planning and assessments for fossils subjected to fire in other parks. Experience gained through paleontological resource monitoring within NPS areas and the development of park-specific field monitoring protocols have helped to inform staff regarding threats to the fossils and the best practices for mitigating resource impacts through management actions.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Dragons from Hell: further pterosaur material from the Lancian faunal stage (Maastrichtian) of northern Laramidia

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The latest Cretaceous of North America is one of the most intensely studied regions of the Mesozoic. However, despite intensive collecting in this region, comparatively few pterosaur remains have so far been reported. Only a handful of pterosaur specimens from northern Laramidia have been reported in the literature, in stark contrast to the highly fossiliferous Javelina Formation of southern Laramidia. Nevertheless, even fragmentary pterosaur material can reveal cryptic diversities upon detailed appraisal. Recent reanalysis of fragmentary Late Cretaceous material has highlighted a high global pterosaur diversity primarily composed of the clade Azdarchidae.

Here we report additional fragmentary material of pterosaurs from the Hell Creek, Lance, and Scollard Formations and review the pterosaur diversity of the latest Cretaceous Laramidia. We describe the first pterosaur material, an indeterminate azhdarchid radius, from the Lower Scollard Formation, expanding the known biogeographic range of Lancian-aged Laramidian pterosaurs into Alberta, Canada. All presently known pterosaur material from the Lance Formation pertains to individuals with estimated wingspans less than three meters, suggesting the presence of a small-bodied taxon in the Lance ecosystem. Reappraisal of a nearly complete cervical vertebra indicates an early-diverging azhdarchid closely related to *Mistralazhdarcho.*

The only diagnostic taxon so far known from Lancian Laramidia is *Infernodrakon hastacollis* from the Hell Creek Formation, and we identify additional fragmentary material of similar-sized azdarchid individuals from the Hell Creek. Our findings indicate no evidence for the presence of giant pterosaurs in the Hell Creek, Lance, and Scollard Fms.

Further studies are required to determine if this represents a taphonomic bias or an actual absence of the giant body size ecological guild compared to more southern Laramidian localities. The fragmentary nature of the pterosaur fossil record described here makes it currently unknown whether an actual faunal compositional change occurred among pterosaurs in this faunal stage of northern Laramidia.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Brush-based matrix removal of vertebrate fossils from the Upper Cretaceous Djadokhta Formation, Mongolia

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Since its first expeditions to the Gobi Desert in 1922, the American Museum of Natural History has conducted extensive research on Mongolian fossils, refining preparation approaches for these materials. Specimens from Ukhaa Tolgod and Udan Sayr exhibit exceptional preservation within friable, weakly cemented eolian sandstones of the Djadokhta Formation. While traditional mechanical preparation using pin vises, dental tools, and air scribes is effective, it is often unnecessarily aggressive for friable fossils, requiring considerable manual dexterity and increasing the likelihood of damage to delicate structures, including surface markings. In response, a brush-based matrix removal method was implemented using a range of brushes such as chip, acid, paint, wire, wax, polishing, and anti-static types, selected for variations in bristle stiffness, tip geometry, and hair density. Brush selection was optimized by function, with brass wire brushes employed for matrix reduction and surface reshaping, while trimmed paint brushes facilitated precise, grain-by-grain sediment removal under microscopic magnification. This approach enables controlled, incremental sediment removal across macro- and microscales while maintaining specimen stability. It effectively preserves fine anatomical details such as cranial sutures, neural spines, and digits, maintains articulation, and minimizes microfracturing during preparation. Although typically regarded as cleaning tools, brushes can function as primary matrix removal tools in friable sediments when properly selected. This method provides a high-control, low-impact strategy for preparing fossils from unconsolidated or weakly lithified sediments and demonstrates its broader applicability to similarly fragile specimens, supporting its use as a practical addition to paleontological preparation methods.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Quantifying intraspecific variation in osteohistology in a large sample of an extant avian

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Most terrestrial fossil vertebrates are represented by just one or a few individuals, but in modern populations, intraspecific variation can be substantial, leading to uncertainty in the delimitation of extinct species. Intraspecific variation has been quantified in many gross anatomical traits and across many species, but less attention has been paid to variation in bone histology and how this variation correlates to aspects of life history. Furthermore, some osteohistological studies of extant taxa rely on a single individual to represent a species when inferring aspects of growth and biomechanics, ignoring possible confounding effects of intraspecific variation. Herein we quantify the intraspecific variation in bone histology of the extant avian *Buteo jamaicensis* (red-tailed hawk),

which has been documented as having low variation in body length (coefficient of variation of approximately 6%), to test whether histology exhibits similarly low variability. Our sample consists of 58 wild-born *B. jamaicensis* individuals, encompassing fledglings to somatically mature individuals. All were salvage specimens whose sex, location, and date of collection (approximating or equating to the date of death) were recorded. Specimens were collected from New York, New Jersey, and Wyoming. Each individual was CT scanned and a femoral thin section was taken. Bone diameter, cortical thickness, and outer circumferential layer (OCL) and inner circumferential layer (ICL) thicknesses were quantified in somatically mature individuals. Preliminary results indicate a mean and standard deviation cortical thickness of 740 and 97 microns, respectively, a mean and standard deviation OCL thickness of 140 and 45 microns, respectively, and a mean and standard deviation ICL thickness of 129 and 53 microns, respectively. Coefficients of variation for these histological variables (approximately 10–40%) are much higher than those for body size in *B. jamaicensis*, suggesting that variation in developmental and/or biomechanical signals related to bone histology exceeds the variation in asymptotic body size. Histological proxies of growth, metabolism, or biomechanics developed from low sample sizes of extant animals may be confounded by intraspecific variation. Future work will quantify neurovascular and cellular variables leading to a better understanding of sources of variation in osteohistology for studies of both extant and extinct animals.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Early diversification and coexistence of macropods in the latest Oligocene, Etadunna Formation, South Australia

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The Etadunna Formation (Lake Eyre Basin, South Australia) preserves an early record of macropodiform evolution, including Macropodidae, Potoroidae, Hypsiprymnodontidae, and the extinct Balbaridae, making it key for understanding early macropodoid diversification. Paleomagnetic data place the earliest macropodiforms in Zone A at ~24.8 Ma. Early assemblages in Zones A–B contain a single potoroid taxon (Genus K. nov. gen. et sp.) with semilophate dentition. A major faunal turnover occurs in Zone C (~24.2 Ma), after which macropodiforms persist until ~23.3 Ma (Zone E). During this interval, higher zones (C–E) show increased diversity and a shift toward lophodont and semi-lophodont dentitions, indicating substantial diversification. Macropodiforms continue into the overlying Wipajiri Formation (~19.5 Ma), indicating prolonged coexistence of multiple lineages over ~5 Myr, with species persisting in close geographic proximity for an extended interval. Calcaneal analyses across all four families indicate that Balbaridae exhibit locomotor morphology more similar to macropodids and potoroids than hypsiprymnodontids. Body mass and calcaneal tuber scaling further align Balbaridae with the macropodid best-fit line, supporting a possible sister-taxon relationship. This affinity is also reflected in dental morphology, with both groups sharing lophodont dentition and a distinct posterior molar "bench." Despite similar body sizes across taxa, marked differences in tooth morphology and locomotion distinguish hypsiprymnodontids from potoroids, balbarids, and macropodids, suggesting ecological separation. However, distinctions between balbarids and macropodids are less pronounced. Tooth morphology reflects broad dietary categories rather than specific food items, whereas dental microwear records damage caused by foods consumed shortly before fossilization. Microwear analysis of fossil teeth from these taxa provides greater insight into their species-specific diets and the ecological niches they may have occupied.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Quantifying effects of variations in articular cartilage shape and muscle activation patterns on the elbow joint kinematics of *Dreadnoughtus schrani*

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Recent biomechanical studies have found that the shapes of articular surfaces affect the resulting joint kinematics when modeling with six degrees of freedom and that these differences are crucial to understanding the biomechanics of extinct organisms. One such study examined the elbow of *Dreadnoughtus schrani*, one of the most complete giant titanosaurian sauropod dinosaurs yet discovered, with six degrees of freedom and various articular cartilage shapes, finding that the shape of the articular cartilage affected the resulting kinematics of elbow flexion. Previously, we qualitatively explored these variations in cartilage shape in combination with variations in the active flexor muscle(s). Here, we build on that work to investigate these variations quantitatively. New simulations of this model were conducted in the multibody dynamic simulation program Adams. We compared 12 simulations of flexion that combined three reconstructions of articular cartilage shapes and four variations in which muscles were active. Each simulation was conducted to the maximum degree of flexion and employed the minimum required muscle force to reach maximum flexion with joint rotations and translations calculated in Adams. Kinematic data were interpolated using MATLAB prior to our quantitative analyses, and the simulation with an "average" cartilage morphology and all muscles active was chosen as our control. Control simulation kinematic data were subtracted from the kinematic data of the other simulations to identify where they differed. Time points yielding distinct contrasts were then examined for biomechanical significance. These quantitative analysis techniques have previously been applied within the field of paleoclimatology, but to our knowledge this is their first application in the field of paleobiomechanics. Applying these methods, we found that the morphology of the articular cartilage and muscle activation patterns affected joint kinematics. For example, the differences between the control and other simulations primarily occurred at consistent timings (e.g., at ~40–60% and 90–95% of flexion). These differences were found to result from our input contrasts in the shape of the articular cartilage and the line of action of each individual flexor muscle. Our results advance understanding of the biomechanics of the forelimb of *Dreadnoughtus*, which more broadly applies to understanding how variations in the shape of articular cartilage affect limb kinematics.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A proposed fossil avian egg from the White River Group: a comparative analysis

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Fossil avian eggs are extremely rare in the White River Group (WRG), especially those exhibiting little to no deformation. Although fossil avian egg collections have been established at several repositories, identifying them is particularly challenging as shapes resemble worn fluvial stones. A specimen (ONG-av1-16) hypothesized to be a Galliformes egg, based solely on its shape, was recovered from Oligocene–Eocene strata in northwest Nebraska during the summer of 2016. After a CT scan was conducted for a potential embryo, images showed a crystalline interior which suggests fertilization did not take place. Although an embryo was not detected, there are other methods that could be employed to evaluate the likeliness of being a fossil egg. Thus, this project uses comparative qualitative and quantitative analyses to further evaluate the likeliness of ONG-av1-16 as an avian egg. The overall shape of ONG-av1-16 is ovoid and comparable to known fossil eggs. Magnified images of the outer surface showed pitted, channel-like textures which are like other known fossil avian eggs but different when compared to the smoother modern chicken egg. SEM images exhibit detailed topography of the ONG-av1-16 surface with rounded elongated ridges separated by channels. Quantitative data of length (l), width (w_1, w_2), and greatest circumference (GC), showed similarities between ONG-av1-16 and known fossil avian eggs (n = 31; from South Dakota School of Mines and University of Nebraska). The length and width ratio of all specimens were graphed so outliers (deformed)

could be removed from standard statistical parameters (mean, median, mode, variance, and standard deviation). T-Test means (ŷ), at confidence interval 95%, are equal (ŷ for w_1 = 41.35 mm; *P* = 99%) or approximately equal (ŷ for l = 6.59; *P* = 67%, and ŷ for w_2 = 35.20; *P* = 84%) to ONG-av1-16, which supports our hypothesis. However, there was significant difference in greatest circumference due to deformation (ŷ for GC = 121.55; 3%). Based on preliminary results, the authors of this study propose ONG-av1-16 to be a fossil avian egg and will focus their future efforts on generating additional data for comparative analyses. Moreover, the current study has recognized the need for a protocol to identify fossil avian eggs from the WRG and will attempt to establish a methodology.

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Climate phase mediates dental evolution in the Paleocene–Eocene plesiadapiform *Phenacolemur*

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Climate is frequently invoked as a driver of mammalian morphological evolution, yet the mechanisms linking environmental change to phenotypic responses remain poorly understood. We examined dental evolution in the paromomyid plesiadapiform *Phenacolemur* from the Bighorn Basin, Wyoming, a lineage spanning major climatic transitions from the late Paleocene through the early Eocene. Dental measurements from lower premolars and molars were compiled for more than 300 specimens representing successive species within the lineage. Specimens were assigned numerical ages using updated stratigraphic correlations and matched to interpolated mean annual temperature (MAT) estimates derived from regional paleobotanical records. Generalized additive models were used to evaluate relationships among dental traits, temperature, and climatic context. Climate phase distinguished intervals occupying similar temperature ranges but differing in whether temperatures were rising or falling through time. Contrary to thermoregulatory expectations, dental traits did not exhibit uniform inverse relationships with temperature. Instead, responses were nonlinear, weak, or approximately linear and were not consistently negative. Models incorporating climate phase consistently outperformed models based on MAT alone, indicating that similar temperatures produced different morphological responses depending on climatic trajectory. Premolar crown-height traits exhibited the strongest climate-associated responses, the greatest climate-phase dependence, and the most extensive intervals of significant directional change, potentially reflecting shifts in dietary resources that altered selection on the puncture-crushing function of the lower fourth premolar. Derivative analyses further revealed that elevated rates of morphological change were concentrated during post-PETM cooling and subsequent early Eocene warming rather than during the initial rise into PETM warmth. These results suggest that climate influenced dental evolution indirectly through ecological changes associated with climatic transitions rather than through direct thermoregulatory effects. More broadly, they demonstrate that climatic trajectory and environmental context explain dental evolution more effectively than temperature alone, highlighting the importance of ecological mediation in mammalian responses to climatic change.

Funding Sources: Ohio State University Graduate Enrichment Fellowship (2014–2015); Ohio State University Alumni Grant for Graduate Research and Scholarship (2017)

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Using ultraviolet light as a tool in finding and processing cave fossils

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Caves are well-known for their ability to preserve vertebrate fossils. Some of these remains are important paleontological resources that are otherwise poorly documented in the fossil record, particularly microvertebrates and cave dwellers. Overall, caves typically preserve the remains of animals that used the cave, fell in, or were transported underground via geologic or hydrologic processes, carnivores, scavengers, or other collectors. While larger vertebrate remains are sometimes visible and obvious in caves, mud and other sediment can make it difficult to see and recognize specimens. This issue is more problematic for smaller vertebrates which are often overlooked, yet abundant, in cave deposits. Here we demonstrate the utility of using ultraviolet (UV) light and photoluminescence to find and assess vertebrate deposits in and from caves. This study includes examples of (1) stratified microfossil deposits in moist silty clay, (2) scattered remains of small vertebrates and fragments of larger vertebrates in dry dusty deposits, (3) fossil material in breccia and perched sediment, and (4) successful attempts to relocate previously described faunal deposits from caves. The enhanced visibility with UV allows for greater recognition of fossils and depositional settings, as well as the ability to collect material more carefully. After collecting, UV light can also be used while screenwashing to minimize the impact of this process on delicate fossils, and during the picking and sorting process to increase efficiency. While this study focused on remains from caves, some fossils from other types of deposits are also photoluminescent under UV light; a fact that is recognized in the paleontological literature. For those sites, the same techniques noted above could be used for finding and processing fossil materials. As a note of caution, it is important to wear safety glasses that block UV light when using these methods.

Technical Session XIX: Carnivora (Saturday, November 14, 2026, 1:45 PM)

An enigmatic tremarctine bear skeleton from Cebada Cave, Chiquibul cave system, Belize

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In the late 1980s, cavers were mapping a portion of the Chiquibul cave system known as the Mind Proddler section of Cebada Cave when they found an abundance of bat skeletons, including the extinct vampire bat, *Desmodus draculae*. The same chamber also contained a complete skeleton of a juvenile tremarctine bear. This photogenic complete specimen was highlighted in a National Geographic article in April of 2000 and was tentatively identified as the extinct Florida cave bear, *Tremarctos floridanus*. Species level identification was based on measurements of an upper second molar that was collected by the original cave team, and unfortunately, that specimen is now lost. In April of 2025, we revisited this section of the cave to assess paleontological resources, particularly the bear. Our examination of the skeleton resulted in some answers and more questions. Dental measurements actually resemble the living spectacled bear of South America (*Tremarctos ornatus*) more than the extinct *T. floridanus*, and it may be the former. If this is the case, the specimen represents the first record of the spectacled bear outside South America. It is also possible that the bear represents a new morphotype, a transitional form between the extinct (*T. floridanus*) and living (*T. ornatus*) forms, or even a new species. Photographs, a photogrammetric model, and 3D scans of the bear skeleton provide an important record of this unique and fragile fossil specimen. These records preserve the current condition of the material and can be used for research, teaching, outreach, and conservation purposes. After assessing fossil material from Mind Proddler, it is clear that this section of Cebada Cave represents an exceptional fossil locality that deserves more paleontological research and a high level of protection.

Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation &

Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Mosasaurus 3D: a museum encounter with *Prognathodon*

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Mosasaurs, like many fossils, suffer taphonomic damage, and are often fossilized in ways that render them challenging to display. Presenting them “as found” often requires anatomical interpretation that is unrealistically challenging to the typical museum visitor. Thus, reconstructions using 3D scanning, digital editing and modeling, and 3D printing technologies have increasingly been employed to overcome these challenges. Here, we present our collaborative project, “Mosasaurus 3D,” in which we built a 3D-printed life-size skeletal reconstruction of the mosasaur *Prognathodon*, a collaboration between Dutch, US, and Angolan institutions. Two specimens of *Prognathodon* from the Maastrichtian of the Netherlands and Angola form the basis for the reconstruction. The holotype of *Prognathodon saturator* comes from the Maastrichtian type strata of the Netherlands. Preserved material includes most of the skull, cervical and dorsal vertebrae, ribs, and pectoral girdle elements. In the Namib Desert of southern Angola, a similar large *Prognathodon* skeleton was discovered in disarticulated state, preserving many elements missing from the Dutch specimen. Though taxonomically distinct at the species level, digital editing allowed us to reconstruct missing parts between the two specimens, with data from other *Prognathodon* specimens from Texas and Belgium added. The resulting 3D model now brings this impressive mosasaur to the public through 3D printing—in Angola and the Netherlands.

At the Maastricht museum, the skeleton is displayed suspended overhead without barriers or glass, and within arm’s reach. We considered this essential for visitors to fully experience the spectacular proportions of the animal. This display is also made possible by our choice of print filament and infill settings to produce resilient elements, and anticipating that damage or wear to any element can be easily repaired in place or reprinted on demand. In addition to the value of public displays, the project yielded high-quality 3D data that will be used for study, publication figures, and archival purposes.

All material was scanned using Artec Leo and Spider 3D scanners. Scans were processed, mirrored, merged and retrodeformed using Blender. 3D prints were pre-processed using Creality Print FDM, Simplify3D and Ultimaker Cura software. Prints were made, depending on the size, on Ultimaker 2/2+, 7, Ender K1 max or Builder 1500 3D printers, using partially recycled PLA print filament.

Funding Sources: Mondriaan Fonds grant for international collaborations heritage institutions

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Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

Assessing early Permian vertebrate feeding behaviors and pelycosaur dentition evolution through stable isotopes at the Craddock Bone Bed in Baylor County, Texas

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The Craddock Bone Bed, situated in the Texas red beds of Baylor County, is renowned for its preservation of early Permian vertebrate fossils. The fossil assemblage is dominated by predators, with the extinct synapsid group, the pelycosaurs, being particularly prevalent. While rare, the Craddock Bone Bed also possesses the first true terrestrial, vertebrate herbivore: *Diadectes*. Despite the prolific nature of the bone bed and its place within the evolution of the synapsid group, the trophic relationships and evolution of synapsid

dentition remain underexplored. Stable carbon isotopes ($\delta^{13}C$) are an established geochemical means of assessing feeding behaviors in ecosystems, particularly when sampled from tooth enamel due to its resilience to diagenetic alteration. In carnivores, the $\delta^{13}C$ values are reflective of a trophic enrichment relative to their preferred prey targets. As for herbivores, the $\delta^{13}C$ values are associated with the plant material consumed during foraging. This study utilized stable carbon isotope measurements from *Dimetrodon* (n = 15), *Secodontosaurus* (n = 12), *Diadectes* (n = 10), and *Orthacanthus* (n = 10) tooth enamel bioapatite to assess their feeding preferences at the Craddock Bone Bed. It was hypothesized that *Dimetrodon*, the apex predator, would exhibit $\delta^{13}C$ values reflective of an "eat anything" behavior, while the tertiary carnivore, *Secodontosaurus*, would exhibit a trophic relationship with the freshwater sharks, *Orthacanthus*. As the sole herbivore, *Diadectes* was hypothesized to exhibit $\delta^{13}C$ values suggestive of a C3 plant diet. The results indicate that contemporary predator–prey relationships were not present at the bone bed since neither terrestrial carnivore, *Dimetrodon* and *Secodontosaurus*, showed trophic enrichment of $\delta^{13}C$ values relative to *Diadectes* or *Orthacanthus*. It was suggested that generalist feeding was the dominant behavior amongst the bone bed's carnivore populations, while *Diadectes* $\delta^{13}C$ values reflected a potential diet of environmentally distressed C3 plants. The evolution of pelycosaur dentition was also explored using thin sections of teeth from three representative taxa: *Dimetrodon*, *Secodontosaurus*, and *Ophiacodon*. Measurements suggested that increases in enamel thickness correlated with the transition from primitive (i.e., *Ophiacodon*) to advanced (i.e., *Dimetrodon*) forms.

Funding Sources: The Whiteside Museum of Natural History The Perot Museum of Nature and Science The Study of Earth and Man The Dallas Paleontological Society

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Osborn the *Velociraptor* and Zophia the *Protoceratops*: Fighting Dinosaurs life reconstructions for educating the public

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The "Fighting Dinosaurs" is a fossil specimen currently housed in the Mongolian Institute of Geology in Ulaanbaatar that famously shows the dinosaurs *Velociraptor* and *Protoceratops* interacting in a predator/prey relationship. Our goal is to use 3D life reconstructions to represent the *Velociraptor* and *Protoceratops* of the "Fighting Dinosaurs" and educate the public on rare fossilization processes. Both reconstructions are based on 3D models available for download from Sketchfab. The base models were 3D printed using polylactic acid (PLA). Osborn the *Velociraptor* was originally constructed as a high school project but is now rebuilt and repurposed as a life-sized (~1.9 m long) reconstruction of the *Velociraptor* in the "Fighting Dinosaurs." Bird feathers were added to the wings alongside hair over the rest of the body using hot glue and spray glue. We have now since added artificial feathers and recolored Osborn following published melanosome evidence for other dromaeosaurs and, more speculatively, colored the face to resemble a Southern Cassowary (*Casuarius casuarius*). We also repaired his support stand by drilling a hole into the center of a wood base, after which we cut and fit a PVC pipe using duct tape and glue as binding agents. The public is often impressed by the feather coverage on Osborn, along with his small stature compared to movie adaptations.

Zofia, a *Protoceratops* life-size model (1.8 m long), is the other half of this display and was printed using Creality 3D printers. The Protoceratops model was spliced into ~30 pieces. It took ~6 weeks to print all the pieces. After printing they were assembled using polyvinyl acetate ("Butvar" B-76) mixed with acetone. Zofia was then covered with DAP DRYDEX Drywall Joint Compound and sanded down. Currently we are using clay to provide surface texture, and plan to add fake quills to the tail to resemble those known from its close relative *Psittacosaurus.* Zofia is incomplete as of

now, but the public so far is still impressed by the size of the model based on interactions with students passing by the model.

At outreach events these models serve as visuals to help entice and educate the public, especially children. With Osborn we explain the skeletal evidence for feathered dinosaurs. Zofia similarly shows how we can speculate about soft tissue based on fossils of other related taxon that do have soft body preservation. Together, they teach about preservation types and dinosaur behavior.

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

A little long in the tooth: using linear morphometrics to discriminate species and molar position within the mesonychid *Dissacus*

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Confident assignment of isolated teeth to specific positions and taxa has long posed a major challenge for mammalian paleontologists. This problem is especially significant when tooth position informs interpretations of species identity, diet, and body mass. Although teeth often preserve discrete diagnostic features, specimens of uncertain position are frequently excluded from analyses, further reducing already limited sample sizes for rare taxa. Lower molars of the mesonychid *Dissacus*, for example, are difficult to distinguish because of their overall morphological similarity. Minor qualitative characters are commonly used for positional and taxonomic assignment, but these features are often variable and difficult to assess in heavily worn or damaged specimens, limiting the scientific utility of incomplete isolated teeth.

Here, we investigated relationships between tooth morphology and position across multiple species of *Dissacus*-grade mesonychids. Using linear measurements of molar trigonids and talonids, we compiled the largest dataset of *Dissacus* lower molars to date, consisting of 92 teeth, including 60 specimens with confident positional and taxonomic assignments. We conducted principal component analysis (PCA) to visualize differentiation among molars by position within and between taxa and applied leave-one-out cross-validation (LOOCV) to evaluate the ability of linear measurements to predict molar position. PCA results showed that most variance (88.74%) was explained by PC1 (77.12%) and PC2 (11.62%), with PC1 strongly correlated with overall size. LOOCV analyses of confidently identified specimens of *Dissacus navajovius* and *Dissacus praenuntius* yielded classification accuracies of 66.7% and 76.9%, respectively. These models allowed the assignment of most teeth of unknown position with moderate to high confidence. We also identified close affinities between specimens of uncertain taxonomy, including the nomen dubium "*Dissacus longaevus*," and *Hyaenodictis* (= *Dissacus*) *willwoodensis*, consistent with previous studies. Our results demonstrate that simple linear measurements, particularly when combined with qualitative characters, can improve positional and taxonomic identification of isolated and fragmentary teeth, thereby increasing the analytical utility of specimens that might otherwise be excluded from study.

Funding Sources: Center For Humans Evolutionary Studies (CHES) Albert Fellows Award
Delaware Valley Paleontological Society (DVPS) Paul Bond Scholarship

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Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

Closing the loop on a >90-year-old abandoned mammoth quarry in Tule Springs Fossil Beds National Monument, Mojave Desert, southern Nevada

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Tule Springs Fossil Beds National Monument (TUSK), located in the upper Las Vegas Wash, Nevada, showcases exposures of the Las Vegas Formation (LVF) that have yielded the Tule Springs local fauna (TSLF), the largest late Pleistocene open-site vertebrate assemblage from the Mojave Desert and southern Great Basin. Periodic excavations since the early 1900s have produced thousands of fossils from hundreds of discrete localities. The LVF, a largely desert wetland sequence, consists of 17 geologic units that collectively span more than 500 ka, of which 13 have fossils. The TSLF is characterized by relatively common remains of Columbian mammoth, *Mammuthus columbi*. In the early 1930s, fieldwork by the American Museum of Natural History (AMNH) in the region located multiple fossils of an individual of *Mammuthus columbi*. A partial skull and lower jaw of a presumed older female were collected from the site and reposited at the AMNH, but associated mammoth postcrania were left exposed at the surface in the field. The locality was subsequently rediscovered but not excavated during an expedition in 1962–1963, then relocated again in November 2003 during surveys for a proposed land sale. Left in place, the locality became a focal point for public field trips to promote the importance, abundance, and diversity of fossil resources at Tule Springs—and the importance of their preservation.

After the National Park Service designation of TUSK as a national monument in 2014, the locality was monitored periodically to track the condition of the exposed remains. After documenting rapid and irreparable ongoing damage sufficient to diminish the scientific importance of the locality, TUSK personnel elected to mitigate resource loss by fully retrieving the near century-long exposed fossils at the surface, including exploratory excavation for in situ remains.

Excavation took place in late spring of 2024. Recovered fossils included a partial mammoth tibia, fibula, and calcaneum as well as abundant freshwater invertebrates. The locality is within bed E_0 of the LVF, in a spring-fed pond and stream channel depositional setting consistent with the recovered invertebrate fauna and yielded a calibrated radiocarbon age of ~23 ka. This project culminates over 90 years of episodic investigations at this locality, providing valuable information that can be shared publicly about science and the methodology of paleontological techniques and management.

Funding Sources: US Department of the Interior Contract No. 140P8124P0013, “Paleontological Excavation of Locality 141, National Park Service Tule Springs National Monument (NPS-TUSK)”

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Variation in sacral number and identity in fossil sloths (Mammalia, Pilosa)

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Xenarthrans are unusual among mammals in both their variation in vertebral numbers and possessing a synsacrum. Whether such variability is relatively recent or ancient is often difficult to assess in the fossil record. However, recent explorations have produced several fossil sloths (Megaloncnidae) from Hispaniola with relatively complete pelvises that can be compared to Megalonychidae specimens from the Miocene of Patagonia. Plio–Pleistocene Caribbean and Patagonian Miocene fossil sloth pelvises were surveyed for their vertebral counts. The definition of a synsacral vertebra was fusion of the vertebral body and/or alae to adjacent vertebrae and/or the presence of a sacral foramen. Vertebral morphology, particularly the cranial- and caudal-most, were compared to lumbar and caudal vertebrae from these taxa when possible. Overall, 25 individual pelvic specimens were surveyed, and synsacral counts were taken. All four Miocene individuals had six total vertebrae. Three of four *Parocnus* individuals had eight total vertebrae with the other having seven. *Acratocnus* (n = 7) had 3 specimens with seven total vertebrae and 4 had eight. *Neocnus* (n = 10) had 1 specimen with five, 8 with six, and 1 with seven synsacral

vertebrae. For each taxon, despite being part of the synsacrum, individual vertebrae may have the morphology of either a lumbar or a caudal. All taxa possessed either four or five vertebrae with a "sacral" morphology but varied in the inclusion of "lumbar" and/or "caudal" vertebrae into the synsacrum. *Acratocnus* individuals had between one and three "lumbar" vertebrae, *Parocnus* had one or two "lumbars," whereas *Neocnus* had zero or one. Inclusion of a "caudal" vertebrae was typical for the Caribbean forms, with the exception of two *Acratocnus* individuals lacking a fused "caudal". The Miocene forms largely had one "lumbar" and one "caudal." The incorporation of "lumbar" and "caudal" vertebrae into the synsacrum was both more common in the Caribbean taxa compared to the Patagonian. The variability in the Miocene forms cannot fully be assessed due to the small sample, but *Acratocnus* and *Neocnus* exhibited four different combinations of added "lumbar" and/or "caudal" whereas *Parocnus* showed two forms. This variability in sacral numbers suggests a possible area of evolutionary change. Drivers of selective pressure and how it varied among these fossil taxa requires additional research.

Technical Session XIV: Return of Reptile'O'Rama: Triassic time (Friday, November 13, 2026, 1:45 PM)

First report of procolophonid remains from the Middle Triassic of India

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Procolophonoidea represents one of the most successful parareptilian groups to have survived the end Permian mass extinction and has been extensively discussed in the context of survivorship analyses across the Permian–Triassic boundary. These morphologically and ecologically diverse taxa exhibited a wide geographic distribution throughout the Pangea. The group is characterized by distinctive cranial armor and varied dental morphologies, reflecting a wide spectrum of feeding adaptations including insectivory, durophagy, and high-fiber herbivory. We report here the first record of a Middle Triassic procolophonid from the Yerrapalli Formation of the Pranhita–Godavari Basin, India, based on a small incomplete right mandible, which is heavily encrusted with iron-rich mudstone. X-ray micro-CT imaging enabled us to digitally remove the thick encrustation and facilitated a detailed assessment of the anatomical structures. Dentary is the largest component of the preserved mandible and is characterized by acrodont dentition with cylindrical and procumbent teeth with circular cross-section at the anterior end, followed by closely spaced uniform conical teeth, multiple rows of replacement teeth lingually, and a longitudinal ridge on lateral surface of the dentary. Comparison with similar taxa and phylogenetic analysis recovered the Indian specimen as belonging to an early-diverging non-leptopleuroninae procolophonid. Depending on the tooth morphology, the taxon is inferred to have consumed relatively soft food items compared to that of advanced procolophonids possessing extensive oral food processing. Within the trophic framework of the Yerrapalli ecosystem, the taxon likely occupied a lower trophic level and probably fed on insects and small burrowing invertebrates that were abundant across the Yerrapalli floodplains. The addition of a new procolophonid to the late Anisian–early Ladinian Yerrapalli assemblage alongside other synapsids and diverse diapsids, further enriched the known faunal composition of the Middle Triassic ecosystem. The study also highlights the taxon as a transitional Middle Triassic form persisting from late Anisian to early Ladinian, which contrasts with other globally known Middle Triassic procolophonids that are confined to either of the substages.

Funding Sources: Department of Science and Technology, India (DST/Inspire Fellowship/2019/IF190569)

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Ceratopsid "mummies" reveal unique integument structure and scalation

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C. H. Sternberg's discovery of *Edmontosaurus* "mummies" in 1908 and 1910 in the Lance Formation (Maastrichtian) in east-central Wyoming overshadowed his subsequent discovery in 1913 of a *Chasmosaurus* "mummy" in the Dinosaur Park Formation (Campanian) along the Red Deer River in Alberta, Canada. The upright nearly complete skeleton was covered, or associated with, areas of scaled integument renderings, although portions were lost during excavation and later preparation of the skeleton for display. A year later in 1914 along the same river, Barnum Brown discovered a nearly complete articulated skeleton of *Centrosaurus* (*Monoclonius*) with scaly integument rendering over its flank. Short descriptions and one photograph each showing the association of integument rendering is all that has been published on these specimens. In 2002, a partial *Triceratops* skeleton was collected from the "mummy zone" of east-central Wyoming near Sternberg's early duck-billed "mummy" sites. Large sediment slabs and smaller blocks associated with the skeleton preserve the most complete record of scaly integument renderings for any ceratopsid. Collectively, these three specimens show that ceratopsid integument over torso and flanks (1) is exceptionally thick, peeling off in flat slabs without wrinkles or following the contours of underlying bone; (2) has a unique rosette scalation pattern with a discordantly large central feature scale surrounded by a single ring of peripheral scales; and (3) has parasagittal rows of paired rosettes over the torso midline with additional rosettes spaced farther apart on trunk flanks. Among these genera, *Triceratops* has the largest scales ever recorded, those central to rosettes approaching 10 cm in diameter. Multiple factors may account for the rarity of ceratopsid versus contemporary hadrosaurid integument renderings, but we do not attribute this differential to the thickness or durability of the scaly integument.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Cryptic diversity among Eocene fossil crocodylians of western North America: insights revealed by a new crocodylian from the Ypresian of Wyoming, USA

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The lower to middle Eocene (Ypresian–Lutetian) strata of western North America were host to a diverse and abundant assortment of fossil eusuchian crocodyliforms. In addition to taxa such as *Borealosuchus*, *Boverisuchus*, and various alligatoroids, multiple species of Longirostres-line crocodylians are recognized, including "*Crocodylus*" *affinis* and *Brachyuranochampsa*. Ongoing morphological assessment of fossil specimens from Eocene strata of the Rocky Mountain region indicates a new species from the lowermost Bridger Formation of Wyoming (Greater Green River Basin) and possible additional species from the upper Bridger and Washakie formations of Wyoming as well as the Clarno Formation of Oregon. The new species from the lowermost Bridger Formation is distinguishable from similar taxa such as "*C.*" *affinis*, *Brachyuranochampsa*, and others on the basis of multiple morphological character states, including the presence of prominent anteroposteriorly oriented preorbital ridges at maturity, moderately long (but not attenuated) posterodorsal premaxillar processes extending to between the third and fourth maxillary alveoli, an acute pointed anterior frontal tip, a transverse ridge (i.e., spectacle) on the frontal between the orbits, a posterior maxillary process within the lacrimal, an intermediate dorsal occlusion pattern, and the ectopterygoid maxillary ramus separated from the suborbital fenestra by the maxilla. These morphological comparisons underscore the potential for cryptic diversity among fossil eusuchians from this region/interval and highlight the importance of Paleogene North American fossils in understanding the early evolution of Longirostres-line crocodylians.

Funding Sources: University of Iowa Max and Lorraine Littlefield Fund

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Endocranial reconstruction of *Yizhousaurus sunae* and implications for pituitary hypertrophy in Sauropodomorpha

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The endocranial evolution of sauropodomorph dinosaurs remains poorly understood, particularly near the transition to Sauropoda and the emergence of gigantism. Endocasts from taxa near this transition are especially important for understanding changes in brain and neurovascular morphology associated with the evolution of sauropod body plans. We present a computed tomography-derived digital endocast of the Early Jurassic, early diverging sauropodomorph *Yizhousaurus sunae* from the Lufeng Formation of southern China, providing new insight into endocranial morphology near the sauropod transition. Segmentation reveals a well-preserved hindbrain and neurovascular structures, although portions of the forebrain and inner ear remain obscured by mineralization and taphonomic distortion. The endocranial morphology of *Y. sunae* exhibits a strongly sigmoidal profile and pronounced pontine flexure characteristic of basal sauropodomorphs, while occupying an informative position near the transition to Sauropoda. Cranial nerves V, VII, IX, and XII are identifiable, and a prominent dorsal venous sinus is preserved. A distinct pair of cerebral carotid arteries extend ventrally from an enlarged hypophyseal fossa, which, despite the poor differentiation, can be reconstructed with confidence based on its anatomical continuity with these vascular structures. This hypophyseal enlargement is characteristic of sauropodomorphs, especially more derived taxa and Sauropoda itself, yet its functional significance remains uncertain. Pituitary hypertrophy has historically been solely associated with gigantism, although recent work suggests it may be decoupled from brain size, raising questions regarding evolutionary and physiological role. Since the hypophyseal fossa lies adjacent to the cerebral carotid arteries and associated venous structures, one additional possibility is that pituitary enlargement reflects a role in cerebral circulatory regulation. As sauropods evolved extreme body sizes and neck lengths, this imposed substantial physiological demands, including maintenance of cerebral perfusion over considerable vertical distances and resulting high pressures. The hypophyseal fossa and related endocranial vasculature in *Y. sunae* provides a case study in a larger dataset for ongoing comparative analyses investigating whether pituitary enlargement is more closely associated with neurovascular architecture and circulatory demands than with brain size alone.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

A marine vertebrate fauna of the Indian Cave Sandstone (Carboniferous, Gzhelian) of Nebraska

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The Indian Cave Sandstone, part of the Towle Shale member of the Onaga Shale Formation (Admire Group) was deposited during the Gzhelian (303.7–298.9 million years ago) at the end of the Pennsylvanian Period in what is present southeastern Nebraska. The environments that formed this incised valley fill deposit were fluvial and estuarine and were also host to a diverse faunal assemblage that included brachiopods, mollusks, and plants, as well as the teeth of chondrichthyan and osteichthyan fishes, as reported by previous investigations. This examination of the Indian Cave Sandstone vertebrate fauna identified symmoriiform chondrichthyans (*Denaea saltsmani*, *Stethacanthus*), ctenacanthiform chondrichthyans (*Glikmanius myachkovensis*), hybodontiform chondrichthyans (*Ossianodus nebraskensis*,

?*Acrodus olsoni*, *Lissodus*), eugeneodontiform chondrichthyans (*Bobbodus schaefferi*), bransonelliform chondrichthyans (*Bransonella nebraskensis*), cochliodontiform chondrichthyans (*Deltodus*), xenacanthiform chondrichthyans, petalodontiform chondrichthyans (*Petalodus ohioensis*, *Janassa*), and palaenisciform osteichthyans (Palaeonisciformes indet.).

Funding Sources: Paleontological Society Student Research Grant and Wright State University–Lake Campus Research Committee

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Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Reanalysis of *Cryolophosaurus ellioti*: Interpreting alternative phylogenetic placements

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Early theropod faunas of the Triassic and Early Jurassic were dominated by small to medium sized coelophysoids. However, larger-bodied crested species were present, including *Zupaysaurus*, *Dilophosaurus*, *Sinosaurus*, *Dracovenator*, and *Cryolophosaurus*, the subject of this research. The relationships between these taxa and other averostran and tetanuran theropods remain debated due to competing phylogenetic hypotheses and a lack of character data. Previous phylogenetic analyses tend to recover *Cryolophosaurus* and other crested, larger bodied Early Jurassic theropods in two alternative trees. In one alternative, these species cluster either as a grade or in a "*Dilophosaurus*" clade outside of Averostra. In the other, *Cryolophosaurus*, and some of the other species are among the earliest-diverging branches in Tetanurae. Here, we bring new anatomical information on the skull of *Cryolophosaurus* from previously undescribed braincase and CT scans of the holotype skull to bear on this question. Two recent character matrices were selected to test the effect of adding new data for *Cryolophosaurus*. The first comprises 372 characters and 70 terminals and supports *Cryolophosaurus* as a basal tetanuran with the presence of the antorbital fossa on the jugal bone, and an isolated and reduced prefrontal bone as synapomorphies. The second character matrix, which is modified from the first, instead finds support for a "*Dilophosaurus*" clade that includes *Cryolophosaurus*. Synapomorphies uniting this clade are an anteroposteriorly expanded ventral process of the squamosal, a shallow indentation between basal tubera and basisphenoid recess, and an elongated retroarticular process. Comparison of the phylogenetic analyses highlight key differences within the second matrix that influence the placement of *Cryolophosaurus*. These differences include correcting some character states for *Coelophysis bauri*, the inclusion of ordered characters, and the incorporation of additional terminals. Furthermore, *Sinosaurus* was found to play a critical role as dividing into exemplars as terminals causes a reversal of topology from basal tetanuran to the "*Dilophosaurus*" clade. These results suggest taxon sampling has a stronger impact than addition of new character information on the phylogenetic placement of *Cryolophosaurus* within this poorly sampled part of theropod phylogeny.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Comparison of Early Paleocene microvertebrate assemblages from Denver Basin, Colorado, USA, shows difference in relative abundance of Puercan Fauna between mountain proximal and distal environments

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The Denver Basin of Colorado, USA, is developing into one of the best time-calibrated terrestrial records of the end-Cretaceous event and includes sediments from approximately one million years

before and after the Cretaceous–Paleogene (K–Pg) extinction. Due to its proximity to the Laramide orogeny, active during the Late Cretaceous and Early Paleocene, the Denver Basin presents a unique opportunity to compare resilience and recovery between mountain proximal and mountain distal paleoecosystems across the K–Pg boundary. Here, we compare the relative abundance of vertebrates from two early Paleocene Denver Basin microvertebrate bonebed localities: the mountain proximal DMNH 7383 (~600 ky post-K–Pg) and the mountain distal DMNH 21663 (~600 ky post-K–Pg). DMNH 21663 preserves chondrichthyan ray teeth and a high abundance of the plastomenid turtle *Plastomenus joycei*. Whereas the mountain proximal DMNH 7383 has no chondrichthyan ray teeth and fewer *P. joycei* relative to other turtle taxa, like *Compsemys victa*, which is less abundant at DMNH 21663. The mammalian fauna also differs between localities. The mountain proximal locality, DMNH 7383, is dominated by the large-bodied periptychid *Carsioptychus coarctatus*, whereas, at DMNH 21663, arctocyonids, such as *Loxolophus sp.*, are more abundant with a virtual absence of large-bodied (>20 kg) periptychids. Crocodylians are represented by an undescribed alligatorid with globidont dentition and *Borealosuchus sternbergii*. Although direct comparison of crocodylian abundance is challenging due to difficulty positively identifying *B. sternbergii* from microvertebrate bonebed material, the proportion of molariform to caniniform crocodylian teeth at DMNH 7383 indicates a habitat dominated by the alligatorid by a ratio of nearly 9:1. At DMNH 21663, there are proportionally fewer molariform crocodylian teeth; the alligatorid is still more abundant, but less so (~3:1). The similar age and latitude of DMNH 7383 and DMNH 21663, coupled with the documented differences in faunal compositions suggests distinct mountain proximal and distal habitats during the earliest Paleocene. These faunal pattern differences, in addition to the distinct floras documented from these field areas, are part of an emerging picture of the post-K–Pg environment, wherein differences in topography and localized climate likely played a role in driving ecosystem restructuring and niche-partitioning among the survivors of the K–Pg mass extinction.

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Ontogenetic changes in the femoral histology of *Monodelphis domestica*: implications for inferring the life histories of fossil mammals

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The marsupial–placental dichotomy refers to the divergent life-history strategies of extant therian mammals: marsupials have short gestation and long lactation times, whereas placentals have long gestation and short lactation times. These distinct life histories are visible in long-bone histology. Marsupials are born highly altricial and adult cortices are dominated by periosteal lamellar and parallel-fibered bone, reflecting protracted postnatal growth and midshaft expansion. Placentals, in contrast, are born relatively precocial, so they retain a large portion of perinatal compact cancellous bone in the mid-cortex buttressed endosteally and periosteally by lamellar bone. These histological correlates of reproductive strategies provide previously inaccessible insights into the evolution of mammalian life history in the fossil record. However, our understanding of therian bone growth comes largely from wild-caught museum specimens of uncertain age, limiting our ability to precisely infer weaning and gestation times in fossil specimens. Here, to improve our marsupial bone-growth model, we describe the femoral histology of the gray short-tailed opossum (*Monodelphis domestica*) spanning a series of postnatal (P) growth stages that cover two pre- and seven post-weaning time points: P10, P46, P66, P70, P123, P150, P300, P400, and P476. Describing the transverse, midshaft cross sections: P10 is mostly unossified and composed entirely of woven-fibered tissue. P46 is entirely

porous, woven-fibered bone, with some primary osteons beginning to form. P66 is the earliest post-weaning specimen and is dominated by compact cancellous bone (disorganized bone; DB), but for the first time that DB grades periosteally into parallel-to-lamellar fibered bone (periosteal organized bone; POB) along the anteromedial cortex. P70 is dominated by DB on the endosteal half of the cortex and POB on the periosteal half, with a thin crescent of endosteal organized bone (EOB) lining the medial medullary cavity. By P123, the EOB has been resorbed. P150, P300, P400, and P476 are histologically similar in that they are composed almost entirely of POB, and there are only small crescents of DB medial and/or lateral to the medullary cavity. These preliminary results reinforce the link between mammalian life history strategies and long-bone histology, and they offer a new insight: the shift to depositing periosteal organized bone may be associated with weaning, at least in *Monodelphis*.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

First report of the fossil crocodile shark, *Pseudocarcharias rigida* (Lamniformes, Pseudocarchariidae), from the Lower Miocene of North America

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Pseudocarcharias rigida (Probst) is a fossil shark (Lamniformes: Pseudocarchariidae) represented by isolated teeth from Miocene deposits worldwide. Despite its wide geographic distribution, it remains a rare and enigmatic taxon. In this study, we report the first occurrence of the species from the Early Miocene (Aquitanian) Pyramid Hill Sand Member of the Jewett Sand in southern California, USA. The teeth resemble those of the presumed sister species, the extant *P. kamoharai*, and display a wide morphological range with strong disjunct and gradient heterodonty. However, we find that *P. rigida* can be distinguished from *P. kamoharai* by multiple trends in dental characteristics, including more mediolaterally robust upper anterior teeth, less distally inclined lateral teeth, and a significantly larger maximum size. Total body length (TL) estimates of *P. rigida* based on the quantitative relationship between the tooth crown height and TL on the extant *P. kamoharai* range up to 2.5 m, which is over twice the size of the largest known extant *Pseudocarcharias*. The robust upper anterior teeth and large body size suggest a potentially wider dietary range in *P. rigida* than *P. kamoharai*, possibly preying commonly on slightly larger fish than *P. kamoharai* typically consumes, in addition to small or soft-bodied invertebrates, such as shrimp and squid. The fossil record suggests that *P. rigida* inhabited marine environments similar to those of *P. kamoharai*, supporting an interpretation as a mesopelagic predator.

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

The vertebrate fossil record of the Permian Usili Formation (Songea Group, Ruhuhu Basin): historical collections and recent advances

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The Karoo Basin of South Africa is synonymous with the study of terrestrial ecosystems before, during, and after the Permian–Triassic Mass Extinction (PTME), as it provides a near-continuous succession of diverse and well-preserved fossil vertebrate assemblages. However, the Karoo is not the only Permo–Triassic Basin of southern Africa with exceptional fossil preservation, and its preeminence in the literature could lead local patterns to have an outsized impact on interpretations of the PTME. Here, we evaluate data collected from nearly a century of vertebrate paleontology in the Lopingian Usili Formation of Tanzania's Ruhuhu Basin to provide a comparison for late Permian-aged vertebrates outside of the Karoo. Based on the results from five field seasons over the past two decades, we

present a new stratigraphic range chart and descriptions for Usili Formation tetrapods within four fossiliferous intervals, designated U1–U4. In comparing our localities to those collected in the 1930s, we find that the stratigraphic range chart used for most of the past century of research on the Usili Formation likely omitted its basal conglomeratic unit and thus is offset by 60–70 m from our stratigraphy. Recalibration of this chart reveals that seemingly contradictory locality information fits into the U1–U4 stratigraphic scheme without issue. We find a general correlation between the Usili Formation and the Cistecephalus and lower Daptocephalus assemblage zones of the Karoo Basin in South Africa, though at this time we lack sufficient data to support recognizing more than one biozone within the Usili Formation. This is due to multiple factors: lack of sampling higher in the section, the absence of taxa common in the Karoo (e.g., Diictodon, Cistecephalus), the presence of endemic taxa (e.g., Kawingasaurus, Peltobatrachus), and the continuity of some taxa through multiple fossiliferous intervals as well as across the upper part of the underlying Ruhuhu Formation and into the Usili. Notably, these continuities highlight the uniqueness of the basal conglomerate (U1) as it contains many otherwise unsampled taxa despite being low in the formation. Accepting the Usili Formation cannot be precisely correlated to the South African biostratigraphy suggests that, despite their relative geographic proximity, the biozonation system of the Karoo Basin may not be perfectly applicable to other upper Permian basins of southern Africa.

Funding Sources: NSF EAR-1337569 and EAR-1337291

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Stable isotope and rare earth element signatures of fossil bone as a resource protection tool and paleoclimate proxy

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Badlands National Park (BADL) hosts one of the most complete terrestrial fossil assemblages across the Eocene–Oligocene transition (EOT), making it ideal for investigating the effect of shifting climate and diagenetic conditions on fossilization. Dense fossil beds also attract poachers; in fact, theft remains a main threat to BADL fossils as conviction requires the near-impossible task of proving specimen provenance beyond a reasonable doubt after collection. This project aims to provide the scientific community with a tool that is both a paleoclimate proxy and means of fossil protection by analyzing rare earth element (REE) and $\delta^{13}C$ and $\delta^{18}O$ isotope signatures of fossil bone.

Previous research suggests that bones uptake the isotopic and REE signatures of pedogenic conditions during fossilization. We hypothesize that: 1) fossils from distinct stratigraphic intervals and geographic areas will have distinct signatures; 2) combined REE/isotope signatures can be used to statistically discriminate fossil provenance, and 3) isotopes in fossil bones record a shift to cooler and drier conditions across the EOT at BADL. Prior research on White River Group (WRG) fossils outside of BADL used REEs and isotopes to achieve 100% regional provenance distinction. Within BADL, a past study collected 100 fossil bones—along with stratigraphic, paleopedologic, and taphonomic data—and achieved 80–90% locality discrimination using REEs alone. For this method to aid resource protection, nearly 100% distinction is needed. This project reanalyzes these specimens for $\delta^{13}C$ and $\delta^{18}O$ isotopes to determine if 100% intra-Park locality distinction is feasible with the REE/isotope method.

While this study focuses on the Paleogene WRG, the methods are broadly applicable across geologic time and terrestrial depositional environments. With the validity of this method comprehensively tested, the scientific community will gain a new tool that achieves two powerful things. The robust paleoclimate proxy encoded in fossil bone has often been ignored in past work but can reveal components of the paleoecosystem, such as aridity, temperature, and soil-water

composition, and clarify the effects of pedogenesis and taphonomy on bone fossilization. Further, if the precise provenance of ex situ specimens can be determined, conviction of poachers will increase, the number of specimens lost to science will decrease, and researchers will be able to publish on specimens that lack original locality data.

Funding Sources: National Park Service (Badlands National Park): PMIS 154957 and PMIS 338948 to D. Terry

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Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

A reassessment of the age of the Moradi Formation of northern Niger: the tetrapod biostratigraphic evidence reviewed.

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The Moradi Formation hosts a wholly endemic tetrapod assemblage made up of two early diverging temnospondyls (*Saharastega*, *Nigerpeton*), a giant captorhinid (*Moradisaurus*), a pareiasaur (*Bunostegos*), and an indeterminate gorgonopsian. An inferred paleolatitude of approximately 15°S places the Moradi ecosystem within an equatorial arid belt straddling the Pangean supercontinent. Since the first reports of vertebrate fossils from the Moradi Formation in the 1960s, it has been considered late Permian in age. Given that the Moradi fauna is wholly endemic, biostratigraphic arguments regarding its age have been based on perceived “stage of evolution” rather than precise correlations. Even operating within this paradigm, though, recent phylogenetic work on this fauna is at odds with a late Permian age. *Saharastega* and *Nigerpeton* are most closely related to clades best known from the Permo–Carboniferous and *Bunostegos* consistently falls outside of the clade of Lopingian velosaurian pareiasaurs. Therapsids are among the most biostratigraphically widely used tetrapod fossils in Permo–Triassic assemblages, but they are rarely preserved in the Moradi Formation, with the absence of dicynodonts being especially notable. The most diagnostic therapsid record is a snout fragment preserving the roots of a large canine and two robust postcanines, which was referred to the temporally restricted gorgonopsian subclade Rubidgeinae and cited as evidence of a late Permian age. Reexamination of this material indicates that it is not gorgonopsian and instead is better interpreted as representing an anteosaurid dinocephalian. The rounded cross-section of the canine in this specimen is unlike the blade-like canine seen in gorgonopsians, as are the robust postcanine teeth. In addition, the palatal morphology is nearly identical to that seen in *Anteosaurus* and *Titanophoneus*, with a massive reniform palatine boss that is proportionally large relative to the total width of the palatine. Reidentification of this therapsid record from the Moradi Formation prompts a reconsideration of the age of its tetrapod assemblage because anteosaurids, like all other dinocephalians, are exclusively Guadalupian (middle Permian) in age. This age puts it in line with recent Permian discoveries in the Mediterranean and suggests that there was a broad paleoequatorial fauna with very different clade-level abundances than the better-known temperate assemblages of this age.

Funding Sources: NSF EAR-0617718

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

A total-evidence approach to elucidating evolutionary relationships within Vespertilionoidea, a diverse superfamily of bats (Mammalia: Chiroptera)

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Vespertilionoidea is a diverse, cosmopolitan superfamily of bats (Mammalia: Chiroptera) containing nearly 750 extant species, thus accounting for about half of the known diversity of

living bats. The fossil record of Vespertilionoidea is relatively well-sampled compared to other bat superfamilies, with at least 130 fossil species currently known. While fossil members of the crown group first appear by the middle Eocene (~38 Ma), recent phylogenetic analyses have recovered at least one early Eocene bat as a stem vespertilionoid, suggesting the group had diverged by at least ~54 Ma and lending some support to molecular-based estimates of a late Paleocene or early Eocene clade origin. As an old, diverse, and cosmopolitan clade of bats, Vespertilionoidea presents an ideal mammalian system in which to study dispersal, cladogenesis, and rates of morphological evolution throughout the Cenozoic. In order to enable such future studies of vespertilionoid evolution, we used a Bayesian inference framework to develop a total-evidence, tip-dated phylogeny including representatives of all extant and extinct vespertilionoid families, subfamilies, and tribes, as well as fossil taxa putatively assigned to the group. We recovered tentative support for several recent family-level taxonomic changes among early Paleogene bats, including *Khonsunycteris* and Philisidae occupying a position outside of crown Vespertilionoidea, and *Chadronycteris* falling near Cistugidae. Additionally, with moderate posterior node support, we recovered *Quinetia* within Plecotini; *Stehlinia* outside of crown Vespertilionoidea; and a monophyletic Philisidae, including *Philisis*, *Dizzya*, and *Witwatia*, but not *Khonsunycteris*. By sampling across the entire known diversity of this clade, we reassess recent hypotheses of early bat systematics and lay the groundwork for future analyses of morphological evolution and paleobiogeography in a diverse mammalian group.

Funding Sources: Arizona State University School of Life Sciences

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Insights into mammoth reproduction from steroid hormone records and growth-rate variation in Siberian and North American tusks

Zoë A. Simmons[1], Ethan Shirley[1], Daniel Fisher[1], Michael Cherney[1], Adam Rountrey[1]

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Mammoth tusk growth rate and chemistry reflect behavior and environmental conditions. Seasonal changes in organic and mineral content of mammoth tusk dentin appear in X-ray and visible light as annual growth features, permitting reconstruction of chemical and growth chronologies. Dentin accretion rate in both sexes increases in adolescence, then decreases through adulthood and senescence. Male mammoth tusks may show growth-rate variation related to episodic high testosterone and violent reproductive behavior known as musth. Dentin samples from a Siberian permafrost tusk show testosterone spikes in growth increments that likely correspond to these episodes. Female Siberian tusks exhibit growth cycles with an approximately five-year period during adulthood, likely associated with reproduction. However, transient high testosterone in males and multiyear growth cycles in females have not yet been observed in North American specimens. Here we describe three North American mammoth tusks: one male from Yukon permafrost and two females from upstate New York pond sediments. We measured progesterone and testosterone from serial dentin samples using LC-MS/MS and ELISAs, and CT scanned the female tusks to measure growth increments digitally. Progesterone levels in one New York mammoth were unusually high, while the other female had progesterone similar to modern elephants and Siberian mammoth specimens previously measured; this suggests that environmental contamination may complicate quantification of endogenous steroid hormones in non-permafrost specimens. Testosterone levels in the North American male were within the range observed in Siberian specimens. LC-MS/MS results show fluctuating testosterone levels throughout the tusk, including an increase near the pulp cavity and other elevated intervals similar to those expected in musth episodes. ELISA results for testosterone and progesterone show different, less pronounced patterns, indicating that additional inter-method comparisons are needed. Measured growth increments in the female mammoth tusks show midlife oscillations that may correspond to reproductive cycles, but desiccation-related delamination made some measurements difficult. Further study of these and other specimens will

clarify effects of preservation on steroid hormone recovery and provide more data on reproductive-cycle length variability, helping reveal geographic patterns of mammoth behavior.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Regional variation in molar wear and occlusal morphology in *Mammut americanum*

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Mammut americanum provides an opportunity to investigate patterns of molar wear and occlusal morphology across geographically widespread populations. The broad distribution of this proboscidean allows for comparison of wear progression and tooth morphology among individuals from across North America. Twenty-five specimens from the Yale Peabody Museum (Connecticut), were photographed using a Nikon D3400 camera and assessed using a combination of two-dimensional and three-dimensional morphometric analyses. Initial measurements of tooth length, width, and wear percentage were made from two-dimensional images using ImageJ (NIH). Three-dimensional models were generated through photogrammetry in Agisoft Metashape software and models were scaled and examined in CloudCompare. Measurements of crown height, basin depth, and occlusal relief were also collected. Specimens were assigned wear stages based upon observed occlusal morphology and wear intensity. Worn surfaces were digitally reconstructed in the animation software package Blender to estimate original crown morphology. Cross-sectional profiles were generated in R to facilitate comparisons among specimens. Length and width measurements demonstrate that M3 crown proportions remain relatively consistent across regional groupings despite variation in overall tooth size. Comparisons of wear percentage, crown height, and occlusal relief indicate that heavily worn teeth generally exhibit reduced crown height and expanded wear surfaces. However, occlusal relief appears relatively conserved across the observed range of wear values, suggesting that moderate wear may not substantially alter overall tooth topography. These findings establish a quantitative framework to interpret mastodon feeding ecology and broaden Late Pleistocene environmental reconstruction through dental morphology, wear progression, and other proxies.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

The youngest occurrence of the genus *Eopelobates* in North America

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Anurans are taphonomically brittle organisms that often don't preserve well in the fossil record owing to their fragile, hollow bones and the cartilaginous portions of their skeletal system. When they are present in a fauna, they are generally heavily fragmented, making identification difficult. An anuran partial skull and associated postcranial elements (NDGS 23401) was discovered in a concretion recently recovered from a Whitneyan fauna within the Brule Formation at the Fitterer Ranch locality (Stark County, North Dakota). Despite its well-preserved nature, physical preparation of the specimen from the concretion was deemed too risky to perform. Computed tomographic (CT) scanning was used to visualize the portions of the skeleton still covered in matrix. The presence of ornamentation covering the frontoparietals, nasals, squamosals, and maxillae, along with proceleous vertebrae, indicate the specimen is a member of the Pelobatoidea (spadefoot toads). In the Brule Formation, specimens assigned the modern *Scaphiopus* (North American spadefoot toads; Scaphiopodidae) previously have been identified. However, the presence of fused frontoparietals and ossified quadratojugals argue against a referral of the specimen to this genus, but rather to the extinct

Eopelobates (Pelobatidae). *Eopelobates* is a genus of toad-like frogs that lived in North America and Europe during the Cenozoic. This genus is considered to the be the closest relative to the modern *Pelobates* (European spadefoot toad), differing on cranial (ornamentation less pronounced, nasals more bulky) and postcranial (absence of spade, unfused sacrum, and urostyle) features. This new specimen differs from previously known *Eopelobates* in having an ornamentation made of small tubercles (instead of pits and ridges). Interestingly, while *Eopelobates* survived until the Miocene in Europe, it has been considered to have gone extinct at the Eocene–Oligocene boundary in North America. Thus, this new specimen would represent the youngest North American occurrence of the genus and the family, and suggest a more complex evolutionary history of Pelobatidae, with two lineages surviving well into the Paleogene.

Funding Sources: The University of Tennessee Division of Student Success, The University of Tennessee Department of Earth, Environmental, and Planetary Sciences

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Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Variation in the molar dentition of a population of *Neotoma micropus* from La Salle County, Texas, USA, and implications for interpretation of the fossil record of woodrats

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Studies of single populations provide important baseline data for the minimum amount of variation that exists within a species and allow for the investigation of patterns of variation resulting from sexual dimorphism and changes through ontogeny. We examined a sample of 44 individuals of the southern plains woodrat (*Neotoma micropus*) collected over approximately 72 hours in October of 2004 from a portion of Chaparral Wildlife Management Area (CWMA) in La Salle County, Texas, USA. That sample includes 22 females and 22 males. Based on variation in body length and tooth wear, juveniles through senescent adults are represented in both sexes. We photographed the upper and lower dentition of each individual in occlusal and right buccal views to provide a visual record of variation in the molar dentition of the population of *Neotoma micropus* from CWMA. We reviewed published literature for morphological features of the molar dentition that were used to positively identify material as *Neotoma micropus* or to exclude that species from further consideration in a comparative analysis, as well as for reports of variation in the molar dentition of the species. Our review yielded 49 morphological features, 39 of which we were able to evaluate on the photographs of the dentition of the population of *Neotoma micropus* from CWMA. Some features were not feasible to evaluate on modern specimens in which the left and right dentaries are articulated, the molars remain in place the alveoli, or the relevant morphology may be obscured by organic debris adhered to the teeth. All discrete morphological features that we evaluated were polymorphic within the population of *Neotoma micropus* from CWMA. Quantitative features either exhibited a general trend through ontogeny or varied with no discernable pattern. We observed little sexual dimorphism in the molar dentition of the population of *Neotoma micropus* from CWMA. Both the discrete and quantitative features varied in ways that were not predictable based on the statements in the published literature, which is sobering given the fact that a single population represents a best-case scenario for the amount of morphological variation present in a species. As additional populations of *Neotoma micropus* and more species of *Neotoma* are considered, our ability to recognize diagnostic features in the molar dentition diminishes.

Funding Sources: Lundelius Fund in Vertebrate Paleontology (Jackson School of Geosciences)

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Intraspecific variation in large herbivore oxygen isotopes reveals water use strategies and refines aridity proxies for fossil sites in North America

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Climate change is threatening mammal communities as drought frequency and severity intensify. During the late Quaternary, North America experienced a series of droughts, but it has been difficult to tie these events to megafaunal responses because of the challenges of calculating paleo-aridity. Although oxygen isotopes have been widely used in Africa as an aridity proxy, applying this proxy to North America is challenging due to the high seasonality of precipitation and the physiology of today's megaherbivores. To develop a $\delta^{18}O$ aridity proxy, we must estimate the local meteoric water $\delta^{18}O$ value and compare this with the oxygen-18 isotope enrichment of the tooth enamel ($\delta^{18}O_{enamel}$) of an evaporation-sensitive (ES) species, one that derives its water primarily from plants. Meteoric water $\delta^{18}O$ values are typically estimated by evaluating the $\delta^{18}O_{enamel}$ values of evaporation-insensitive (EI) species, which obtain water primarily from surface waters. However, in North America, there are very few EI species remaining following the end-Pleistocene extinctions (~12 kya). Instead, to develop a North American $\delta^{18}O$ proxy, we must revise our approach, identifying the inter- and intraspecific variation inherent in physiological water processing and seasonal diet.

Here, we compare the evaporative sensitivity of six modern North American megaherbivores: bison, pronghorn, bighorn sheep, horse, elk, and mule deer. We determine the degree of evaporation sensitivity using a steady-state mass balance model of oxygen isotope fluxes in body water to differentiate the influence of physiological, dietary, and environmental factors. By doing so, we determine: 1) relative drought tolerance for each species, 2) the degree of seasonality-conferred intraspecific variation on $\delta^{18}O$ values, and 3) whether differences in seasonal intraspecific variation in highly ES taxa are similar to $\delta^{18}O$ baselines in EI taxa and can be used as a proxy when EI taxa are not present. Our results indicate a broad spectrum of evaporation sensitivity, with pronghorn and mule deer as the most ES and wild horse as the most EI. Intraspecific variation in $\delta^{18}O$ values reveals dietary and seasonal changes but can also reveal water supplementation and human effects. Species' evaporation sensitivity indicates species' drought tolerance and can facilitate the development of an aridity proxy for North America.

Funding Sources: NSF-CAREER (NSF #1945013), GT Center for Programs to Increase Engagement in the Sciences

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Stratigraphy and paleontology of the Orphan Mesa area, Petrified Forest Member of the Chinle Formation in the Chama Basin, northern New Mexico

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Orphan Mesa is a prominent geographic feature in the Ghost Ranch area of Carson National Forest. It is notable for being the hypothesized locality of some of the original *Coelophysis* fossils and for being the locale of the *Eucoelophysis baldwini* type material (*Eucoelophysis* Quarry, EQ). Recently, additional remains referred to *E. baldwini* have been described from the nearby Hayden Quarry (H2, H3, and H4), and EQ and H2 were lithostratigraphically correlated. Previous authors correlated EQ with the Canjilon and Snyder Quarries. A measured section of the Petrified Forest Member exposures at Orphan Mesa accords well with previously published sections. However, our interpretation of the distribution of vertebrate fossils differs. We identified three fossiliferous horizons compared to the one identified previously.

The most fossiliferous horizon that is broadly exposed is the lowest of three greenish-gray siltstones. Fossils are typically isolated and

recovered as float weathering from deeply weathered outcrops. Charcoal is present at most exposures, and there are abundant bivalves at a few localities. A typical Revueltian fauna including metoposaurid temnospondyls, phytosaurs, aetosaurs, non-crocodylomorph loricatans, and theropod dinosaurs is present. We collected an articulated phytosaur skull with a hemimandible and some associated postcrania from relatively unweathered rock, suggesting the abundant float is weathered from more complete specimens.

The EQ is a localized deposit between the lower two greenish-gray siltstones, and we tentatively agree it is roughly correlative to H2. The bone producing horizon consists of mudstone concretions supported by very coarse sand to small pebble conglomerate interbedded with reddish-brown mudstone. Many of the concretions contain isolated dinosauriform vertebrae, presumably from *E. baldwini*; and, based on recovered femora the bonebed contains multiple silesaurid individuals. Other concretions and the reddish-brown mudstone contain elements from larger-bodied phytosaurs and aetosaurs as well as dinosauromorphs, with occasional association.

Above the *Eucoelophysis* bonebed, a second greenish-gray siltstone produces sparse isolated fossils of small vertebrates, local concentrations of gastropods, and frequent charcoal. The third and highest greenish-gray siltstone contains petrified wood and other plant fossils, with more abundant charcoal and no vertebrate fossils identified as of yet.

Funding Sources: Stony Brook University OVPR Seed Grant

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Long-term eco-evolutionary dynamics of mammals in relation to landscape, climate and environmental change: a view from the Mojave Region of southwestern North America

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The Basin and Range Province (BRP) of western North America underwent major landscape reorganization during the Miocene, shaped by extensional tectonics, increased topographic complexity, and major climate variation (e.g., Miocene Climatic Optimum). In the Mojave region of the BRP, the Crowder and Cajon (17.5–12.7 Ma), Barstow (16.5–13.0 Ma), and Dove Spring (13.5–7.3 Ma) formations have nearly continuous strata from which diverse fossils and multi-proxy paleoenvironmental data have been recovered, including evidence for early C4 vegetation. These records thus capture a fine-resolution time series of ecological responses to environmental change. Collection of large- and small-mammal fossils from these formations additionally provides a unique opportunity to compare lineage-specific responses to tectonic activity, climate, and vegetation change. A collaborative body of research arising from this long record demonstrates several key findings. First, species richness in the Mojave is elevated during middle Miocene warming and rapid tectonic extension, reflecting broader patterns across the BRP. Elevated richness is found at local to regional scales, with high faunal turnover spatially in relation to broad-scale connectivity across the Mojave and BRP and temporally across periods of landscape reorganization. Second, landscape and climate change also shape basin-scale habitat heterogeneity and depositional environments. Thus, the distribution of fossils reflects not only biological changes in richness over time, but also the influence of taphonomy and stratigraphic architecture. Finally, environmental change does not produce a uniform ecological response across mammalian communities. Using various stable isotopic and morphological approaches to reconstruct species ecology, we found differing responses to environmental change across small- and large-mammal lineages, asynchronous changes in vegetation and mammalian diets, and a decoupling of resource availability and resource use, producing complex community dynamics over

time. When evidence is available, small mammals appear to be more sensitive recorders of environmental change than large mammals. The synthesis of paleobiological and geological questions, datasets, and approaches across long records such as that found in the Mojave region provide key insight into the complex roles landscape, climate, and environmental change play in shaping biodiversity from local ecological responses to macroevolutionary patterns.

Funding Sources: NSF Awards #1655720, #1813996, #2041895, and various internal funding sources at the University of Michigan and Stony Brook University

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Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

Moving beyond causation: examples of how the late Pleistocene megafauna extinction influenced mammal taxa and community structure and function in the Edwards Plateau of Texas

Felisa A. Smith[1], S. Kathleen Lyons[2], Emma A. Elliott Smith[3], Catalina P. Tome[4], J. Chris Sagebiel[5], Marina Marina Casiano Ruiz[1], Carson P. Hedberg[6], Jonathan S. Keller[1], Esteban Restrepo Cortés[1]
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One of the most striking features of the Pleistocene was the abundance and diversity of extremely large charismatic species such as mammoths, giant ground sloths, wooly rhinos, and sabretooths on all habitable continents. Over the Pleistocene, and particularly at the terminal Pleistocene, much of this diversity was lost. Studies of this event often focus on the causes of the terminal Pleistocene extinction; what has been largely overlooked until recently were the likely *consequences* on ecosystems of the loss of millions of large-bodied animals. This catastrophic biodiversity loss is quite relevant to modern conservation concerns. Ongoing trophic and body size downgrading are leading to worrisome changes in modern ecological communities, and we do not know how and if the functional roles of large-bodied animals are replicated by smaller-bodied congeners. Here, we employ the Late Quaternary fossil record for the Edwards Plateau of Texas to examine the aftereffects of the terminal Pleistocene megafauna extinction, which we argue is an excellent proxy for characterizing some of the likely outcomes of modern biodiversity loss. Building on the unparalleled Late Quaternary fossil record we have compiled over the past 10 years, we have employed modeling approaches, and empirical characterizations of body size and diet through morphological, stable isotopes, and 3D ecomorphological analyses, to quantify the ecological legacy of the extinction. We find significant shifts in community functional diversity, species abundance, ecological interactions among predators and prey, and alterations in dietary isotopic niche and body size of taxa related to the loss of megafauna in the system. Whereas some taxa responded to late Pleistocene climate change, most show some effect of biodiversity loss. Our work provides an important baseline for modern conservation efforts and demonstrates how the Late Quaternary record can yield insights into the influence of megaherbivores on natural ecosystems.

Funding Sources: National Science Foundation Division of Environmental Biology DEB 2344776 (FA Smith, PI and SK Lyons, co-PI) and DEB 1555525 (FA Smith)

Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

Structural changes in food web networks on the Edwards Plateau over the last 22,000 years as a result of the megafauna extinction

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Climate changes and human impacts have the potential to alter the composition of communities and the species interactions within them by affecting the environment they inhabit. In addition, we are experiencing rapid biodiversity loss, which many scientists are calling the sixth mass extinction. After the loss of those megafauna, assemblages are depauperate with many empty niches. Surviving species do not shift into those empty niches and are unable to provide the ecosystem services lost with the demise of the megafauna. The impact of these changes on species interactions, adaptive success, and community structure across the Pleistocene–Holocene transition remains poorly understood. Quaternary mammals of North America provide a system to study these impacts because they have a good record through several glacial cycles, some combinations of which didn't have a major effect on mammals until the megafauna extinction, and they span the entry of humans into the continent. Using a robust dataset of species occurrences, stable isotopes, body size, and climate variables, we constructed and compared ecological networks of mammal paleocommunities on the Edwards Plateau, Texas. One site, Hall's Cave, has a temporal resolution that allows an in-depth analysis by separating the last 22,000 years into 16 time intervals. We measured the structure of food webs using modularity, species contributions to modularity, and an index of node overlap and segregation. We found consistent decreases in modularity across all sites with food webs shifting from having multiple clusters in the Pleistocene to fewer clusters in the Holocene. Additionally, node overlap and connectance increases while modularity decreases over time. Spearman's rank correlation analyses indicate that changes in modularity were not driven by changes in species richness across time, nor were they driven by climate change. Furthermore, the degree of node overlap shifted across the Pleistocene–Holocene transition and was significantly different from null model expectations in the Holocene, but not in the Pleistocene. The transition from a diverse and compartmentalized network to a network of less complexity with an overlap of interacting species may have been driven by other factors that altered the food web. This implies that the change in mammal food web structure of the Edwards Plateau was mainly a consequence of the megafauna extinctions and not coupled with climate change.

Funding Sources: National Science Foundation Division of Environmental Biology grants (1555525, 1744223, and 2051255)

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Palaeoecological and taxonomic description of new Gulf Coast mosasaur taxa from the Blue Springs fossil site (Coon Creek Member of the Maastrichtian Ripley Formation), Mississippi, USA

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The early Maastrichtian (Cretaceous) Coon Creek beds at the Blue Springs fossil site in Union County, Mississippi, preserve an assemblage of mosasaurs just prior to the Cretaceous–Paleogene extinction event. The Coon Creek Member forms a time-transgressive shelf deposit that extends from southeastern Tennessee to northeastern Mississippi, where the Blue Springs fossil site preserves a distinct assemblage of nearshore, shallow-marine taxa (the gastropod *Turritella trilira*, the decapods *Avitelmessus grapsoideus* and *Dakoticancer australis*, and the bivalve *Anomia argentaria*). Mosasaur material recovered from the site includes isolated marginal and pterygoid teeth, caudal vertebrae, and a fragmented maxilla. Currently, only a single mosasaur species, *Mosasaurus hoffmannii*, has been identified from Mississippi's Maastrichtian period. In addition, only two Maastrichtian mosasaur genera are known from the Gulf Coast region: *Mosasaurus* and *Plioplatecarpus*. Preliminary identification of the Blue Springs material suggests the presence of several additional mosasaur taxa including *Mosasaurus beaugi*, *Tylosaurus* sp., and

Prognathodon sp. Comparative morphological analysis to mosasaur taxa from this region, along with phylogenetic assessment of diagnostic material, is used for the taxonomic placement and description of specimens. Palaeoecological interpretations are derived from tooth morphology and function, geochemical analysis of tooth enamel using oxygen isotopes, and associated non-mosasaur fauna.

Funding Sources: The Drapeau Center for Undergraduate Research

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Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

A functional model of the forelimb of *Archaeopteryx lithographica*

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One of the most dramatic innovations in vertebrate evolution involved skeletal modifications associated with the origin of flight in maniraptoran theropods. Many of these changes were concentrated in the forelimb. Some hindlimb alterations including the opisthopubic pelvis, reduction of the fourth trochanter, and reoriented femur actually appeared prior to the avialan node. As the oldest, most basal known avian, *Archaeopteryx lithographica* from the Upper Jurassic Solnhofen, Germany, represents an important data point for understanding the transition from terrestrial, nonvolant theropods to ornithurine birds capable of powered flight. The nearly complete and minimally distorted Chicago specimen forms the basis of our study modeling of functional changes in the forelimb from nonvolant maniraptoran theropods to that of *Archaeopteryx*. It was completely CT-scanned to produce a virtual skeleton. This project used object files to reconstruct the pectoral girdle and forelimb moment arms. They were imported into Opensim Creator to produce a right forelimb. These had to be subdivided into three separate models to accommodate computer memory. Some parameters, including optimal contraction velocity and tendon length were derived from previous work on other theropods. Bone mass of the individual unfused elements was based on weights of corresponding elements of a similarly sized extant bird. Ranges of motion were estimated from *Archaeopteryx* joint osteology. Increased space and range based on soft tissue distribution is inferred at the shoulder. Motion in three planes was modelled at the shoulder. Motion at the elbow was reduced to two planes: flexion/extension and long axis rotation. Movement at the wrist was limited to flexion/extension and abduction/adduction. Interphalangeal motion was modeled by flexion/extension. Muscles were reconstructed based on muscle scars, extant birds, and previous work on theropod dinosaurs. The models were independently imported into OpenSim to generate plots of moment arms versus joint angle. We expect to use these moment arm results to describe functional changes going from plesiomorphic cursorial theropods to neornithine level powered flight birds. These results will be compared with those of the theropod *Falcarius* and somewhat more derived avians. These should reveal net differences between the earliest known flying birds and extant birds, aiding our understanding of the evolution of flight within the clade.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Calcaneal gear ratios as proxies of habitat openness in Miocene Texas mammal assemblages

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The morphology of mammal calcanea is associated with locomotor function and habitat use, which can be used to predict and reconstruct paleoenvironments. Paleoenvironmental reconstructions are subject to biases, as proxies are indirect records of the past environment. The integration of multiple proxies with complementary sensitivities can help us to reduce uncertainty and

improve our interpretation of past conditions. The Texas Miocene faunas of the Goliad formation are a useful test case that has been formerly well studied. Here, we test whether calcaneal gear ratios can be used to infer precipitation and vegetation density in Miocene mammal fossil assemblages of the Lapara Creek fauna throughout the coastal region of Texas. We collected available calcaneal measurements from the literature and additional measurements from The Texas Vertebrate Paleontology Collections at The University of Texas to calculate gear ratio (which is the position of the sustentacular facet to the total length of the calcaneum) as an indicator of locomotor function. We summarized trait distributions at the assemblage level and compared them with prior paleoenvironmental interpretations of the region. We predicted that high average gear ratios represent dry and open habitats and that low average gear ratios represent closed and wet habitats. Our work suggests that mammal postcranial traits may be used to complement other taxonomic, sedimentological, and floral evidence of the paleoenvironments of the Lapara Creek fauna.

Technical Session IX: Archosaur paleobiology & pterosaurs (Thursday, November 12, 2026, 1:45 PM)

An exceptionally preserved pterosaur reveals deep homology of avian foot scales

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Bird feet have a unique, regionalized pattern of three scale morphotypes: large, overlapping scutate and smaller scutellate scales dorsally, and reticulate scales on the plantar surface. The evolution of this integument is contested, with hypotheses proposing either an early or a late origin on the bird stem lineage. The scutate and scutellate scales have been interpreted either as homologous to those of other reptiles, and so retained from a deep ancestor, or as secondarily derived from feathers during the origin of birds. Developmental and molecular data from living birds have been invoked for both and cannot discriminate between them. The fossil record can, because the two hypotheses predict different distributions of scalation among members of the bird stem lineage, including dinosaurs and pterosaurs. We report an exceptionally preserved specimen of the pterosaur *Ctenochasma* from the Upper Jurassic Solnhofen limestones that preserves both hand and foot scales in palmar and dorsal aspects, providing the first well-preserved manual digit scalation in any pterosaur. Hand and foot scales are strikingly similar and show bird-like regionalized morphologies comprising the three morphotypes, accompanied by soft-tissue pads aligned with the joints. Interdigital webbing is preserved between the digits of the pes and between the small, clawed digits of the manus.

Phylogenetic ancestral-state estimation, combining these data with hand and foot scales recorded in body and trace fossils across the bird stem lineage, indicates that bird-like regionalized scalation was present in both the hands and feet of the last common ancestor of pterosaurs and dinosaurs. Its absence in some lineages, notably large-bodied quadrupedal dinosaurs, reflects repeated secondary loss. Because this pattern predates both the complex feathers from which avian foot scales have been proposed to derive and the spread of feathers onto the tarsus and pes of bird-line theropods, it is unlikely to be feather-derived and cannot be a late avian innovation. The matched integument of manus and pes indicates that fore- and hindlimb coverings were ancestrally near-identical, so the avian novelty lies not in a new foot morphology but in decoupling the integument of the two limbs: the manus became the feathered wing while the pes retained its ancestral scales. Avian foot scalation is therefore a deeply conserved character, inherited from an Early Triassic ancestor more than 250 million years ago.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Study of the type specimen and referred specimens of ?*Gyracanthus duplicatus* establishes its definition, biostratigraphy and paleoecology

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Gyracanth acanthodians are an enigmatic group of stem-chondrichthyans, known primarily from their ornamented fin spines. As they have been suggested to be closely related to the earliest sharks, it is important to understand the morphology and paleoecology of gyracanthids. Among his many other contributions to paleontology, Sir John William Dawson (1820–1899) collected the type specimen of ?*Gyracanthus duplicatus* Dawson (1868) and helped map its provenance in the Joggins Formation of Nova Scotia. A restudy of the type specimen has established that the type's shape and ornamentation are more consistent with *Gyracanthides* than *Gyracanthus*. The matrix preserving the type specimen is of the "Clam Coal" strata of the Joggins area. A second gyracanthid fin spine fragment from the Clam Coal is provisionally referred to ?*G. duplicatus* and is also consistent with *Gyracanthides*. A third specimen, a distal fin spine fragment from the Joggins Formation at the nearby River Hébert, previously referred to ?*G. duplicatus*, is more likely from another gyracanthid species. The presence of a second species of gyracanth within the Joggins Formation may be due to cladogenesis or immigration.

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

Late Carboniferous amphibian diversity in the Hamilton Quarry faunal assemblage

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Living amphibian communities are both taxonomically and ecomorphologically diverse. However, when this diversity arose among their putative amphibamiform temnospondyl relatives is not well constrained. Recent research reveals an already diverse amphibamiform assemblage from the Late Carboniferous (Moscovian; ~309 Ma) Mazon Creek Lagerstätte with lissamphibian anatomy, emphasizing the importance of reassessing amphibamiform diversification in the Carboniferous.

Amphibamiforms from the Hamilton Quarry Lagerstätte (Ghzelian; ~303 Ma) in Kansas are currently placed into a single amphibamiform taxon, *Eoscopus lockardi*. Reexamination of this material has revealed a faunal assemblage with at least three dissorophoid taxa. Here, we revise the anatomy and systematics of the holotype of *Eoscopus lockardi* (KUVP 80408) using comparative anatomical and phylogenetic methods, μCT, and 3D segmentation. *Eoscopus* can be distinguished from all other amphibamiforms based on three pairs of vomerine fangs, among other features. Also, we recognize at least two distinct taxa previously assigned to *Eoscopus*, represented by FMNH PR 1158 which possesses a supratympanic flange of the supratemporal and a semilunar curvature along the ventral border of the supratympanic flange of the squamosal, characters exclusively associated with olsoniforms; and FMNH PR 1155 which possesses a flared dorsal iliac blade, a short and distally-expanded sacral rib, and a wide skull with round anterior skull margin, similar to *Gerobatrachus* and definitive Mesozoic batrachians.

A novel phylogenetic analysis recovers the KUVP 80408 at the base of amphibamiforms, while FMNH PR 1158 within olsoniforms, as the basalmost taxon after *Palodromeus*. However, FMNH PR 1155 is recovered in proximity to *Gerobatrachus*. These results, along with similar patterns of diversity in the Mazon Creek assemblage, show the widespread and persistent exploration of lissamphibian morphospace, including derived frog-like cranial structure and a collection of frog-like postcranial characters, by Carboniferous amphibamiforms. It is unclear whether this pattern reflects scattershot acquisition of lissamphibian-like morphology in consecutive

radiations of amphibamiforms or challenges in correctly resolving amphibamiform phylogeny, but in either case, this undermines the current consensus timeline for the stepwise acquisition of the lissamphibian bauplan.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Semicircular canal morphology records locomotor and ecological diversification in toothed whales (Cetacea: Odontoceti)

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The semicircular canals are sensory organs essential to balance and spatial navigation in vertebrates. Housed within the dense, compact periotic bone, the canals are often preserved even in fragmentary specimens. In mammals, the canal morphology correlates statistically with locomotion mode and habitat, and it has accordingly been used in evolutionary paleobiology to reconstruct the ecology and behavior of extinct taxa. Research has nonetheless focused overwhelmingly on terrestrial mammals, and, secondarily, aquatic lineages remain comparatively unexamined. For cetaceans, the prevailing view holds that the canals became reduced during the transition to aquatic life and retain little morphological diversity or ecological signal, an interpretation based on limited taxonomic and ecological sampling. Here we examine the ecologically diverse toothed whales (Odontoceti), assessing semicircular canal morphology in relation to behavior and ecology in 53 of the 79 extant species. Phylogenetic generalized least squares analyses recovered a strong phylogenetic signal in absolute canal size, which grouped species by clade. After size correction, however, species from distantly related lineages converged in morphospace, consistent with functional convergence rather than shared ancestry. These taxa shared a demand for pronounced head rotation: riverine species from several independent lineages and species that move their neck to seize and dismember large prey. Because canals detect angular acceleration and their sensitivity increases with both canal length and luminal cross-section, such behaviors should favor sensitivity-enhancing geometry. Cetaceans show progressive cervical fusion, and most oceanic species have limited neck mobility within a streamlined, fast-swimming body; by contrast, riverine species that retain incomplete fusion or reacquired mobility tend to have elongate canals relative to body size. Large-prey biters such as *Orcinus orca* tend to have a wider canal lumen, whereas species that pursue and swallow small fish whole, or feed by suction, require little neck movement and showed no such enhancement. These results indicate that, despite their overall reduction following the transition to aquatic life, the semicircular canals of toothed whales have diversified in relation to species-specific locomotion and habitat beyond size and phylogeny, underscoring their potential for reconstructing the paleoecology of cetaceans, including extinct forms.

Funding Sources: Sasakawa Scientific Research Grant no. 2026-4094

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Interpreting climbing ability in Permian synapsids using autopodial proportions reveals limits of mammalian and reptilian models

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Amniotes occupy an extraordinary variety of ecological roles, including arboreal habits that arose in multiple Carboniferous–Permian lineages such as the reptiliomorph *Anthracodromeus* longipes and the synapsid *Eoscansor cobrensis*. Several anatomical correlates for arboreality in fossil taxa have been proposed, including ungual curvature, digit length, trunk length, and phalangeal proportions—in particular, a high penultimate phalanx length—which coincides with adaptations found in modern taxa. Here we report

on a varanopid specimen close to *E. cobrensis*, which possesses elongate penultimate phalanges and long and slender digits, leading us to hypothesize that it was arboreal or possessed climbing abilities. To test this, we used linear discriminant analyses (LDA) and logistic regressions to develop models for differentiating between taxa with climbing abilities (arboreal, scansorial) and those that are predominantly ground-dwelling (terrestrial, fossorial, etc.) using metapodial and phalangeal proportions from the third digit of the manus and pes of extant mammals and lepidosaurs. We then applied these models to our specimen, several other varanopid taxa, sphenacodonts, and therapsid taxa. The models developed from the mammalian taxa had a higher accuracy in predicting the ecological categories of extant taxa than those using the reptilian taxa, and both mammalian and reptilian models recovered a relationship between an increase in the length of the penultimate phalanx associated with climbing-adapted taxa, consistent with previous studies.

Additionally, most reptilian and mammalian manus models outperformed their respective pes models in prediction accuracy with the exception of the mammalian logistic model. However, the ecologies of extinct taxa were not clearly predicted by these models, with nearly all taxa having conflicting classifications across our different models, and some having unusually high probabilities (>99%) in unexpected classifications. This underlines the importance of understanding which models would best fit these extinct taxa, as although the mammalian models show high accuracy in assessing other modern taxa, whether these or reptilian models are applicable to pelycosaur-grade synapsids from the late Paleozoic needs further analysis.

Funding Sources: NSF-2219902 to AKH and NSF-2219947 to RBI

Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

Dietary flexibility in Late Pleistocene megafauna and implications for extinctions in South Africa

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The fossil record from the southern Cape of South Africa provides the richest record of late Quaternary megafaunal extinctions on the continent. This includes the extinction of several ungulate grazers and grassland specialists, including the long-horned buffalo (*Syncerus antiquus*), giant Cape zebra (*Equus capensis*), and Brink's caprin (Caprinae gen. et sp. indet.) near the Pleistocene–Holocene transition. Their loss corresponds with the extirpation of other grazers, such as black wildebeest (*Connochaetes gnou*) and southern reedbuck (*Redunca arundinum*), and the appearance of communities dominated by small browsers and mixed feeders. Although the extinction of large grazing herbivores has been linked to the loss of grass-dominated ecosystems, independent pollen records fail to show major declines in grass availability across this transition. A critical assumption is that the extinct herbivores were dedicated grazers. To evaluate this assumption, we utilize dental microwear texture analysis (DMTA) on 53 fossil herbivore teeth from the Late Pleistocene at Boomplaas Cave, a well-stratified faunal sequence spanning the past ~65,000 years. DMTA quantifies microscopic wear patterns on teeth to infer diet (grazing, browsing, mixed feeding). Contrary to expectations, some presumed grazers, including the Brink's caprin and alcelaphin antelopes (wildebeest and hartebeest), exhibit microwear values similar to those of highly variable, seasonal, mixed-feeders. Other grazers, such as reedbucks (*Redunca* spp.) and hippotragin antelopes (*Hippotragus* spp.), have DMTA values similar to variable grazers, but consume more browse than their extant congeners. Our results suggest that these herbivores may have had a more flexible diet than previously assumed. The reconstructed diet complicates scenarios linking extinctions to loss of grassy forage and raises questions about why late Pleistocene "grazers" consumed more dicots than their present-day counterparts. We propose that low atmospheric

CO_2 during glacial phases increased dicot palatability via reduced production of secondary compounds (e.g., tannins), allowing "grazing" herbivores to broaden their diets. With increasing CO_2 in the Holocene, the palatability of dicots decreases, leading to stronger dietary niche differentiation, less available forage, and increased competition. Our observations force a reevaluation of the cause of the southern Cape extirpations and extinctions, if the loss of grass is not likely a factor.

Funding Sources: The Leakey Foundation, Paleontological Society, and NSF GRFP to K.S. Research at Boomplaas is supported by the NSF Archaeology Program (#2150712 and 2149759)

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Identifying drivers of variation in life history traits in extinct animals: A case study using paleohistology in the non-avian theropod dinosaur *Allosaurus*

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Growth curve reconstruction based on bone histology has revealed that many extinct dinosaurs possessed substantial and unexpected variation in life history traits (e.g., growth rate, time to reach asymptotic body size). *Allosaurus*, a non-avian theropod dinosaur from the Late Jurassic Period, is one such taxon. Previous research has reported a nearly twofold variation in the body size of skeletally mature *Allosaurus* from the same quarry. Numerous hypotheses have been proposed as drivers of this variation, including cryptic species occurrence, sexual dimorphism, and developmental plasticity. As *Allosaurus* is one of the most well-represented theropods, it makes for an excellent case study for developing methods to explain variation in life history traits in the fossil record. To this end, I have assembled a sample of 43 skeletal elements from 39 individuals of *Allosaurus* sourced from 16 localities in the Morrison Formation. All three currently recognized species of *Allosaurus* from North America (*A. fragilis*, *A. jimmadseni*, and *A. anax*) are represented in the sample. A suite of methods was used to test five hypotheses: developmental plasticity, sexual dimorphism, taxonomic variation, geographic variation, and stratigraphic variation. This approach revealed five distinct growth strategies in *Allosaurus*. Substantial variation both within each locality and within each growth strategy provided strong support for developmental plasticity. No support was found for sexual dimorphism in the sample when considering morphology or growth strategies. No support was found for differences in life history between *A. fragilis* and *A. jimmadseni*, whereas *A. anax* was found to be substantially larger and faster growing than the other species. A new species of phyletic dwarf was identified, which achieved an asymptotic body mass one-eighth that of an average *Allosaurus*. Geographically, only one trend was reconstructed across paleolongitude. However, this trend most likely signals a sampling bias rather than a biological signal. Some recovered growth strategies are restricted to specific quarries of different ages and lithologies, implying that as its ecosystem (e.g., climate, species composition) changed, *Allosaurus* growth curves shifted in response. The exceptionally plastic development of *Allosaurus* may have been key to its success across large geographic areas over millions of years.

Funding Sources: Adelphi University Horace McDonnell Award; Jurassic Foundation Student Research Award; Paleontological Society Student Research Award; OCEES Reilly & Roosenburg GRFP

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Size-related morphological variation and its implications in *Psittacosaurus*, the most speciose non-avian dinosaur genus

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Distinguishing valid new species from different growth stages of already known ones is a persistent challenge in paleontology. Anatomical

differences between juveniles and adults within a growth series can exceed those between adults of closely related species, presenting challenges to correctly estimating biodiversity. Ontogeny can be a major source of intraspecific variation, but because it correlates with size (as a proxy for maturity), it can potentially be controlled for. However, previously proposed methods, such as cladistic ontogeny (producing ontograms), are ill-suited for the large amounts of variation (including individual variation and polymorphism) seen in some empirical studies. The early-diverging ceratopsian *Psittacosaurus* is the most speciose non-avian dinosaur genus, with 19 historically named species. While some species are based on singleton specimens, other *Psittacosaurus* species are known from hundreds of specimens and comprehensive growth series. This offers a unique opportunity to assess taxonomically important variation against extensive individual, ontogenetic, and potentially sexual variation observed in large populations. Growth series of five species offer a robust framework to compare singleton species to as well.

For this purpose, we devised a graphical approach to track the distribution of morphological features (including ontogenetically variable character states) along a size axis, which correlates strongly with histological age in *Psittacosaurus*. We then evaluated the distinctness of debated species against the size-controlled distribution of traits, including polymorphisms, in each of the five established growth series using character compatibility.

Out of the 19 historically named species of *Psittacosaurus*, seven species are valid, six are junior synonyms, five are nomina dubia, and one is a distinct neoceratopsian genus. Our comprehensive analysis shows that some anatomical regions previously overlooked are taxonomically informative accounting for ontogeny, such as the posterior processes of the postorbital and jugal, sutures and fossae on the skull roof, and the basicranium. The dentary flange, which varies widely in size and morphology across many species, is ontogenetically highly variable and potentially dimorphic, making it unreliable for taxonomic use.

By making variation explicit, our approach avoids arbitrariness in species designation that has historically affected the taxonomy of *Psittacosaurus*.

Funding Sources: NSF FRES award (#1925884) to P. J. Makovicky and the UMN TRTG, SSB GSRA, Jurassic Foundation, and Bell Museum Fund to M. Son

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

The oldest known fossil searobin (Triglidae: Prionotinae) from the late Eocene of Florida, USA, confirms 35-million-year persistence of searobins on the North American Atlantic coast

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The Perciformes have long been considered one of the most taxonomically and morphologically diverse of all actinopterygian orders. The circumscription of this group has changed significantly in recent years, with many highly diverse former orders, such as the order Scorpaeniformes (now the suborder Scorpaenoidei), being subsumed into the Perciformes, while other lineages have been split from the order. The fossil record of Perciformes *sensu stricto* prior to the Oligocene remains fraught with uncertainty.

The Scorpaenoidei is considered the second earliest-diverging suborder of the Perciformes, and among its most diverse in both species and morphology. Among the most morphologically unique of the Scorpaenoidei is the early-diverging family Triglidae, containing the gurnards and searobins—famous for their bizarre derived traits, including their leg-like “walking” fin rays and the large, brightly-colored fan-like pectoral fins. Although common in the fossil record from the Miocene onwards, only a few triglid specimens are known from the Oligocene of Europe, and they are seemingly absent from the Eocene aside from isolated alleged otoliths. This serves as a major knowledge gap in calibrating the timing of the

radiation of Scorpaenoidei and crown-group Perciformes as a whole.

In this study, we identify the earliest fossil triglid known from skeletal remains from the Late Eocene-aged upper Ocala Limestone of Florida. This specimen, originally discovered in 1992 deep within a cave system, comprises a three-dimensionally preserved associated skeleton including a complete neurocranium. The morphology of these remains strongly indicates affinities with the early-diverging modern subfamily Prionotinae, a group still restricted to both coasts of the Americas, where they are the only nearshore triglids. This finding provides a significant calibration point for phylogenies of the Scorpaenoidei and suggests that—in spite of the significant changes in the paleoenvironment and ichthyofauna of the tropical western Atlantic/eastern Pacific since the Eocene—some of the modern fish lineages restricted to these regions have roots dating back to this time. This indicates long-standing provincialism among some American littoral fish clades. We suggest that the extensive Paleogene limestone deposits of the southeastern United States, understudied compared to their European counterparts, have the potential to reshape our understanding of the origins of modern percomorph lineages.

Funding Sources: Wright/Tucker/Fite Endowment, Florida Museum of Natural History, Vertebrate Paleontology Division

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Occlusal perforation across Vertebrata as a case in defining homology

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Facial perforation by mandibular teeth is a conspicuous feature, sometimes used as a diagnostic character, that is observed repeatedly across disparate vertebrate lineages. Thus far, this trait has only been described with regards to individual species or clades without broader comparative context. Here we outline the formation and assess the homology of this trait across Vertebrata to assess its potential as a phylogenetically informative character. In actinopterygians (*Brazilichthys macrognathus*), temnospondyls (Mastodonsauridae*, Nigerpeton ricqlesi*), saurians (Crocodylomorpha, *Tanystropheus hydroides*), and synapsids (Traversodontidae, Ecteniniidae), teeth from the dentary poke through foramina in the maxilla and/or premaxilla when the jaw is shut. In many of these crocodylians and synapsids, prepatterned vacuities for tooth accommodation ("occlusal pits" or "paracanine fossae," respectively) typically correspond with the apicobasally longest dentary teeth, and holes form at the dorsal roof of these vacuities. Many non-crocodyliform crocodylomorphs (= "sphenosuchians") possess a narrow opening between the premaxilla and maxilla that receives the fourth dentary tooth. We present a specimen CM 87670 which exhibits this form of tooth accommodation, as well as seemingly a set of crocodylian-style perforations within the maxilla, in contrast with a conspecific individual (CM 29894) which lacks both. In extant crocodylians, the position, size, and number of these occlusal perforations exhibit high interspecific, intraspecific, and even intraindividual (asymmetrical) variation that imply scant heritable constraint. The mastodonsaurid *Eocyclotosaurus appetolatus*, known from more than 1,000 specimens from a single locality, also varies in the size and position of occlusal perforation for the symphyseal tusk, which forms "palatal" and "premaxillary apertures." We thus argue that these fenestrae originate from erosion by occlusion and are contingent on preexisting snout and tooth morphology. Occlusal perforation should therefore not be considered homologous between taxa at high or low taxonomic levels and should not constitute a taxonomically diagnostic or phylogenetically informative character on its own. Understanding osteological variation in the fossil record by studying living taxa, and qualifying how this variation develops, anchors our knowledge of how morphology evolves.

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

Fossils of a large Permian ray-finned fish (Actinopterygii) from the western USA highlight multiple origins of large body size in Paleozoic actinopterygians

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Biases in the fossil record, when unrecognized, can impede research on the evolution of extinct animals. For example, a literal reading of the fossil record of ray-finned fishes would suggest that body length, as a proxy for body size, was low (<1 m) throughout the Paleozoic. However, a subset of rare, understudied, and typically poorly preserved fossils show that large-bodied ray-finned fishes were present as early as the Late Devonian. Description of fragmentary actinopterygian remains (USNM 457213, FMNH P. 25772, IMNH 2596/51199) from the Phosphora Sea of Idaho and South Dakota shows that a >1 m ray-finned fish was present in the lower Permian of North America. The Phosphoria fossils, in conjunction with scattered descriptions in the literature, indicate that large-bodied actinopterygians were present in both marine and freshwater environments by the Pennsylvanian. Further, large body size is associated with radically different morphologies across stem-group actinopterygians, suggesting multiple origins in distinct feeding niches. Although fossils of large-bodied Paleozoic-aged ray-finned fishes are rare and generally poorly preserved, such remains are critical for alleviating size bias in our understanding of actinopterygian evolutionary history.

Technical Session III: Squamata (Wednesday, November 11, 2026, 1:45 PM)

A new iguanian skull and cervical vertebral sequence from the Late Cretaceous Two Medicine Formation (Montana, USA)

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The Two Medicine Formation of Montana has been a source of paleontological interest for more than a century and has yielded several unique fossils, including two nearly-complete specimens of *Magnuviator ovimonsensis*—the earliest known iguanomorph fossil from Cretaceous North America. The close evolutionary relationship between *Magnuviator* and the Mongolian Temujinidae suggest the Two Medicine Formation represents a largely untapped resource for the study of Late Cretaceous terrestrial squamates and their biogeography. Here we describe MOR 665, a partially complete and partially articulated squamate skull and vertebral sequence from Bob's Vacation Site of the Two Medicine Formation. This specimen was collected in 1990 but has not undergone formal study until now. The orbit of MOR 665 appears large in proportion to the rest of the skull, though as the upper portion of the cranium is disarticulated this large appearance may be at least partially due to breakage. MOR 665's mandibles are well-preserved and are relatively short and deep compared to the rest of the skull, and along with the maxillae bear small, simple homodont and lozenge-shaped teeth without well-developed accessory cusps. The relatively simple morphology of the teeth indicates that MOR 665 is an iguanian. Further, the dentary proportions and tooth morphology clearly differentiate it from *Magnuviator.* MOR 665 also preserves seven of the expected eight cervical vertebrae in squamates. The elongate morphology of these indicates that the specimen had a proportionally long neck, an unusual trait for an iguanian. Further details on anatomy and phylogenetic placement are expected to emerge as CT scan data continues to be segmented.

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Establishing the sex of shed caribou antlers

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Shed antlers of caribou (*Rangifer tarandus*) are common Pleistocene fossils and useful biogeographic indicators of critical habitats; females shed their antlers shortly after they give

birth (identifying calving grounds) and male shed theirs following the mating period (identifying regions near their mating grounds). Unfortunately, our understanding of the morphological differences between isolated male and female antlers is largely limited to size (including the surface area of the pedicle attachment surface, where the antler binds to the cranium), a metric that is not sufficient for differentiating large females from smaller males. Thus, before we can fully decode the paleoecological data available from many fossil records, we must develop a more comprehensive method for differentiating the sex of caribou antlers. Here, we used 144 modern caribou antlers of known sex (64 females, 80 males) to quantify their morphological and size-based distinctions. Antlers were evaluated at the Canadian Museum of Nature and included those grown by calves, adolescents, and adults. We collected data on the presence/absence of antler tines (e.g., brow, bez), presence/absence of palmation (broad, flat, and lobed tines), and the lengths of the major and minor axes of the pedicle attachment surface (from which surface area and ellipticity were calculated). In addition to pedicle attachment surface area, we found several features that differentiate females from males, including pedicle ellipticity, presence of the brow and bez tines, the number of points on the bez tine and main beam, and presence of palmation along the bez and main beam. Random forest models that integrated some or all of these characteristics had significantly greater predictive power (more than twice the kappa values) of those built using only pedicle surface area. Importantly, this includes models built using only features available from antler fragments, increasing opportunities for identifying the sex of shed antlers from Pleistocene fossil assemblages.

Funding Sources: NSF (DEB-2135479), Sigma Xi GIAR (University of Cincinnati chapter), Arctic Centre Travel Award

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Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

The curious case of the crooked neck—reconstruction of an apatosaurine sauropod neck

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The biomechanics and posture of sauropod necks remain much debated, largely because complete and undistorted specimens are rare. BYU 18531, an exceptionally preserved apatosaurine from the Upper Jurassic Morrison Formation of Utah, consisting of cervical vertebrae C2–C15 and anterior dorsal vertebrae D1–D4, provides a rare opportunity to reconstruct neck geometry and mobility. Individual vertebrae were digitized using photogrammetry, laser scanning, and CT and were then articulated in a three-dimensional kinematic model based on the biomechanics of extant highly congruent, opisthocoelous vertebrate necks.

Contrary to the proposal that thick intervertebral disks resulted in head elevation in sauropods, the high joint congruence unambiguously supports thin intercentral separations (~14 mm), which do not scale with centrum length. Rearticulation reveals an unexpected “reflex” curve rather than a simple dorsally curved arc or avian sigmoid neck. Two curvature inflections partition the neck into: 1) a short, dorsally curved proximal segment, 2) a longer ventrally curved medial segment, and 3) a short, dorsally curved distal segment. Intervertebral joint flexibility from C2 to D1 was approximately uniform (~8° ventroflexion, ~9° dorsiflexion, and ~11° lateroflexion), with no avian-like flexibility regionalization. Disarticulation at extremes of both dorsiflexion and lateroflexion was prevented by osteological stops (contact between the postzygodiapophyseal lamina and the prezygapophyses of subsequent vertebrae) while preserving a 50% zygapophyseal overlap. Ventroflexion was constrained only by zygapophyseal overlap.

The three segments allow efficient browsing over a range of head elevations. The proximal segment provides coarse head elevation and direction, and the medial and distal segments allow progressively finer positioning. It was a generalist browser, capable of a wide swath from ground level to about ~6 m high, while maintaining a vertical distance

from head to heart of ~3 m (that of a giraffe). The side-to-side arc length varies from ~8 m at ground level, ~15 m at shoulder height, to ~4 m at maximum head height of ~8 m. Flexion from proximal to distal progressively engages osteological stops to resist axial torsion as well as excessive dorsiflexion. Given that the undeflected head is ~3 m above the ground in ONP, yet able to reach 8 m high, we interpret this sauropod to be a "facultative high browser."

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

A new hsisosuchid crocodyliform from the Lower Jurassic Lufeng Formation (Yunnan, China) and the evolution of the crocodyliform pterygoid

Josef Stiegler[1], Tori F. Gabor[2], Xing Xu[3], Shundong Bi[4], James M. Clark[2]
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The crocodyliform fauna of the Early Jurassic (Hettangian–Sinemurian?) Lufeng Formation in Yunnan, China has until recently been represented by fragmentary material, all from the Zhangjiawa Member. The first one discovered, *Platyognathus hsui*, was originally described from a mandibular symphysis in 1944 but in 2025 was redescribed from a complete skull. An important description of Lufeng material by Simmons in 1965 misidentified a partial skull and postcrania as belonging to *P. hsui*, and here we report on a new specimen referrable to the same unnamed species as Simmons's specimen. The new specimen comprises the anterior half of a skeleton, including a complete skull with mandible, and is the most complete crocodyliform known from the Lufeng Formation. Our phylogenetic analysis places the new specimen in a clade with *Hsisosuchus*, a genus of Middle–Late Jurassic terrestrial crocodyliforms from China recently hypothesized to form a clade with the putative Early Jurassic goniopholidid *Calsoyasuchus*. Hsisosuchid features of the new taxon include an unusual anterolaterally facing postorbital and two homoplastic features (Bremer support = 3). Unlike *Hsisosuchus*, a maxillary fossa is absent, a distinct transverse ridge on the pterygoid is absent, and the suborbital fenestra is larger—all plesiomorphies concordant with its earlier stratigraphic position. If thalattosuchians are sister to Crocodyliformes, then *Hsisosuchus* and the new taxon are on a branch at the base of a monophyletic Protosuchia; if thalattosuchians are mesoeucrocodylians, then *Hsisosuchus* and the new taxon are sister to Neosuchians + Notosuchians. *Calsoyasuchus* does not group with hsisosuchids but with mesoeucrocodylians; with implied weights (k = 12) it is sister to neosuchians + notosuchians.

A functionally important change from the ancestral pseudosuchian condition involved the rotation of the pterygoids posteriorly, associated with enlarged pterygoideus muscles and flattening of the skull. *Hsisosuchus* is important in being more like neosuchians and notosuchians in these features than are "protosuchians," with the large pterygoids rotated posteriorly to nearly cover the basisphenoid. The new taxon is less developed than *Hsisosuchus* in the rotation of the pterygoids—its basisphenoid is more broadly exposed posterior to the pterygoids though less than in protosuchids. The polarity of this character change depends on whether thalattosuchians are outside Crocodyliformes and if Protosuchia is monophyletic.

Funding Sources: NSF EAR 1636753, Wilbur V. Harlan Fund

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

Reassessment of phytosaurs (Archosauriformes) from the Upper Triassic Newark Supergroup and anatomy and variation of *Rutiodon*

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The semiaquatic phytosaurs (Archosauriformes) now include >35 taxa globally from the Middle–Late Triassic. The North American record of this group spans nearly the entire in-group, including some of the earliest-branching (*Wannia*, *Parasuchus*) to the latest-known (*Redondasaurus*). Phylogenetic analysis of the group has clarified relationships of both the earlier-branching non-leptosuchomorph phytosaurs and the later-branching mystriosuchines; however, our understanding of the latest Carnian–earliest Norian taxa remains clouded. The most commonly identified taxon from eastern North America, *Rutiodon*, was identified throughout the well-dated Newark Supergroup for more than 150 years and was used to correlate that extensive stratigraphic record across other much more fossiliferous localities in northern Pangea (e.g., southwestern USA, Germanic Basin). However, *Rutiodon* includes multiple named species, was never properly diagnosed, and reassessment of existing material questioned proposed diagnostic cranial features as plesiomorphic, limiting its formerly geographically extensive record. Thus, *Rutiodon* was restricted to eastern North America, but not all phytosaurs from the Newark Supergroup are referrable to the endemic *Rutiodon*. For example, reidentification of a specimen assigned to *Rutiodon* from the early Norian Zions View tetrapod assemblage of the middle New Oxford Fm. (Gettysburg Basin), Pennsylvania, is the first confirmed occurrence of *Parasuchus* in the Newark Supergroup. Further, the prenarial portion of a cranium from the upper Norian–Rhaetian Blomidon Fm. of Nova Scotia identified as *Rutiodon* and recently renamed *Jupijkam paleofluvialis* is not diagnostic beyond Phytosauria. CT data for the lower Norian neotype specimen of *R. carolinensis* (USNM 214513: Cumnock Fm., Deep River Basin) is used here to provide the first anatomical description for this important cranial material. Differences among both cranial and postcranial material identified as *Rutiodon* from the Cumnock of Egypt, North Carolina, (e.g., USNM 214513, AMNH 1, 2, 3, 5) indicate the need to better quantify ontogenetic, intra-, and interspecific variation among these specimens and establish a modern diagnosis of apomorphic character states for *Rutiodon* across the skeleton. Recognizing the diversity within and across these phytosaur specimens from eastern North America will provide a modern biological understanding of this group and help clarify an important stage in phytosaur evolutionary history.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Fossil mammals from Old Bean Coulee of the Two Medicine Formation in Montana, USA

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The upper Campanian (~76–77 Ma) Two Medicine Formation in western Montana, USA, is richly fossiliferous. Microsites at the Two Medicine Formation are somewhat rare. The fossils described in the microsite (Old Bean Coulee) from the Willow Creek Anticline suggest a more terrestrial environment than other microsites from the formation. Fossils from this microsite include dinosaurs, lizards, terrestrial reptiles, amphibians, and mammals. The mammals of Old Bean Coulee are represented by teeth from multituberculates (including *Cimexomys*) and marsupialiforms (including *Alphodon*). The description of mammals from this site is essential to gaining deeper insight into the Two Medicine Formation ecosystem and early mammal evolution, more broadly. The mammal teeth were identified by using high-magnification microscope imaging. The images were used to compare dental morphology to previous studies of Cretaceous mammal taxa. Diagnostic features such as cusp arrangement and crests were used for taxonomic identification. Small mammals are particularly valuable for paleoecological interpretation as they tend to evolve rapidly in response to their environment and have shorter lifespans, meaning limited dispersal. Consequently, the presence of small mammals provides high-resolution insight into the terrestrial

environments, vegetation, structure, and ecological complexity of the Old Bean Coulee. The relatively high abundance of mammals at this site suggests a stronger terrestrial vertebrate preservation compared to other microsites found in the Two Medicine Formation.

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

New postcranial material of *Afradapis longicristatus* (Adapiformes, Caenopithecinae) from the late Eocene Locality BQ-2 (Fayum Depression, Egypt): implications for locomotor pattern

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The Fayum Depression in Egypt preserves terrestrial vertebrate fossil sites from the late Eocene through the early Oligocene and contains a unique primate assemblage that includes adapiforms, crown strepsirrhines, and haplorhines. Descriptions of Paleogene fossil primates primarily rely on dental remains, while available postcranial material is restricted primarily to tarsal elements. *Afradapis* is an unusual adapiform from BQ-2 quarry and is thought to be closely related to the European genus *Caenopithecus.* Previous analyses of tarsal material referred to these genera have led to the hypothesis that caenopithecines were specialized antipronograde primates, with adaptive similarities to both lorises and sloth lemurs. Here, we describe additional postcranial material of late Eocene *Afradapis longicristatus* (a distal humerus and a fifth metacarpal) and use it to further test this locomotor hypothesis by assessing whether *Afradapis* shows additional morphological similarities to sloth lemurs and/or other antipronograde primates. Both elements were compared to those of other Eocene adapiforms, as well as those of extant strepsirrhine and subfossil lemurs. Curvature of the metacarpal shaft was measured using the included angle of the metacarpal diaphysis. The specimen shows distinct dorsal curvature, a feature that is also present in subfossil lemurs such as *Palaeopropithecus* and *Babakotia*. We present more quantitative comparisons of this feature within the metacarpals to address the degree of similarity of the new specimen to subfossil lemurs and other adapiforms. The distal humerus shows some features that are also consistent with slow-moving quadrupedalism, but the variability of these features is less clearly linked to locomotor behavior than variation in the talus and metacarpal elements. Overall, these observations support previous conclusions about the locomotor behavior of *Afradapis* based on talar morphology. The temporal context of this material, its presence in the Fayum, and the sister taxon relationship between *Afradapis* and European *Caenopithecus* highlight the adaptive and biogeographic importance of *Afradapis* within the broader context of early primate evolution.

Funding Sources: Boyer NSF BCS 1152848

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

First record of Centrosaurus apertus from Montana, USA, expands the maximum centrosaurine geographic range

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Centrosaurus apertus, by far the best-known centrosaurine ceratopsid dinosaur, is represented by numerous individual specimens and extensive bonebeds from the Dinosaur Park Formation of southern Alberta and Saskatchewan, Canada. Previous research suggests that centrosaurines, in contrast with many chasmosaurines, were geographically restricted, with *C. apertus* estimated at the upper range, ~60,000 km^2. A recently discovered subadult centrosaurine from the Coal Ridge Member of the Judith River Formation south of the Missouri Breaks, central Montana, can be confidently referred to *Centrosaurus apertus* (MOE

M0072). The articulated skull was discovered weathering at the surface, resulting in the loss of the dorsal portion of the facial skeleton, and consists of the rostral, both dentaries, portions of both jugals and epijugals, both quadrates, both squamosals, and a nearly complete parietal. The squamosals preserve five episquamosal positions and evidence for an epiparietosquamosal on the parietal-squamosal suture. The parietal preserves six epiparietal positions on each side, with ep1 recurved dorsally and ep2 flattened and directed posteriorly. The absence of preserved episquamosals and epiparietals, together with a combination of long-grained bone surface and mottled texture, indicates that the individual was skeletally immature. The overall shape of the parietal and the number of episquamosals are typical of *Centrosaurus apertus* and differentiate the specimen from other centrosaurines (e.g., Nasutoceratopsini, Albertoceratopsini, *Wendiceratops*, *Sinoceratops*). It can be further distinguished from *Spinops* by the absence of a rounded ep2, from *Coronosaurus* by the absence of "cauliflower-like" epiparietal ornamentation, and from *Stellasaurus*, *Styracosaurus*, and pachyrhinosaurines by the absence of posteriorly directed, elongate spikes. The presence of *Centrosaurus* in central Montana extends the north/south geographic range of the species to ~400 km with a range of ~120,000 km^2, conservatively estimating a 300 km wide coastal plain as indicated by specimens ranging from Alberta to Saskatchewan. Even with this effective doubling of the species range in *Centrosaurus*, it remains remarkably small in comparison to the ranges of chasmosaurine ceratopsians such as *Torosaurus* and *Triceratops* and carries implications for estimating maximum geographic range in centrosaurines, a characteristic that likely contributed to their rapid diversification during the Campanian of North America.

Funding Sources: Museum of Evolution, Maribo, Denmark

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

New toothed mysticetes (Aetiocetidae) from the Pacific Northwest indicate dental simplification independent of tooth loss in baleen whales

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In baleen whales (mysticetes), the evolution of bulk filter feeding coincided with major transformations in feeding anatomy, including tooth loss and the origin of a novel soft tissue structure (baleen). While the fossil record documents a departure from the toothed ancestral condition, the precise sequence of steps in dental simplification, reduction, and/or loss remains unresolved. Furthermore, contradicting topologies of recent phylogenetic analyses indicate that the relationships among the earliest mysticetes are unstable. Specifically, these analyses challenge the long-standing monophyly of Aetiocetidae, a group of toothed mysticetes from the North Pacific that represent the most closely related toothed mysticetes to edentulous forms (Chaeomysticeti). Stem mysticetes that traditionally include so-called toothed mysticetes exhibit a variety of dental morphologies, ranging from a strong degree of heterodonty and large tooth sizes (e.g., non-aetiocetid *Coronodon*), to the weakly homodont and small tooth sizes in *Aetiocetus*. Currently, the inclusion of strongly heterodont taxa within a monophyletic Aetiocetidae suggests that apparent trends in dental simplification occurred independent of tooth loss. We describe material from two new toothed mysticete taxa collected from the Oligocene of Oregon, USA, and British Columbia, Canada. These taxa are characterized by a strongly heterodont dentition with relatively large double-rooted cheek teeth. Attritional wear facets on the postcanine teeth suggest a functional postcanine dentition with some shearing capability. A maximum parsimony phylogenetic analysis recovers both taxa as basal branching within a monophyletic Aetiocetidae. Our results support the hypothesis that dental simplification among aetiocetids occurred independent of tooth loss in baleen whales.

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

Localized bone expansion in a new Miocene odontocete rostrum (VMNH 220047): reassessment of paleopathological diagnoses in enigmatic rostra

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Elongate rostra occur in many Miocene odontocetes and commonly are recovered as incomplete or isolated elements. Because of this isolation, pathological modification of the rostrum can complicate taxonomic and veterinary interpretations of the underlying material. Several enigmatic rostra from the Miocene Chesapeake Group of Maryland and Virginia, as well as a singular specimen from the Hawthorn Group of Florida, were previously interpreted as exhibiting chronic periostitis, with abnormal proliferative bone growth concentrated primarily along the premaxillae. These lesions presented as regions of expansive, concentric bone growth around the rostral elements. Although those specimens were identified as pathological, the etiology and biological significance of the condition remain unresolved. Here, we describe both the external and internal morphology of VMNH 220047, a partial odontocete rostrum from Carmel Church Quarry, Calvert Formation, Virginia. The specimen preserves localized pathological expansion of the premaxillae and portions of the maxillae, and is morphologically comparable to previously described pathological Miocene odontocete rostra from the Chesapeake and Hawthorn groups. Computed tomography and gross morphological examination were used to assess the distribution and internal structure of the lesion. The rostrum is narrow anterior and posterior to the expanded region, which is externally irregular, bulbous, and expanded posteriorly. No teeth or alveoli are preserved in either the premaxillae or the maxillae. Internally, the lesion exhibits concentric layering of periosteal reactive bone, with no clear evidence of fracture, displacement, or aggressive destructive expansion. VMNH 220047 represents a ninth rostrum in the previously recognized sample of Miocene odontocete rostra with proliferative bone growth, indicating this may be a recurrent morphological pattern rather than unrelated abnormalities. The similarity in morphology among the specimen samples allows the lesion to be assessed comparatively through shared criteria of anatomical distribution and modeling, showing relationships between specimens as well as modern equivalent pathogenesis. Despite a lack of definitive etiology, the repeated occurrence of this pathological pattern suggests a shared disease progression affecting the rostral bones of Miocene odontocetes and provides a framework for evaluating abnormal expansion in elongate rostra of other taxa.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Habitat heterogeneity in the Uinta Basin, Utah (middle Eocene)

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The middle Eocene rock units in the Uinta Basin in northeastern Utah have been interpreted as a subtropical forest that experienced a shift to drier, more open conditions from the Uintan to Duchesnean North American Land Mammal Ages (NALMAs). Lower intervals of the Uinta Formation (UF) are characterized by mottled greenish-gray-tan mudstones and siltstones interspersed with widespread coarse sheet sandstones. The upper UF exhibits more oxidized reddish and purple paleosols, and these extend into the overlying Duchesne River Formation (DRF), which exhibits even more red oxidized layers. UF sediments were deposited contemporaneously with the stratigraphically intertonguing lacustrine Green River Formation. The sediments of the UF and DRF suggest an earlier landscape dominated by riverine forests, perennial streams and ponds, and

permanent standing water that transitioned to a later environment defined by more ephemeral water sources. This general environmental trend appears to be mirrored by the vertebrate fossil record of these two formations.

Historically, the collection of mainly medium and large mammals from this site hampered our understanding of paleoenvironmental diversity. Recent fieldwork focusing on collecting a total vertebrate fauna from these sediments has led to the identification of multiple habitat types. Here, using the complete catalog of UF and DRF vertebrate specimens (N = 5590) from the Uinta Basin Project (UBP), localities were classified as terrestrial, semiaquatic, or aquatic. Aquatic and semiaquatic localities were identified by the presence of at least one aquatic (e.g., fish) or semiaquatic (e.g., semiaquatic turtle) vertebrate, respectively.

Results indicate that while strictly aquatic localities compose only 8.1% of localities, approximately half of all known UBP localities are aquatic or semiaquatic. In the DRF, 36.3% of localities are aquatic or semiaquatic (as compared to 51.0% in the UF), consistent with increased aridity in these younger sediments. However, interestingly, 86% of DRF specimens were derived from either aquatic or semiaquatic localities, including the first known lepisosteid (gar) fossils from this formation. These results will be discussed within the larger geographic framework of the basin.

Documenting this habitat heterogeneity and associated faunal diversity is critical to a complete reconstruction of, and the impact of climate change on, this important middle Eocene sequence.

Funding Sources: NSF-EAR 2011695, NSF-EAR 2011677, NSF-EAR 2011685, NSF-EAR 2011698, GVSU OURS

Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

Quantifying the taphonomic constraints on anatomical information in vertebrate fossils from the high paleo-latitude Lower Triassic Fremouw Formation of Antarctica

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The Fremouw Formation hosts the oldest record of tetrapod vertebrate fossils from Antarctica and figures prominently in paleontologists' understanding of vertebrate assemblages at high paleolatitudes during Early Triassic times. Comparative work between the Fremouw and coeval assemblages at lower latitudes could uncover spatial heterogeneity in the tempo of recovery from the end-Permian mass extinction (EPME) across southern Pangea. However, to better understand the contribution of the Antarctic fossil record during the recovery of terrestrial ecosystems after the EPME, we must first characterize and quantify the geologic, taphonomic, and sampling filters that affect our ability to reconstruct ancient biodiversity and environments. In this study, we use more than 600 specimens housed at the University of Washington Burke Museum of Natural History & Culture and the American Museum of Natural History to assess taphonomic controls on the completeness and quality of anatomical information preserved in the Fremouw vertebrate assemblage. We use a novel, semiquantitative metric to quantify each specimen's skeletal completeness, regardless of taxonomy and specific morphology. We then compare skeletal completeness with: 1) matrix lithology, 2) depositional setting, 3) taxonomic affinity, and 4) specimen locality. We find that, on average, more complete fossils are found in finer-grained sediments representing mostly lower-energy fluvial depositional environments interpreted as primarily crevasse splays on floodplains. Coarse-grained and conglomeritic lithologies representing high energy environments such as the base of fluvial channels, on average, preserve the least anatomically complete specimens. Lithologies representative of high energy environments also preserve the highest percentage of specimens too incomplete to assign to a specific taxon. Additionally, although dicynodont therapsids and temnospondyl amphibians are the most numerous fossils in these collections, on average the most skeletally complete groups are archosauromorph reptiles, as well as therocephalian and cynodont therapsids.

These results suggest specific depositional settings, body size, and identification biases play prominent roles in filtering skeletal information in the Fremouw fossil record and could inform future basin-level comparisons across southern Pangaea and the influence of taphonomic controls on interpretations of the paleobiological history of fluvial foreland basins.

Funding Sources: NSF ANT-2313242, ANT-1341304, ANT-1947094

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Ornithischian niche partitioning in the Lance Formation analyzed via dental microwear texture analysis (DMTA)

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The community-level feeding ecology of ornithischian dinosaurs of the Upper Cretaceous Western Interior Basin (WIB) region has been debated extensively with no clear consensus on the macroecology of any given assemblage or on how these ecological dynamics changed during the final 15 million years of the Cretaceous Period. Dental microwear texture analysis (DMTA) is an emerging methodology in diapsid paleobiology that quantitatively infers feeding behaviors based on scanning confocal microscopy and scale-sensitive fractal analysis of dental microwear patterns. It has been applied extensively to mammal community ecology but remains understudied in diapsid taxa. The Lance Formation of Eastern Wyoming, USA, preserves a dinosaur faunal assemblage from the upper Maastrichtian. It is coeval with the more famous Hell Creek Formation and preserves a similar coastal semi-tropical riparian floodplain ecosystem. We analyzed the feeding guild structure and niche partitioning of Lancian ornithischians using existing museum collections. DMTA variables were gathered from collected ornithischian teeth to map the studied taxa in texture-dietary spaces to infer feeding ecology and potential dietary niche partitioning based on comparisons to data from modern analogues. Principal component analysis (PCA) results were statistically inconclusive, but anisotropy-complexity bivariate analysis revealed grazing, browsing, and generalist niches similar to those of extant herbivorous mammals. Multidimensional scaling analysis (MDS) results additionally indicated that body mass class was the most significant predictor of DMT features. Further study is needed to compare results to other paleoecological proxies and to DMTA of other taxa or other sympatric communities.

Funding Sources: The Citadel Summer Research Provost Grant

Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

Co-evolutionary dynamics of body mass and wing length in birds

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Wing morphology and locomotor function is known to be influenced by body mass, yet the nature of the allometric relationship of the wing across the bird phylogeny is currently unknown. As a key regulator of many organismal traits, body mass may also influence evolvability in bird wings by introducing or removing mechanical and modular constraints. Such changes in evolvability may be expressed in macroevolution as changes in variance. While biomechanical studies have implicated several other morphofunctional traits in flight performance, we use wing length due to its extensive availability, functional relevance, and suitability for body mass analyses. We characterize the role of body mass in modulating the mean of wing length (through allometry) and variance (through evolvability). Using a comprehensive trait database and phylogeny, we fit a Bayesian

phylogenetic trait evolution model (the Fabric Regression model) for more than 9,700 extant and extinct species of birds to detect the locations of shifts in the mean and variance of wing length. Our results demonstrate that the allometric relationship is vastly varied across the phylogeny, suggesting clade-specific constraints. The slope of the body mass–wing length relationship in many clades is often far from isometry (0.33), such as in birds of prey and owls (0.45) or the various songbird orders (0.08–0.2). Body mass also structures variance, with smaller birds showing more variable wing lengths. Despite this, we find that evolutionary changes in body size do not directly affect the ability to produce more variation. We reconstruct directional evolutionary trends for relative and raw wing length, uncovering many sustained trends, such as in Gruae (shorebirds and rails) and Strisores (hummingbirds, swifts, and nightjars), both of which have undergone reductions in wing length for ~60 million years. Finally, increases in wing length evolvability accumulate through time across most clades, perhaps indicative of phenotypic radiations.

These results imply that wing length evolution is shaped by both body mass (which appears to set the range of accessible morphologies), and clade-specific (functional) constraints. We stress the importance of extending this analysis to other wing traits, which are essential to understanding the evolution of wing morphology broadly. The differences we find between relative and raw wing length evolution also demonstrate the value of incorporating covariates in macroevolutionary studies.

Funding Sources: Society of Vertebrate Paleontology: The Futures Award

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Using statistical analysis to discriminate stratigraphic and population variation in Late Triassic (Carnian–Norian) Metoposaurids (Stereospondyli), with possible implications for alpha taxonomic resolution and phenotypic response to climate change

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Metoposaurs are common members of Late Triassic faunal assemblages throughout North America, Europe, India, and Morocco. However, due to substantial physical similarities between populations, as well as a high degree of variation within populations, their systematic relations and alpha taxonomy, particularly of the North American taxa, are poorly understood and limit the potential for understanding their regional and temporal variation, as well as limiting the usefulness of metoposaurs for biostratigraphic resolution. The work presented here represents the initial stages of a comprehensive bivariate and multivariate study of metoposaurs variation through time and space. The Museum at Texas Tech University and several other institutions house extensive collections of metoposaur specimens from West Texas localities that provide a rich starting point for such research. One hypothesis is that metoposaur size changed over time, potentially in response to increasing aridification over the course of the Late Triassic in the western USA. Vertebral elements of known stratigraphic and geographic provenance were measured and analyzed with software packages in R and mapped via the Google Earth Engine platform. The results support that the average size of metoposaur vertebrae decreased over the course of the Late Carnian and Norian. The map created through this study provides the Paleontology Division of MaTTU with a geographical visualization of its collection that can be added to and expanded upon with future discoveries. The multivariate analysis incorporates skull material from numerous localities, including Elkins Place, Rotten Hill, and Otis Chalk Quarries 2 and 3, all of which have been thoroughly measured and analyzed through additional packages in R. Through the process of evaluating multiple variables simultaneously, there is great potential for distinguishing different types of variation, including ontogenetic, intraspecific, and interspecific. In order to strengthen the results, future efforts will involve incorporating skulls from additional collections, expanding the scope to include postcranial material, and tightening the analytical procedure as necessary, all with the goal of expanding and clarifying our understanding of

these widespread amphibians and the environment in which they lived.

Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

Neoplasia through evolutionary time: evidence, bias, and mechanisms from the fossil record

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Cancer, or at least neoplasia, may be as old as life itself, representing a trans-phylogenetic phenomenon observed across the animal kingdom, including basal metazoans (e.g., cnidarians). Radiographic survey of 10,312 dinosaur vertebrae revealed a metastatic cancer lesion in a single individual among the 708 examined. None were recognized on macroscopic examination in that cohort. Macroscopic survey of 50,000 bird skeletons identified metastatic cancer in 24 individuals.

The study of prehistoric cancer is feasible because the biological and morphological characteristics of neoplasms have remained remarkably consistent from the Mesozoic to the present. Malignant bone tumors identified in extinct taxa include giant cell tumors, chondrosarcomas, and osteosarcomas, which can be further subclassified based on growth patterns and tissue organization. Recent integrative analyses combining gross morphology, histology, and microstructural data from fossil specimens have provided unprecedented insights into tumor growth dynamics and pathophysiology at the tissue level. Rather than being driven solely by genetic mutations, the fossil evidence is consistent with the Tissue Organization Field Theory, which posits that cancer arises primarily from disruptions in tissue architecture and organization. The preservation of pathological features in fossil bone demonstrates that such tissue-level dysregulation is an ancient and evolutionarily conserved mechanism underlying neoplastic transformation.

Despite the high prevalence of cancer in modern populations, its detection in paleontological material remains limited. This discrepancy likely results from preservation biases, selective sampling of well-preserved specimens, and the fact that many tumors do not produce diagnostic surface modifications. Additionally, a substantial proportion of metastatic and primary bone tumors can only be identified through radiological or destructive analyses, indicating that current estimates significantly underestimate true prevalence. With the increasing ability to confidently diagnose neoplastic diseases in the fossil record, future research should focus on (1) expanding comparative datasets of both macroscopic, radiologic, and histological tumor features across extant and extinct taxa, and (2) implementing systematic, population-level studies that integrate radiological techniques.

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Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

Mammals from the Hewett's Foresight local fauna (Lance Formation, Bighorn Basin, Wyoming) reveal a unique mountain-proximal ecosystem prior to the Cretaceous–Paleogene mass extinction

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Studies of mammalian communities leading up to the Cretaceous–Paleogene (K–Pg) mass extinction have primarily focused on fossils from coastal lowland paleoenvironments. Because small mammals are species-poor in coastal lowlands today, we may therefore be underestimating the diversity of pre-extinction mammalian communities. Hewett's Foresight is a latest Cretaceous (ca. 68–66 Ma; Lancian North American Land Mammal Age) fossil locality in the Lance Formation of the Bighorn Basin, Wyoming, located ~15 km southwest of the Laramide Beartooth Uplift. Here, we revise the taxonomy of mammals from the Hewett's Foresight local fauna, with the aim of illuminating pre-extinction mammalian biodiversity patterns in this distinctive mountain-proximal

paleoenvironment. Mammals from Hewett's Foresight include new taxa only known from the locality and other taxa that are primarily known from other mountain-proximal depositional environments. We describe a new species of neoplagiaulacid multituberculate and individual multituberculate and metatherian specimens that may represent new species, all of which are unique to the Hewett's Foresight local fauna. The metatherians are mostly typical of those from the Lancian NALMA elsewhere, but we describe a new genus of glasbiid metatherian that is found at both Hewett's Foresight and the Type Lance local fauna in eastern Wyoming. The eutherians consist of leptictids and cimolestids that mostly resemble those from the coeval Trochu local fauna of the Scollard Formation, which is located proximal to the Sevier front in Alberta. Although analyses including therian mammals are pending, the taxonomic composition of the multituberculates from Hewett's Foresight most closely resembles that from the Laramide-mountain-proximal Black Butte Station and Pawnee Grasslands local faunas in Wyoming and Colorado, respectively. The Hewett's Foresight local fauna highlights that there was spatial heterogeneity in mammalian taxonomic richness and constituency in the latest Cretaceous of the Western Interior of North America. As such, mammalian communities may not have responded uniformly to environmental perturbations preceding and during the K–Pg mass extinction. In sum, this study reinforces the need for future research on mammalian assemblages outside of coastal-lowland paleoenvironments to more completely understand terrestrial ecosystem change across the K–Pg boundary.

Funding Sources: University of Michigan Department of Earth and Environmental Sciences, Turner Grant, and Rackham Graduate School

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Exploring the foraging ecology and extinction chronology of Pleistocene–Holocene megalocnid sloths from Hispaniola

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Sloths evolved in South America during the Eocene and dispersed into the Caribbean Islands in the Oligocene before radiating throughout the Americas. This broad geographic range sustained a diversity of sloths, with 27 genera thriving in the Late Pleistocene. Caribbean sloths comprised their own now-extinct family, Megalocnidae, about which we know remarkably little. We used stable carbon ($d^{13}C$) and nitrogen ($d^{15}N$) isotopes in bone collagen to illuminate the foraging behavior of three megalocnid genera from montane sinkholes in southwestern Hispaniola: *Neocnus*, *Acratocnus*, and *Parocnus*. Carbon isotopes can discern consumption of trees and shrubs versus tropical grasses. Combined, C and N isotopes can clarify preferred foraging habitats (e.g., forest canopy, forest floor, or open landscape). Based on past morphological research, we anticipated that *Neocnus* (8 kg) was semi-arboreal, browsing leaves in forest canopies; *Acratocnus* (15 kg) was semi-arboreal, foraging closer to the ground; and *Parocnus* (79 kg) was terrestrial, consuming grasses and shrubs. Our isotopic data partially support these expectations: *Parocnus* had variable $d^{13}C$ and relatively elevated $d^{15}N$ values, which we believe is consistent with terrestrial foraging in open habitats. Conversely, *Acratocnus* had relatively elevated $d^{13}C$ and low $d^{15}N$ values, which is more consistent with foraging in the canopy than the understory. *Neocnus* had the lowest $d^{13}C$ and $d^{15}N$ values, which may reflect foraging in the forest understory. However, it also had highly variable isotopic data, which may indicate dietary flexibility. This variability could also be the result of some individuals being non-local. We observed numerous butchered sloth bones while collecting samples, which insinuates human hunting and discard. We will use oxygen isotopes to clarify if sampled sloths originated from different elevations, and radiocarbon (^{14}C) dating to investigate potential temporal isotopic trends. Existing ^{14}C dates for Hispaniolan sloths are very limited (eleven total); this includes nine *Neocnus* (ranging from ca. 4,400 to 27,700 radiocarbon years before present, or ^{14}C yr BP), but just one *Acratocnus* and *Parocnus* (ca. 10,400 and 14,200 ^{14}C yr BP, respectively). Dates for these larger sloths are

considerably older than the mid-Holocene arrival of humans, but butchered bones clearly indicate sloths overlapped temporally with people in Hispaniola. Additional ^{14}C dates will elucidate when these taxa truly disappeared.

Funding Sources: National Science Foundation Grant EAR-2047818, the University of Cincinnati Department of Geosciences, and the American Society of Mammalogists

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Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

Are bigger teeth more complex? Scaling relationships and integration in *Stegodon* molars

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Dental characters such as plate count, crown dimensions, and enamel thickness are widely used in taxonomy and inferences of evolutionary relationships, yet the extent to which these traits scale with overall tooth size remains poorly quantified. Thus, determining how dental traits are organized and integrated is essential for understanding the developmental organization and evolutionary diversification of stegodont dental morphology. *Stegodon* is an extinct proboscidean distributed across much of Asia from the late Miocene to the end of the Pleistocene. Its taxa exhibit substantial variation in body size, including multiple instances of insular dwarfism, thereby providing an opportunity to investigate how tooth complexity scales with body size. We analyzed allometric relationships and integration among multiple dental parameters from maxillary and mandibular cheek teeth of Asian *Stegodon*, including plate count, crown length, width, and height, lamellar length, enamel thickness, as well as shape and hypsodonty indices. We used ordinary least squares and standardized major axis regressions to evaluate scaling relationships and correlation and partial least squares (PLS) analyses to assess patterns of covariation and integration among dental traits. Most crown dimensions exhibit strong positive and largely conserved scaling with overall tooth size. Residual correlation analyses reveal structured patterns of covariation among crown dimensions, enamel thickness, hypsodonty, and lamellar architecture. PLS analyses indicate significant integration between lamellar architecture and crown size, crown shape, hypsodonty, and enamel thickness in both mandibular and maxillary dentitions. However, the strength of integration varies among trait complexes and is consistently stronger in mandibular than maxillary dentitions. Despite this overall integration, plate count exhibits weaker and more variable scaling relationships than other crown dimensions, suggesting that some aspects of dental complexity may be evolutionarily more flexible than crown size and shape. These results indicate that *Stegodon* molars evolved as highly integrated systems while retaining traits with differing degrees of evolutionary flexibility.

Funding Sources: UP Diliman OVCRD Outright Research Grant No. 232330 ORG, UP NIGS Research Grants, AMNH Collections Study Grant, Jardine Foundation

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Technical Session VI: Dinosauria II: a “bird-hipped” bonanza (Thursday, November 12, 2026, 8:00 AM)

Nasal soft-tissue anatomy of *Triceratops* and other ceratopsid dinosaurs and its evolutionary sequence

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Although ceratopsid dinosaurs possess a characteristically hypertrophied narial region, soft-tissue anatomy associated with such a skeletal structure and their biological significance remain poorly understood. The present study provides the first comprehensive hypothesis on the soft-tissue anatomy in the ceratopsid rostrum based on the

Extant Phylogenetic Bracket approach. Several cranial specimens of *Triceratops* including the computed tomography-scan data of an isolated premaxilla as well as those of phylogenetically diverse ceratopsids were examined and compared to the anatomical features of the rostrum in extant reptiles. The resulting hypothesis includes the narial neurovascular pathways and locations of the nasal gland and nasolacrimal duct. Particularly, the narial innervation pattern in ceratopsids is inferred to be unique among reptiles and is suggested to have evolved in response to the enlargement of the naris in non-ceratopsid ceratopsians. In addition, respiratory turbinates are inferred to have been present in ceratopsids for the first time based on an osteological correlate and would likely have served for cephalic thermal regulation as in extant birds and mammals. Acquisition of such a structure might have mitigated a thermal problem associated with the large size of the ceratopsid head.

Funding Sources: JSPS KAKENHI grant nos. 24KJ1879, 25KK0046, Overseas Challenge Program for Young Researchers; FY2018 and FY2019 GRASP by the University of Tokyo

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Thems the breaks: Risks of handling an overprepared *Gopherus hexagonatus* specimen and an economical stabilization solution to preserve data for future research

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In 1986, a mass death assemblage of eleven giant *Gopherus hexagonatus* tortoises was found in Willacy County, Texas, during flood remediation efforts. These Pleistocene fossils offer important insights into extinct Texas tortoise morphology, ecology, and behavior as the specimens occurred in apparent nest pits and were accompanied by intact eggs. Preservation for future study is critical. Specimen TMM 42927-2 presented several preservation challenges. This complete shell and plastron was rendered unstable by aggressive over-preparation when limb girdle areas were hollowed out in the search for skeletal elements. Stored in a lidless, decomposing papier-mâché jacket, the specimen had already been broken during handling and was exposed to dust, pests, and UV light. A modern, felt-lined plaster-and-fiberglass clamshell cradle was made to properly protect the specimen. When seating the specimen into the cradle, a part of the previously damaged marginals snapped off, and despite additional hardening with Paraloid B-72, the extremely friable fossil continued to break. This necessitated a more robust strengthening approach. We created a reversible paste of thick B-72 and finely-ground matrix to buttress weak and thin areas in the interior of the shell and plastron. The paste provided excellent reinforcement, however, vertical surfaces proved challenging as the material would slump and pool before fully curing. Ethafoam dams made from scrap supplies were an effective way to hold the paste in place long enough for it to cure. The final challenge was accessing deep, hard-to-reach cavities with the paste. Our team did not wish to move or rotate the specimen further and risk additional breakage, so a way to access these delicate areas was sought. Several options were considered. Pastry bags with plastic tips did not provide enough control, syringes improved control yet still did not have enough length, but a standard-stem polypropylene funnel and an old dowel rod was able to access the problem areas. Paste was injected into the cavities and the funnel slowly retracted. After curing, the specimen was no longer flexible or friable and stabilization was deemed successful. This experience stands as a cautionary tale about working with non-permineralized fossils. Reinforcing thin, at-risk areas should be done prior to handling and need not be an expensive or material-consuming endeavor; our lab achieved this using standard on-hand supplies and materials from the scrap bin.

Funding Sources: Jackson School of Geosciences, the University of Texas at Austin

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Technical Session VI: Dinosauria II: a “bird-hipped” bonanza (Thursday, November 12, 2026, 8:00 AM)

Body mass growth curve comparison and patterns of limb allometry in *Pachyrhinosaurus lakustai* (Dinosauria: Ceratopsidae) based on osteohistological evidence

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Studies of ceratopsid dinosaurs tend to focus on skulls, but postcrania also offer important insights about these animals, as exemplified by the utility of limb bone measurements in building growth curves of body size against age in years. Age can be determined osteohistologically by counting cyclical growth marks, like lines of arrested growth, that are deposited annually in bone. However, the few studies to have produced ceratopsid growth curves have used different limb bones and size measures, making comparisons difficult. A new growth curve using femoral circumference to estimate body mass for the ceratopsid *Pachyrhinosaurus lakustai* differs strikingly from a previously constructed curve for that species based on humeral circumference. Femoral mass estimates increase faster with age than humeral ones, with the femoral curve estimating a body mass of ~1,640 kg for a 9-year-old and the humeral curve estimating a body mass of <800 kg for a 9-year-old. To better understand *Pachyrhinosaurus lakustai* growth patterns, I turned to investigating patterns of allometry between the limb bones. Traditional methods of studying allometry by comparing measurements of bones from known individuals cannot be applied to *P. lakustai*, which is known only from a single disarticulated bonebed assemblage. However, the osteohistologic data from *P. lakustai* provides a sample of bone circumferences for a given age, allowing the average circumference of each bone at each age to be used to plot the "average allometry" between bones. Such a plot for the femur and humerus of *P. lakustai* shows a slope of 1.2 ± 0.28, indicating that humeral circumference may be slightly positively allometric relative to femoral circumference. This may reflect increased weight bearing in the forelimb as the skull grows to a large size. Additionally, the possibly positive allometry of the humerus relative to the femur shows that the difference between the growth curves is due to a factor besides allometry. Perhaps *P. lakustai* femora supported more body mass from the hindquarters than humeri did from the forequarters such that in *P. lakustai*, femora are more robust for their mass, and their humeri more slender, than in extant animals. Regardless, these data demonstrate the need for extreme caution when comparing growth curves based on different elements. Additionally, the histologic approach to evaluating allometric patterns used here opens such studies to taxa known only from disarticulated bonebed material.

Technical Session IX: Archosaur paleobiology & pterosaurs (Thursday, November 12, 2026, 1:45 PM)

A new azhdarchid pterosaur from the Maastrichtian Ouled Abdoun Basin, Morocco, and the diversity of small-bodied Late Cretaceous pterosaurs

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Terrestrial pterosaur communities of the latest Cretaceous are predominantly formed by members of the long-necked toothless clade Azhdarchidae. Although latest Cretaceous azhdarchids are famous for reaching wingspans up to 10 meters, the clade occupied many size classes and coexisting azhdarchid species frequently differ in adult body size. However, smaller-bodied individuals are less likely to preserve outside of Konservat-Lagerstätten. The highly fossiliferous Ouled Abdoun Basin from the late Maastrichtian of Morocco provides a unique look into a multitaxic pterosaur community. Although most of the pterosaur remains from this unit pertain to marine pteranodontians, a smaller number of azhdarchid specimens have also been recovered from this region.

Here we report a new azhdarchid taxon from the Ouled Abdoun Basin, represented by wing and cervical vertebra specimens formerly referred to *Tethydraco* and aff. *Quetzalcoatlus*, respectively. A nearly complete wing differs from the coeval *Tethydraco regalis* in multiple aspects, including lacking a warped deltopectoral crest of the humerus and reaching skeletal maturity at less than 30% the wingspan of the *T. regalis* holotype. Instead, this specimen most closely resembles "*Quetzalcoatlus*" *lawsoni*. A mesocervical vertebra from a similar-sized individual also closely resembles "*Q.*" *lawsoni* and is considered most likely conspecific with the wing specimen. Several autapomorphies allow them to be identified as a distinct taxon from all other pterosaurs, including the coeval *Phosphatodraco*. An expanded phylogenetic analysis recovers this taxon within the gracile azhdarchid clade Serpennata, as the sister taxon of "*Quetzalcoatlus*" *lawsoni*.

Both specimens of the Moroccan azhdarchid are at or near osteological maturity and have estimated wingspans of approximately 1.8 meters. Reappraisal of azhdarchomorph material from across the Late Cretaceous reveals a cryptic diversity of small-bodied (wingspans ≤ 2.5 m) taxa, often coexisting with larger forms. While a higher variety of pterosaur lineages occupied small- and mid-sized terrestrial pterosaur niches prior to the end of the Cenomanian, azhdarchomorphs, particularly azhdarchids, occupied all pterosaur size guilds in Santonian–Maastrichtian terrestrial ecosystems.

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

Correlation of typical behavior with hind-body and forebody morphology of mammals

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The skeletal morphology of mammals has been used to infer behavior by countless functional morphologists with most implementing forebody morphology into their research and some implementing traits from throughout the body. The extent that hind-body morphology is reflected in mammalian behavior has yet to be thoroughly researched and compared to forebody morphology. Here we compare lever arms from forebody joints to those from hind-body joints over sixteen locomotor categories, based on 277 extant mammal species. Analysis of Variance (ANOVA) and the mean variance of locomotor categories per motion indicates that there is a difference in mean mechanical advantage of most forebody and hind-body joints between locomotor categories ($p < 0.001$). Locomotor categories with specialized lifestyles are more strongly associated with unique mechanical advantages of specific forebody joints than hind-body joints. The classification rates from linear discriminant analyses (LDA) suggest that forebody traits are most effective at discriminating specialized lifestyles and hind-body traits are more effective at discriminating unspecialized lifestyles involving semiaquatic paddling and walking. The LDA was only able to classify specialized and unspecialized lifestyles with high accuracy after being performed with a dataset that included forebody and hind-body traits. The classification rates were slightly improved by adding non-lever arm traits to the data, demonstrating the significance of at least some non-lever arm traits in locomotion. We conclude that forebody morphology is reflected in a wider variety of mammalian behavior than hind-body morphology, but primarily specialized behaviors. However, hind-body morphology is reflected in certain unspecialized behaviors more than forebody morphology. Locomotor categories are best characterized by morphology from the whole body.

Funding Sources: Cordell Durrell Fund, Earth and Planetary Sciences Department, UC Davis

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Neurovascular soft tissue preservation in the Eocene primate *Tetonius homunculus*

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The holotype skull of *Tetonius homunculus* (AMNH 4194), collected from the Bighorn Basin in 1881,

remains the only skull assigned to the genus despite decades of subsequent field work in the region. *Tetonius* is widely acknowledged as a member of the family Omomyidae, interpreted phylogenetically as either a stem tarsiiform or a stem haplorhine. Despite its significance as the only nearly complete skull available for *Tetonius*, it has largely been understudied in the literature, most likely as a result of the difficulty interpreting the taphonomically deformed and damaged structures.

Recent advances in micro-CT technology have enabled a redescription of the holotype skull. This includes the isolated bones, internal structures and foramina of the basicranium, a well-preserved vestibulocochlear system, and the dislodged incus (preserved as a hollow space). Within the skull, we also identified the preservation of various soft tissues including cranial nerves, arteries, and veins. This rare preservation of neural tissues has been described in various fossils, including invertebrates, fishes, and dinosaurs, but has never been observed in a fossil primate. Here we identify the various soft tissues and compare the cranial nerve patterning of *T. homunculus* to that of modern primates.

Funding Sources: David B. Jones Foundation
University of Kansas

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Comparative antler histology of fossil and modern deer using synchrotron X-ray tomography and hard tissue thin sections

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Antlers are unique among mammals as fully regenerative, seasonally replaced bony appendages, making them a powerful system for studying bone growth, life history, and skeletal regeneration. Fossil cervids preserve critical stages in antler evolution, yet few studies directly connect fossil antler microstructure to the well-documented growth cycle of modern deer. Previous histological investigations have suggested that the fundamental processes underlying the modern antler cycle, including regeneration and shedding, were already established in the earliest cervids, indicating deep evolutionary origins for these mechanisms. To investigate antler tissue microstructure in fossil cervids, we used noninvasive synchrotron X-ray tomography to visualize the tines of the Middle Miocene *Stephanocemas* and *Euprox*. Preliminary synchrotron data revealed cortical architecture, vascular networks, osteonal organization, and remodeling features in our fossil samples that closely match the histology of extant white-tailed deer. Both *Euprox* and *Stephanocemas* antler tines are composed of compact cortical bone, with abundant primary osteons and longitudinally oriented vascular canals, also seen in modern *Odocoileus virginianus* antlers. *Euprox* exhibits denser cortical tissue with more evidence of secondary remodeling, while *Stephanocemas* shows more evenly distributed, smaller primary osteons and less remodeling. All three taxa share the fundamental histological signatures of rapid antler growth, and while some variation in vascularization and remodeling exists, this likely reflects individual growth variation rather than differences in overall growth dynamics. While direct evidence of shedding and regeneration requires pedicle material not preserved in our fossil sample, the overall tissue organization is consistent with rapid growth as seen in modern white-tailed deer. Our observations suggest broad similarities in antler histology between fossil and extant cervids, providing some support for the hypothesis that key features of the antler cycle were already established in early deer. By linking fossil antler microstructure with the histological signatures of modern antler growth, this study provides insight into the evolutionary origins and diversification of one of the most remarkable regenerative systems among mammals.

Funding Sources: CUNY Graduate Center Doctoral Student Research Grant, PSC-CUNY Award # 66282-00 54

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Dental wear analysis of *Platygonus compressus* from Sheriden Cave, Ohio

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The flat-headed peccary (*Platygonus compressus*) was one of the most widespread species across North America during the Late Pleistocene. *P. compressus* is the most abundant species from Sheriden Cave in Wyandot County, Ohio (11,130 ± 60–11,060 ± 60 yr B.P.) housed at the Cleveland Museum of Natural History (CMNH). Here, we examine 279 teeth from at least 50 individuals to evaluate age ranges and compare wear patterns to other known peccary assemblages. The teeth include 181 teeth in mandibles and mandible fragments, 76 teeth in maxillae and skulls, and 22 loose teeth. Using tooth eruption and severity of tooth wear to identify ages of our specimens, we determined that most specimens range between 1 and 6 years old: 15 individuals are juveniles between 1 and 2 years old; 35 individuals are between 3 and 6 years old; and 8 individuals are older than 7 years old. To determine the wear for each individual type of tooth, we plotted tooth wear in categories from no wear to extreme. The majority of M1 molars had extreme wear, M2 molars ranged from severe to moderate wear, M3 molars ranged between mild to severe, P2 premolars had mostly mild wear, P3 premolars ranged between mild and moderate wear, and P4 premolars ranged from moderate and severe wear. When we compared the wear patterns on molars still in mandibles, we found that, contrary to previous studies on peccaries, the wear slopes buccally on teeth in mandibles and lingually on teeth in maxillae and skulls. Therefore, this species may have had a preferred method of chewing and may have had a diet that required more intense grinding. Differences in the direction of wear compared to those from other locations may reflect the type of diet available to the species in this region. Future analyses will compare the *P. compressus* specimens from the CMNH to additional specimens housed at the Cincinnati Museum Center Collections to examine consistency in the direction and severity of wear, to better understand the wear patterns of the species from Sheriden Cave.

Funding Sources: Friends of CMNH

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

Synapsid cranial shape and correlation with topological simplification using 3D geometric morphometrics

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Functional regions related to mastication, including the temporal fenestra, the pterygoid region, and the snout, have experienced many changes in shape in different major synapsid clades. Within synapsids, were some regions of the skull more variable in shape than others and therefore more evolutionarily labile? Reduction in cranial elements has been observed in the evolution of synapsid crania, but are there correlations between cranial morphological disparity and this reduction? To explore these questions, we need to understand changes in cranial shape across different synapsid taxa. In this study, we applied 3D geometric morphometrics (GM) to investigate cranial shape variation in 56 specimens (40 taxa) of “pelycosaurs,” therapsids, and cynodonts. We included subsets of data which include landmarks for different views of the cranium. We also examined correlations between shape, cranium size, phylogeny, and skull simplification metric (SSM). Major shape changes observed from “pelycosaurs” to cynodonts include orientation and relative size of temporal fenestrae, relative length of zygomatic arch, proportion of snout compared to posterior cranium, proportion and orientation of frontal and parietal, curvature of posterior cranium, size of postorbital, relative size and ventral extent of pterygoid process, and toothrow length. Anomodont therapsids occupy a morphospace that is distinct from all other synapsid taxa, including other herbivores. Centroid size has a very mild

correlation with shape, whereas phylogeny is a stronger determinant of morphological constraint. We found no significant correlation between size and SSM. Among the three major synapsid grades, therapsids have the highest PC score variance, followed by cynodonts and "pelycosaurs." The greater variance among therapsids also suggests they likely experienced rapid morphological evolution during the middle to late Permian. There is a potential correlation between this reduction in cranial elements with reduction in morphological constraint in therapsids during this period of rapid expansion in cranial morphology. In contrast to earlier therapsids, an observed decrease in variance and SSM range in cynodonts might reflect novel morphological constraints due to their unique cranial parcellation.

Funding Sources: National Science Foundation Award no. NSF-2325381

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Skull of a young *Pachycephalosaurus wyomingensis* (Ornithischia, Marginocephalia) from the Hell Creek Formation in South Dakota, USA

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Research on ontogeny of marginocephalian dinosaurs has progressed substantially in the past 15 years, resulting in new hypotheses on species-level taxonomy and remarkably large-scale ontogenetic changes in cranial morphology. One such example is *Pachycephalosaurus wyomingensis* from the Maastrichtian of North America. One of the few, well-preserved cranial specimens is a young adult found in the Hell Creek Formation in South Dakota, USA, and housed at the National Museum of Nature and Science, Japan, reported herein. The upper skull is preserved from the premaxilla through the occipital region and is measured approximately 46 cm in length, although most of the dome-like posterior skull roof is missing. The nasals bear longitudinal ridges on the ventral or internal aspect that likely represent the attachment sites of the respiratory turbinate, as previously suggested for other pachycephalosaurids, such as *Stegoceras validum*. Some other preserved parts include the lower jaw bones such as the dentary and the apparently fused angular and articular. The dentary bears rugose sculpturing ventrally, especially along its middle part. The angular similarly bears sculpturing on the lateral and medial surfaces and is also lined with a series of acute processes along the ventral edge. The bones surrounding the cranial cavity are well-preserved, enabling production of digital cranial endocasts based on CT scan data. The boundaries among brain regions are not apparent on the endocast as is the case with previously published brain endocasts of other pachycephalosaurids. Unlike the latter, however, the dural peak is strongly developed. Each semicircular canal is thinner and produces a larger arc than those in other ornithischians, including the one previously segmented in another pachycephalosaurid *S. validum*. Although functional interpretations of the semicircular canal size and morphology are not always straightforward, the observed characteristics possibly suggest fast and jerky motion of the head of *P. wyomingensis* and are thus relevant to the inference on behaviors of this dinosaur using the head.

Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Expanding the body size estimation toolkit for *Alligator* and related taxa

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Body size is associated with nearly every aspect of an organism's biology, and estimation of size in extinct animals is regularly used to characterize their life histories. Prior studies have examined

correlation of total body length (TL) to skeletal measurements in the American alligator (*Alligator mississippiensis*), with some measurements being better predictors of total length than others. Femur length (FL) has been found to be tightly correlated with total body length in *A. mississippiensis*, and this relationship has often been used to estimate the body size of extinct crocodilians. In this study, we examine correlations of other limb elements (humerus, radius, ulna, and tibia) with TL in a large sample of modern *A. mississippiensis* (n = 89). Results show multiple limb elements are effective proxies for estimation of size, with humeral articular length having even lower predictive error than FL (HAL = -1.99%; FL = -5%). This new approach expands the toolkit available to paleontologists and enables higher resolution total length estimation for some extinct alligatoroids known from fragmentary remains. Thus far, regression equations have been applied to several fossil *Alligator* species and more distantly related forms such as *Deinosuchus*. Application of the regression equations to closely related fossil taxa (n = 6) yields total length estimates consistent with published size ranges, supporting the utility of *A. mississippiensis* as a proxy for related fossil species. Application of the regression equations to more distantly related and morphologically divergent taxa (n = 12) is possible, but the resulting TL estimates require cautious interpretation due to greater phylogenetic and anatomical disparity. Overall, the expanded set of reliable skeletal proxies increases the number of limb elements that can be confidently used to estimate body size in both extant and fossil alligators.

Funding Sources: Center of Excellence in Paleontology, East Tennessee State University, Johnson City, TN

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

An early Campanian pachycephalosaur and associated microvertebrate assemblage from the Upper Cretaceous Allison Member, Menefee Formation, eastern San Juan Basin, New Mexico

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The Upper Cretaceous Menefee Formation of the San Juan Basin (SJB), New Mexico, occupies a critical yet historically undersampled interval in the Western Interior nonmarine fossil record. Fossils collected from the Menefee are essential to understanding faunal turnover and distribution of Laramidian vertebrates during the transition from the Santonian to the Campanian. Previous macrofossil surveys in the Allison Member of the eastern SJB have yielded *Menefeeceratops sealeyi* and other fragmentary fossils, principally of turtles. Recent microvertebrate analyses have significantly expanded taxonomic resolution. Here, we document the assemblage from locality L-5635, a previously unreported site that preserves an incomplete dome of the oldest pachycephalosaurid dinosaur known from New Mexico. To assess the faunal composition of this locality, 3,344 g of fossiliferous sediment was processed via systematic washing and sieving. This yielded more than 350 diagnostic vertebrate fossil elements. The assemblage recovered from L-5635 largely mirrors the characteristic Menefee assemblage, representing a complex fluvio-deltaic and estuarine ecosystem. The recovered taxa are dominated by aquatic vertebrates, including teeth of chondrichthyans (*Lonchidion*, *Ischyrhiza*, *Ptychotrygon*, and *Myledaphus*) and osteichthyans (lepisosteids, *Melvius*, and *Paralbula*), with several taxa thought to be restricted to warm regions of Laramidia. Tetrapods include crocodyliforms (cf. *Brachychampsa*) and isolated teeth of indeterminate theropod dinosaurs.

Of particular note is a largely complete, thickened frontoparietal dome surface collected at the site. The thickened frontoparietal is relatively small (anteroposterior length of 113 mm and mediolateral width of 106 mm), but diagnostic of the Pachycephalosauridae and represents the earliest occurrence of this group within the SJB. To date, pachycephalosaur remains in New Mexico are only known from the younger Kirtland and Fruitland Formations. Preliminary principal component analysis (PCA) and linear discriminant

analysis (LDA) of the specimen plot it outside of the morphospace of previously known taxa. The presence of this specimen in the Allison Member extends the temporal range of pachycephalosaurids in the SJB back to the early Campanian (~82 Ma). This suggests that a distinct lineage of these dinosaurs was well-established in the coastal swamp environments of New Mexico.

Funding Sources: Undergraduate Research Assistantship, Office of Student Research, and Society of Vertebrate Paleontology

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Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

Comparative osteohistology reveals contrasting growth strategies in early amniotes and reptiles

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Living birds are among the fastest-growing terrestrial vertebrates, with some reaching adult size within weeks, whereas their reptilian relatives, lizards, turtles, and crocodilians, generally exhibit much slower growth. A key question in organismal biology is how this disparity in growth rates evolved within reptiles. This study addresses this question through osteohistological analysis of two early taxa: the early amniote *Petrolacosaurus* and the early reptile *Captorhinus*. Digital cross-sections of limb bones reveal clear differences in their growth strategies. *Petrolacosaurus* exhibits a high abundance of osteocyte lacunae, localized patches of woven bone, and simple longitudinal vascular canals extending from the inner to the outer cortex. Together, these features indicate relatively rapid growth. In contrast, *Captorhinus* displays fewer, more dispersed osteocyte lacunae embedded within predominantly lamellar bone tissue that persists throughout the cortex. Additionally, vascularization is minimal or absent. These osteohistological features are consistent with slower growth. These findings highlight contrasting growth strategies among early amniotes and reptiles, suggesting that variation in growth rate was established early in their evolutionary history. This research provides new insights into the origins and diversification of growth strategies and contributes to a broader understanding of reptile evolution from their early amniote ancestors.

Funding Sources: Lightsources for Africa, the Americas, Asia, Middle East and Pacific National Research Foundation PMDS240607225199 PAST Africa European Synchrotron Radiation Facility

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Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

The Bartonian origins of the Pelagiceti

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Basilosauridae, the most basal group within the Pelagiceti, is currently delimited to include two subfamilies, the Basilosaurinae (including well-known taxa such as *Basilosaurus*, *Dorudon*, and *Zygorhiza*), and the Pachycetinae (including *Pachycetus*, *Antaecetus*, and possibly the massive *Perucetus*). All members of the Basilosauridae share many craniodental features such as loss of the M3, cheek teeth with two roots, and multiple, well-developed accessory denticles on the cheek teeth. They differ significantly in their postcrania. Where known, the Pachycetinae have lower vertebral counts (few thoracic and lumbar vertebrae), while those of Basilosauridae are higher. New pachycetine fossils from Peru also show that have well-developed hindlimbs and innominata unlike either protocetids or basilosaurids. Pachycetines also have autapomorphies of somewhat elongate trunk vertebrae with anteroposteriorly long vertebral processes, along with pock-marked bone texture.

Updates to ages of several stratigraphic units have pushed many occurrences of previously known basilosaurine archaeocetes from the Bartonian into the Priabonian (late Eocene). Several finds of either unnamed or currently undescribed Pachycetinae have added many occurrences to

the Bartonian that greatly increase our anatomical understanding of this previously enigmatic group. These observations show that the time of transition from semiaquatic to fully aquatic whales likely took place during the Bartonian either within Pachycetinae or between pachycetines or basilosaurines.

Comparison of faunal similarity indexes applied to the vertebrate marine taxa in the Lutetian through Chattian stages suggests that the Bartonian is faunally similar to both the earlier Lutetian and later Priabonian stages. Most significant faunal changes occur between the Priabonian and Rupelian stages. This indicates that the evolution of fully aquatic whales occurred in relatively stable environmental context of the middle to late Eocene and the origin of the Neoceti at or around the Eocene–Oligocene (Priabonian–Rupelian) boundary occurred in synchrony with the global environmental changes related to the initial glaciation of Antarctica.

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

Evaluating the water balance thermo-physiology of late Miocene equids using triple oxygen isotopes of fossil tooth enamel.

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Maintenance of an internal body water balance is a fundamental aspect of survival for terrestrial animals. Water balance thermophysiology (WBTP) describes the unique ways in which an animal is adapted behaviorally, physiologically, and morphologically to simultaneously maintain water balance and body temperature. Stable oxygen isotope studies ($\delta^{18}O$) of water use in modern eastern African ungulates have identified a spectrum of WBTP strategies that range from drinking water dependent (dw-D; e.g., hippopotamus) to drinking water independent (dw-I; e.g, giraffes; primarily obtaining water through food). The triple oxygen isotope system ($\Delta'^{17}O$, $\delta'^{18}O$) is a powerful new tool to evaluate WBTP in both modern and fossil animals. Here we use the triple oxygen isotope approach to study the WBTP of equids from the late Miocene (Barstovian–Hemphillian) of northwestern Nebraska. Preliminary data from our lab suggest that *Hyracotherium*, the potentially ancestral Eocene equiod, had affinity with dw-I taxa, whereas modern equids (*Equus burchelli*) have a closer affinity with dw-D taxa. We hypothesize that early North American horses were primarily dw-I, and that the shift to a dw-D WBTP was associated with the aridification and opening of the Great Plains in the late Miocene–Pliocene. Here, as a preliminary test of that hypothesis, we present $\Delta'^{17}O$ and $\delta'^{18}O$ data measured in equid enamel from the Burge (ca. 12 Ma) and Xmas–Kat (ca. 9.2 Ma) quarries. Our results suggest that Miocene equids occupy a $\Delta'^{17}O$-$\delta'^{18}O$ space intermediate between dw-I and dw-D endmember taxa. Interestingly, $\Delta'^{17}O$-$\delta'^{18}O$ values from tribe Equini (*Calippus*, *Protohippus*) appear to be closer to a dw-D WBTP than those of tribe Hipparionini (*Pseudhipparion*), suggesting these tribes may have exhibited niche partitioning and thus different WBTPs. More data are needed to corroborate this trend. Overall, our results indicate the shift towards a dw-D WBTP in Equidae had not fully occurred by the early late Miocene. Additionally, the $\delta^{13}C$ values of these equids indicate a pure C_3 diet (mean $\delta^{13}C$ = -10.4 ‰ VPDB); future work will assess whether changes in equid WBTP are associated with incorporation of C_4 vegetation into their diets in the latest Miocene and Pliocene.

Funding Sources: University of Michigan Department of Earth and Environmental Sciences Turner Award

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Technical Session XIV: Return of Reptile'O'Rama: Triassic time (Friday, November 13, 2026, 1:45 PM)

Cranial anatomy of the Early Triassic sauropterygian *Corosaurus alcovensis* revealed using micro-computed tomography

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The Early Triassic was a time of experimentation for many groups, with new clades arising after the end-Permian mass extinction. Among them was Sauropterygia, an extremely successful group of marine reptiles that remained abundant throughout the entirety of the Mesozoic. Sauropterygia is generally divided into four groups: placodonts, nothosaurs, pachypleurosaurs, and pistosaurs. This diversity was established by the Middle Triassic, making rare Early Triassic sauropterygians critical data sources for clade origins and interrelationships. However, even the earliest sauropterygians currently known already have derived features characteristic of Sauropterygia, such as an akinetic palate. Initially described as the "first New World nothosaur," the Early Triassic *Corosaurus alcovensis* has a phylogenetic position that shifts dramatically between different studies (e.g., at the base of Eosauropterygia, at the base of Pistosauroidea, as a nothosaur). This lack of consensus is due in part to the preservation of the holotype specimen in which it is difficult to see details of the palate. Multiple previous researchers have attempted to X-ray the holotype to see these features, but attempts failed due to low contrast between the bone and matrix, including the last attempt in 1991.

Here, after years of development in computed tomography (CT) practices for scanning fossils and in light of the growing depth of sauropterygian CT data revealing phylogenetically relevant endocranial anatomy, we present novel CT data of the *C. alcovensis* holotype. Our scan successfully revealed new features including: a large and ovular Vidian canal, a small ectopterygoid restricted to the posterior end of the maxilla, a large interpterygoid vacuity, and rounded basipterygoid processes. These data show that *C. alvocensis* is the oldest known member of Sauropterygia to have a kinetic palate, the likely plesiomorphic state for the clade. The temporal provenance of *C. alcovensis* as one of the few Olenekian sauropterygiforms (alongside Hanosaurus, Majiashanosaurus, Pomolispondylus, and Prosaurosphargis) already argued for its importance to clade origins, but our new anatomical data further cement the future importance of non-Tethyan taxa to this debate.

Funding Sources: Idaho State University SPARC grant & Center for Ecological Research and Education

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

New pathologic and taphonomic insights from basilosaurid skeletal remains preserved in Yazoo clay deposits of Yazoo County, Mississippi

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In May 2025, the Mississippi Geological Survey uncovered associated fossilized skeletal remains of a basilosaurid archaeocete from clay deposits belonging to the Yazoo Formation in Yazoo County, Mississippi. The clay comprising this formation represents a deep marine environment of late Eocene (Bartonian) age, deposited between approximately 37.2 and 33.9 million years ago. The remains consisted of a partial true rib, a partial false rib, and a fragmented partial scapula. Following the excavation, the recovered elements were cleaned, reconstructed, and physically assessed. The surfaces of the remains exhibit a diverse array of taphonomic traces. Numerous cut and bite marks were observed, attributed to scavenging behavior of macrovertebrates. The shapes and patterns of these traces were heterogenous, suggesting they were inflicted by multiple different species. Boring and feeding traces of macroinvertebrates were also observed, suggesting that the skeletal remains were colonized by benthic invertebrates while exposed on the sea floor, in addition to potential traces of microbial activity associated with the sulfophilic stage of decomposition. Potential pathologic traces were observed on the bones as well. These included numerous prominent pit-like structures on the surface of the glenoid fossa and along the medial surface of the false rib, as well as significant thinning of the bone walls on the proximal and distal ends of the true rib and false rib. The abnormally thin bone walls along with the

pit-like lesions are evidence that this animal may have sustained pre-mortem injuries. These may have been due to a degradational skeletal disease or infection, which could have inhibited its normal bone growth or ultimately contributed to its death. This is speculative since the nature of the potential illness has not yet been confirmed and is a subject of current research. Further study of this specimen aims to offer additional insights into the environmental and ecological conditions following its death, as well as better documentation of one of the first observed cases of pathological traces preserved on basilosaurid archaeocete bones from the late Eocene of Mississippi.

Technical Session XII: Organismal paleobiology (Friday, November 13, 2026, 1:45 PM)

Anuran body size inferences: applicability to Late Cretaceous frog assemblages

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Frogs and toads (Order Anura) are a diverse terrestrial vertebrate group with more than 7,900 living species and have the highest rates of modern extinction threats related to climate change, habitat degradation, and pathogens. But, even with more than 200 million years of evolution, we have very limited knowledge on how anuran communities have responded to climatic or extinction events in the past. Considering the fragmentary nature of the anuran fossil record, how can fossil anuran communities be studied? Here we explore body size as a tool to study fossil frog communities. The relation of anuran body size with phylogeny and ecology, and the evolution of these relationships to frog communities, have been hindered by the lack of understanding of the fossil record. Here, we focus on the development of a methodology for estimating anuran body size (as length) that is applicable to fragmentary fossils. We then apply these methodologies to fossil assemblages from the Cretaceous. We use a wide phylogenetic context that includes taxa from 50 of the 57 living anuran families and five isolated bones commonly recovered in the fossil record (radioulna, humerus, sacrum, urostyle, and ilium). We use ten measurements and Ordinary Least Square (OLS) regression analysis for estimating snout–urostyle length (SUL). The measurements are suitable for estimating body size in anurans with confidence (R^2 = 0.85–0.93). Our analysis also highlights significant differences in the sacrum and ilium between two of the most diverse anuran clades, Ranoidea and Hyloidea.

We applied this method to Cretaceous fossils from Madagascar (*Beelzebufo ampinga*) and Montana (Hell Creek Formation). We obtained size estimates for *Beelzebufo ampinga* that are more accurate than those previously reported based on skull fragments. A frog sample from the Hell Creek Formation (48 fossils including ilia, humeri, radioulnae, and urostyles), have an estimated size range from 14.8 mm to 65.8 mm of SUL. Fossils were partitioned into three stratigraphic sub-units, revealing that the oldest horizon had the highest proportion of small individuals, an observation that aligns with the documented trend of increasing body size across Mesozoic anuran assemblages. Our results demonstrate that this methodology can improve analysis of fossil communities through time, while accurate size distributions raise new questions about anuran evolution and their responses to climatic and extinction events.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

A novel approach to making archival cradles using 3D modeling and digital printing software

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As fossils began to be collected in the late 19th century, a method was devised to protect specimens for storage and transport, as well as providing accessibility for research study. Plaster clamshell cradles fortified with burlap, and later fiberglass, became the de facto approach to house specimens safely and in an archival manner. While

this method is still used to great effect today, sometimes problems may arise because of a specimen's complicated shape or weight. One must carefully consider undercuts, possible mechanical locks, and weight-bearing points. Typically, these factors are worked out as the cradle is in the actual stage of creation: building up walls, clay layers, and fiberglass and plaster layers. Unfortunately, sometimes one has to start all over again because of a judgment error discovered in the process. Additionally, a specimen might be too delicate to undergo the physical handling of adding on all the different layers and making them conform to the specimen.

As more and more fossil specimens are also being saved as 3D scans for digital databases, it seems that a different approach to making archival cradles could start in the digital realm. For this case study, a group of eight high school interns participated in a twofold summer program. The first two weeks were spent creating archival cradles in the old manner, giving them experience with handling fossils and also understanding spatial problems. The next two weeks were about learning mesh-based digital modeling software. Since the specimens had already been digitally scanned, it then became a straightforward matter of importing that data into the modeling software and designing functional cradles for the specimens. After successfully creating digital clamshell cradle models in the modeling software, 3D printing software was used to fine-tune the pieces and output using a 3D printer. Both the modeling and the printing software were and are freely available for anyone to download.

This case study demonstrates that archival cradles can be created digitally and that designing them in software can save many frustrating hours of trying to build them physically only to find out they are unusable. There are many ways to customize a digital archival cradle to perfectly suit any fossil specimen. Finally, this was an opportunity for educational outreach, and it was a success by all standards.

Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Ecological and biomechanical trade-offs in the locomotor abilities of the large theropod body plan

Pasha van Bijlert[1]
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In extant ecosystems, terrestrial predators tend to be more athletic than their prey. The current biomechanical consensus predicts the opposite for non-avian dinosaurs: fast locomotion in large theropods would require implausibly high muscle mass, and running gaits would lead to skeletal fractures in the hindlimbs. These are consequences of bipedalism at extreme size, limiting predators more strongly than their prey. This appears inconsistent with extant ecosystems.

Here, I present a multi-method biomechanical analysis of the running abilities of large theropods, validated on the emu (*Dromaius novaehollandiae*), based on extant muscle dissections and detailed 3D reconstructions of six theropods across a size range of 1,440–7,811 kg. Using a newly developed pose-estimation approach, I first tested whether theropods met basic requirements for fast running. When accounting for multi-joint muscles, all theropod models could exert sufficiently high forces for running with plausible leg muscle masses. Beam theory revealed that bone stresses in the lower leg of *Spinosaurus aegyptiacus* (2,976 kg) were too high for habitual walking in >95% of poses, only unrealistically low body mass (1,416 kg) permitted bipedalism. All other theropods could generate the forces required for running without bone fractures.

Next, I performed muscle-driven physics simulations of *Tyrannosaurus rex* (7,811 kg), after confirming that this approach generated realistic gaits in the emu without using motion capture. *T. rex* was capable of grounded running at speeds up to 8.25 m/s, with a total muscle mass of only 12% body mass per leg (comparable to a guineafowl). I analyzed the muscle masses of extant bipeds and found significant positive allometry, predicting substantially higher muscle mass for *T. rex* (22.5–24.3% body mass). At 22.5% body mass per leg, *T. rex* was capable of aerial running up to 16 m/s without skeletal fractures. Although muscularity represents the largest unknown factor in my

simulations, *T. rex* could achieve moderately high speeds even if it were much less muscular than predicted for its size.

Collectively, these results suggest that the athleticism of the theropod body plan was considerably higher than previously appreciated—pursuit predation may have been a viable strategy even at the largest body sizes. *S. aegyptiacus* appears to have secondarily lost this athleticism when transitioning into (semi-)aquatic niches and may have adopted facultative quadrupedal gaits on land.

Funding Sources: Hans de Bruijn fund; European Association of Vertebrate Palaeontologists grant; Royal Dutch Academy of Sciences Ecology Fund; Society of Experimental Biology Fellowship

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

A large-bodied archosaur from the Middle Triassic Manda Beds of Tanzania: expanding known axial diversity in early pseudosuchians

Denyce S. Velin[1], Sterling J. Nesbitt[1], Michelle Stocker[1], Christian A. Sidor[2], Kenneth Angielczyk[3]
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The Triassic radiation of archosaurs following the end-Permian mass extinction marks a key transition in the clade's early evolutionary and ecological diversification. The Middle Triassic Manda Beds in Tanzania provide a crucial record of archosaur diversity during this interval. Here, we describe recently collected pseudosuchian material from the Manda Beds, including an atlas, seven articulated cervical vertebrae with some associated cervical ribs, and a partial femur, all from a single individual. The vertebrae possess amphicoelous centra that are dorsoventrally deeper than mediolaterally wide, with anteroposterior lengths approximately equivalent to dorsoventral height. They possess strongly convex ventral margins in lateral view and increase in mediolateral width posteriorly through the series. The neural spines bear expanded "spine tables" that, in lateral view, transition from relatively short and anteroposteriorly long to taller anteriorly and more anteroposteriorly thin posteriorly (~28 mm dorsoventral height anteriorly to ~45 mm posteriorly). The atlas is mediolaterally thick, measuring approximately 85 mm in anterior width, 55 mm in posterior width, and 107.5 mm in anteroposterior length. Using the circumference of the associated partial femur, we estimate a large pseudosuchian with a body mass of ~350–450 kg and a total length of ~4.0–5.5 m. This material differs from *Mambawakale ruhuhu* in possessing a substantially more anteroposteriorly elongate atlas (~107.5 mm versus ~40.0 mm) and a more strongly arched ventral morphology of the centra. The preserved vertebrae share features with those of *Mandasuchus tanyauchen*, including a ventrally arched centrum profile. However, this specimen differs from *Mandasuchus* in possessing cervical centra with anteroposterior lengths approximately equal to the dorsoventral height, rather than elongate centra (length-to-height ratios: ~0.75–1.34 in our specimen versus ~1.52–1.82 in *Mandasuchus*). The current specimen's neural spines are dorsoventrally tall, whereas those of *Mandasuchus* are shorter and anteroposteriorly longer. This character combination differs from that of all named taxa and other undescribed archosaur material from the Manda Beds, suggesting a greater diversity of large-bodied pseudosuchians in the Manda Beds than previously recognized.

Funding Sources: National Geographic Research Grant #9606-14; National Science Foundation EAR #1024036

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Duplicated mandibular tusks in a juvenile mastodon found in Blair County, Pennsylvania

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In 1907, in Blair County, Pennsylvania, limestone quarry workers discovered the first of the Frankstown caves, which held a cache of Pleistocene faunal fossils. Among them was an

anomalous *Mammut americanum* specimen with two sets of mandibular tusks. This specimen was collected by Olaf Peterson and brought to the Carnegie Museum of Natural History. The Frankstown mastodon then sat in the collections for more than a century. In that time, our understanding of mandibular tusks in the genus *Mammut* has progressed: it is no longer believed that these structures are sexually dimorphic, and their absence helped establish a second species: *Mammut pacificus*. Following the methods established by Fisher et al. (2014), this study uses micro-CT to examine the morphology of the Frankstown mastodon mandible, which revealed the atypical anatomy of the mandibular tusks. The scans of the in-situ tusks demonstrate that two tusks share a single alveolar socket and are oriented diagonally relative to one another. The interpreted pair of deciduous tusks have an extensive enamel coating, and the distal end is "bean-shaped" in cross-section rather than circular. The indeterminate pair of tusks lack the characteristic annual growth increments and pulp cavities of permanent mandibular tusks, but do possess proximal projections, referred to as "closed roots." Three hypotheses for the origin of this condition are proposed: an injury/illness, a congenital anomaly due to environmental pressures, and dental abnormalities.

Funding Sources: Pennsylvania State University Geoscience Department

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Co-evolution of brood size and parental care

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Life history theory posits that organisms face a trade-off between the number of offspring they produce and the energy invested in each, traditionally framed as r/K strategies. "R-selected species" produce many offspring with minimal care. "K-selected species" produce fewer offspring with significant parental investment. How and when lineages shift between these strategies remains a critical area of study, particularly within sauropsids (reptiles, birds, and their extinct relatives) because the strategy type helps infer behavior where direct fossil evidence may be lacking. To infer behavior, we first established measurable statistical relationships between egg-based observations (such as clutch size and other reproductive efforts) and parental investment in extant relatives. We compiled a comprehensive database from previous studies, gathering information on more than 18,000 species across Sauropsida, including some prehistoric taxa. Recorded traits include body mass, clutch size (mean, minimum, and maximum), and indicators of parental care (incubation days, nest structure type, and oviparity versus viviparity). We performed an MCMC generalized linear mixed model to analyze the relationship between clutch size and parental care (incorporating body mass and testing clutch size with and without phylogenetic implementation) as well as performing an ancestral state reconstruction to estimate the clutch size of the archosaur ancestor. Preliminary results suggest that the common ancestor of archosaurs exhibited some level of parental care, consistent with care behaviors of both extant groups (birds and crocodilians), with an average clutch size of approximately 8.5 eggs. Collectively, these findings support the early origin of parental care in archosaur evolution, suggesting it was likely common throughout Dinosauria and subsequently inherited by avian dinosaurs.

Funding Sources: Montana State University Undergraduate Scholars Program

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Technical Session IV: Dinosauria I: big theropods (Wednesday, November 11, 2026, 1:45 PM)

***Oxalaia quilombensis* is not *Spinosaurus*: new fossils from Laje do Coringa (Alcântara Formation, Brazil) support sister taxon status**

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Oxalaia quilombensis was discovered in an intertidal outcrop of the Alcântara Formation off Laje do Coringa (Cajual Island) in the Baía de São Marcos (Maranhão, Brazil). The holotype, a fused pair of premaxillae and a small maxillary fragment, were tragically lost in 2018 in the fire at the Museu Nacional in Rio de Janeiro. Comparisons with similar-age spinosaurine specimens from northern Africa led to the suggestion in 2020 that the Brazilian giant may be a junior synonym of *Spinosaurus aegyptiacus*. High fidelity casts of the holotypic premaxillae of *Oxalaia* lack autapomorphic features of *Spinosaurus* such as a festooned alveolar margin of the jaws or the anterior end of premaxillae wider than long with a posterior constriction. Return visits to the intertidal locality throughout the years, furthermore, have yielded dozens of additional spinosaurine fossils that clearly establish the validity of *O. quilombensis* with several features that are absent in *Spinosaurus*. The articular platform on the frontal for the posterior end of the fused nasals is very wide and extends to the posterior orbit margin to a greater degree than any other spinosaurid, suggesting a longer and wider nasal crest than in any other spinosaurid. Pedal bones are robustly constructed, and some nonungual phalanges are transversely broader than long with prominently flared proximal ends. The functional implications of the shorter and much wider digits of this foot are uncertain. Compared to other spinosaurids, *Oxalaia* and *Spinosaurus* share a suite of derived features, including a hypertrophied hypapophysis on cervicodorsal vertebra, opisthocoelous mid-dorsal centra, tall and anteroposteriorly short caudal centra, reduced medullary cavities in long bones, strong torsion of the distal end of the humerus, less recurved manual unguals, and ventrally flat pedal unguals. The absence of any neural spines in the collection leaves unknown the condition of neck, trunk and tail sails in *Oxalaia*.

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

Integrated Bayesian age–depth modeling constrains the Permo–Triassic boundary and vertebrate turnover in the Karoo Basin

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The Permo–Triassic mass extinction (PTME; ca. 251.9 Ma) was the most severe biodiversity crisis in Earth history, yet the timing and duration of terrestrial ecosystem collapse and recovery remain uncertain due to a dearth of dated horizons correlating fossil assemblages across continental successions. In South Africa's Karoo Basin, the globally important terrestrial PTME record has been the focus of ongoing debate concerning the placement of the Permo–Triassic boundary (PTB), the synchroneity of vertebrate extinctions with the global crisis, and the reliability of regional biostratigraphic correlations in fluvially deposited strata. Here we integrate new high-precision U–Pb geochronology with Bayesian age–depth modeling of eight zircon-bearing horizons from four stratigraphic sections and two geographically disparate PTB field areas (>200 km apart) spanning the vertebrate turnover interval in the Karoo Basin. Zircon crystals were analyzed using LA-ICP-MS and CA-ID-TIMS U–Pb methods. The resulting ages were integrated using modifiedBchron, an open-source R package that applies stratigraphic superposition and Markov Chain Monte Carlo sampling to generate statistically robust age–depth models and uncertainty estimates for the Karoo PTB and tetrapod extinction. Our models incorporate all currently available radiometric constraints for the PTME record in the Karoo Basin, including dates previously used to question the temporal equivalence of vertebrate-bearing strata across the PTB interval and the traditional placement of the PTB in the Karoo Basin. The resulting chronology

indicates that the acme of vertebrate turnover occurred at ~251.773 ± 0.123 Ma and supports placement of the PTB at or near the base of the *Lystrosaurus declivis* Assemblage Zone within the Palingkloof Member of the Balfour Formation, supporting the traditional model. Combined LA-ICP-MS and CA-ID-TIMS analyses further indicate that deposition of the Katberg Formation post-dated the PTB and was deposited during the Early Triassic. By integrating independent geochronologic constraints within a probabilistic stratigraphic framework, these results demonstrate that Bayesian age–depth modelling can resolve long-standing uncertainties surrounding PTB placement and vertebrate turnover in the Karoo Basin. The resulting temporal framework provides an improved basis for evaluating the timing, magnitude, and ecological consequences of terrestrial biotic collapse and recovery during and after the PTME.

Funding Sources: NSF-2325380 to P.A.V. and K.D.A.; NSF-2325381 to A.K.H.

Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Simulated local fossil records reflect neither the whole species nor local evolution, but something in between

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Local adaptation, or when a population within a species adapts to its local conditions, is one evolutionarily important source of intraspecific variation. However, it is predicted to be rare in widespread species, the kind expected to be most common in the fossil record. This expectation, which we refer to as the "jack-of-all-trades hypothesis," predicts that if species encounters a selection-dispersal balance that allows them to occupy a wide range of environments, then selection is also too weak to induce local selection, leading to a single trait value becoming widespread across environments within the species range. Here, we test that hypothesis using simulations through agent-based models paired with comparisons to the modern biota and fossil record. Our first test is whether the simulation can reproduce patterns of intraspecific variation found in modern species, indicating that the model can be parameterized to realistic values. Our second test is to use that parameterization to hindcast patterns of trait evolution within the same species, spot-checking our results against suitable fossil records.

We used an agent-based model that previously produced results supporting a jack-of-all-trades model, adapting it to the case study of toothrow length in the Northern Grasshopper Mouse, *Onychomys leucogaster*. A parameterized model passed the first test. It required only a minimal amount of environmental information, biome and elevation data, meaning that hindcasting using available paleoclimate maps was feasible. The paleomaps were used for the second test: whether toothrows of *O. leucogaster* should have locally adapted to changing environmental conditions. Surprisingly, we found neither strict local adaptation nor a jack-of-all-trades pattern of one trait value across the entire distribution. Instead, we found a pattern of semi-local adaptation that averaged together selective optima of nearby environments, consistent with classical models of local adaptation in modern species. These simulation results predicted specific times and regions of trait change as well as stasis and compared favorably to published Holocene toothrow records from Owl Cave, Idaho. Further work on model sensitivity and additional connections to the fossil record will allow for a more robust evaluation of what kinds of fossil records may reflect local adaptation to changing environmental conditions.

Technical Session XIII: Paleontological Practices: Collections & Curation, Management, and Ethics (Friday, November 13, 2026, 1:45 PM)

The use of GIS in fossil resource management in Alberta, Canada

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The Government of Alberta (GoA) manages historic resources, including the province's rich record of palaeontological resources, under the authority of the *Historical Resources Act* (*HRA*). Geographic Information Systems (GIS) are an important tool in fossil management in Alberta. Regulators use GIS to document known fossil sites and areas of high palaeontological potential and to help mitigate potential industry impacts to palaeontological resources. Spatial datasets of current and past palaeontology permit areas allow regulators to effectively manage permits and find permit reports about specific parts of the province. Localities from palaeontology permit reports are imported into GIS and combined with museum collections datasets from the Royal Alberta Museum and Royal Tyrrell Museum of Palaeontology. The Listing of Historic Resources (the Listing) is a set of areas within Alberta that are either known to contain historic resources or are likely to contain historic resources. Regulators combine GIS datasets of known fossil sites and geology datasets to manage the palaeontological component of the Listing. Industry activities that have the potential to impact historic resources must obtain *HRA* approval prior to the onset of development activities. The Listing is published publicly online and is used by regulators, developers, and consulting palaeontologists to compare proposed developments to areas with palaeontological potential. Consulting palaeontologists can also request fossil locality information from regulators to further determine the potential impacts a proposed project may have on palaeontological resources. Regulators use the Listing, as well as geology and locality datasets in GIS, to screen and review *HRA* clearance applications for potential industry activities. In addition, regulators manage spatial datasets of past *HRA* clearance application project footprints. Past project footprint datasets are used to streamline the application review process and ensure consistency in *HRA* clearance application outcomes. GIS allows regulators to compare and manage a large amount of data covering a geographically large province.

Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Using low-angle light to enhance the recognition of osteological correlates for muscle attachment on fossil bone

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Paleontologists have been observing osteological correlates for muscle attachment on fossil bones for many decades. Frequently, the more prominent of these attachment sites are important components of phylogenetic characters. In recent decades, even less prominent osteological correlates have been recognized for their importance in myological reconstructions and biomechanical analyses. Thus, confident and reproduceable recognition of osteological correlates is an essential first step towards a deeper understanding of the paleobiology of extinct taxa. While prominent osteological correlates are readily visible with the unaided eye, it is easier to miss more subtle texturing. Some techniques like 3D laser scanning can pick up these textures, but often only at high resolution settings that are not available on all 3D scanners. Photogrammetry methods can also capture some of the more subtle osteological correlates on skeletal elements, but these methods can suffer from the same challenges as standard photographs—chiefly that coloration patterns on the fossil can obscure surface textures. The use of low-angle light can help emphasize these detailed features. For example, a shallow ridge will cast a shadow when illuminated by low-angle light, even if the presence of the ridge is debatable under normal light conditions. Similarly, the surface textures on a fossil bone can also be highlighted by the use of low-angle light to make faint osteological correlate textures more visible, again by creating illuminated and shadowed areas. The addition of this technique to the search for and mapping of osteological correlates can help increase the level of certainty a researcher assigns to the positive identification of these structures. Once identified, and viewed more clearly, the size, location, and texturing of each osteological correlate can be more easily and reproducibly reported, which will allow future, more detailed comparisons and

understanding of myological reconstructions and their phylogenetic and biomechanical implications.

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

A new periptychid archaic ungulate from the lower Paleocene Denver Formation of Colorado

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Archaic ungulates ("condylarths") were among the most speciose mammalian groups following the Cretaceous–Paleogene (K–Pg) mass extinction in North America. Corral Bluffs, an exposure of the lower Paleocene D1 sequence of the Denver and Arapahoe formations in the Denver Basin of Colorado, is one of the most exceptional records of early archaic ungulates, yielding numerous skulls and associated jaws from the first ca. 1 million years after the K–Pg mass extinction. Here, we describe a new periptychid archaic ungulate, represented by left and right dentary fragments, a right maxilla fragment, and an associated p1 and P2, from the upper Puercan 2 North American Land Mammal Age at Corral Bluffs. We identify the specimen as a periptychid based on: (1) inflated premolars and molars; (2) appressed molar cusps; and (3) lingually expanded protocones and hypocones. The specimen resembles taxa historically assigned to the Anisonchinae but differs from them in exhibiting: (1) P4 with broad parastylar and metastylar wings; (2) p4 with a small paraconid and subequally sized cuspule that are twinned and form a distinct basin mesiolingual to the protoconid apex; and (3) p4 with a large talonid basin that makes up approximately two thirds of the buccolingual width of the talonid heel. Aspects of the upper cheekteeth of this new taxon fit as plesiomorphic conditions in a previously proposed morphocline among species of *Anisonchus*, characterized by several structural trends: (1) reduction of P4–M2 parastylar and metastylar lobes; (2) buccal retraction of the M1–3 protocone; (3) increase in M1–3 hypocone size; and (4) increasing prominence of lingual furrow between the M2–3 hypocone and protocone bases. The following upper cheekteeth morphocline has also been proposed for another periptychid subgroup, the Conacodontinae: (1) M1–3 hypocone increases in size and expands lingually; (2) M1–3 ectoflexus becomes shallow; (3) M1–3 protocone shifts buccally; and (4) reduction of M1–3 paraconule and expansion of metaconule. Although both morphoclines are characterized by an enlargement of the hypocone, the hypocone expands distally in the anisonchines, squaring the molars, whereas it expands lingually in conacodontines, making the molars more transverse. Thus, although evolving from similar plesiomorphic states, these different trends suggest distinct masticatory and dietary behaviors among periptychid subgroups.

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Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Bone surface modification in fossils from the Late Triassic Placerias–Downs Quarries

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The Placerias and Downs quarries are a pair of spatially contiguous Late Triassic fossil sites in northeastern Arizona (USA) with minimal (~1 m) stratigraphic separation. These exposures pertain to the Carnian–Norian Chinle Formation, although their exact member correlation with better-mapped sequences in the southwest (e.g., Petrified Forest National Park) is still subject to debate. The Placerias–Downs quarries preserve one of the richest Triassic tetrapod assemblages in North America in terms of species and clade-level diversity and have yielded thousands of individual vertebrate fossil elements. Unusually for the Chinle, the Placerias Quarry is numerically dominated by fossils of its namesake dicynodont

(most Chinle faunas include few if any synapsids, with archosauromorph reptiles instead being predominant). Despite the remarkable sample size at these sites and nearly a century of study, various aspects of the paleoecology and depositional history of the Placerias–Downs quarries remain poorly understood. Previous research on the taphonomy of the site concluded that bones at the site showed minimal modification, with the majority of damage observed in the historic UCMP (Berkeley) Placerias Quarry collections representing tool damage during preparation. The North Carolina Museum of Natural Sciences (NCMNS) houses an extensive, largely unpublished collection of fossils from the Placerias–Downs quarries. These specimens were collected and prepared much more recently (2010s) than those at Berkeley (1930s–1940s) and preserve more of the original bone surface than many of the historic materials. Examination of the NCMNS fossils reveals extensive evidence for surface alteration of the bones, representing a diversity of probable pre- and post-depositional damage types. Pre-depositional damage includes feeding traces (from predation and scavenging events) and pathologies, whereas post-depositional damage includes damage incurred in the ground (e.g., root traces) and from human activity (i.e., tool marks during excavation and preparation). Here, we qualify and analyze the prevalence of bone surface modification (BSM) in this collection and identify nine discrete types of BSMs. BSMs occur in 25% of all Placerias–Downs fossils, and ~30% of this damage is inferred as pre-depositional. This suggests protracted surface exposure prior to fossilization, supporting the hypothesis that this assemblage was not derived from rapid mass mortality events such as floods.

Funding Sources: Harkema Fund 1500

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

A diversity analysis of the mammalian insectivores from the mid-Paleocene (latest Torrejonian) of southeastern Montana

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A major diversification of mammals was well underway by the mid-Paleocene (~61.6 to 59.2 Ma), catalyzed in part by the Cretaceous–Paleogene mass extinction. Among the rapidly diversifying mammals were small-bodied insectivores, including members of the Cimolesta, Leptictida, and Eulipotyphla. Insectivores have played a significant role in mammalian evolution and community ecology and continue to do so today, representing more than 10% of extant mammalian diversity. However, these taxonomic groups are seldom the primary focus of paleontological studies, so our understanding of their evolutionary history is limited. One step toward improving our understanding is to examine both taxonomic and body size diversity, shedding light not only on the evolutionary patterns of taxonomic composition but also their ecological characteristics inferred from body size. Here, we analyze the taxonomic and body-size diversity of insectivorous mammals from the mid-Paleocene (latest Torrejonian) of southeastern Montana. Located approximately 20 kilometers north of the town of Ekalaka are two localities, Mehling Site and Medicine Rocks Site 1, which have collections housed at the Carter County Museum and Yale Peabody Museum. These collections consist of specimens recovered by surface collecting and limited screenwashing in the late 20th century and by University of Washington crews and collaborators over the past six years. To date, approximately 200 mammalian partial jaws and isolated teeth have been recovered from each locality. From the combined sample, we isolated, identified, and measured the approximately 40 insectivore specimens to evaluate taxonomic diversity and to calculate body-size estimates for each species. We then compared these data to the taxonomic diversity and mean body sizes of extant insectivorous mammals from analogous environments to provide evolutionary and ecological context. Thus far, we report at least 11 genera across the three major taxonomic groups from these two localities, a richness that is on par with that from nearby To3 localities and similar to, if not slightly higher than, that of modern communities. The majority of the recorded richness is represented by the Cimolesta. With a more comprehensive dataset of the taxonomic

composition and body-size estimates of these To3 groups, we hope to contribute to our understanding of the insectivorous mammals that make up such a significant portion of mammalian evolutionary history.

Funding Sources: Hell Creek Project NSF-EAR 2321341

Technical Session VII: Mammal-mania (Thursday, November 12, 2026, 8:00 AM)

Intraspecific variation in carbonate-collagen stable carbon isotope offsets in large herbivorous mammals: implications for dietary interpretations of fossil taxa in paleontological and archaeological contexts

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Stable carbon isotope ($\delta^{13}C$) analysis is a powerful tool for inferring diet in fossil mammals, with enamel reflecting the whole diet, while collagen is biased toward the protein component of the diet. The offset between carbonate and collagen $\delta^{13}C$ values ($\Delta^{13}C$) has been assumed to be constant within trophic levels but variable between them (i.e., ~6.8-7.6‰ in herbivores and ~4.3‰ in carnivores). However, there is increasing evidence that $\Delta^{13}C$ can vary significantly within herbivores and carnivores, with diet and physiology implicated as possible drivers. Quantifying variation in $\Delta^{13}C$ is essential because enamel carbonate and bone collagen can yield divergent dietary reconstructions. Here we test whether diet operates at the intraspecific level to shape variation in $\Delta^{13}C$ in large herbivorous mammals, using extant species to investigate sources of variation in $\Delta^{13}C$. We sampled bone and enamel from 90 specimens representing 5 species, including species with narrow diets (white rhino and black rhino) and broad diets (springbok, impala, and Grant's gazelle). When the data are considered in aggregate, $\Delta^{13}C$ appears static as previously assumed, with no relationship between enamel $\delta^{13}C$ and $\Delta^{13}C$. However, at the species level, there are significant positive relationships between $\delta^{13}C$ and $\Delta^{13}C$ in 4 of 5 species, with R^2 values ranging from 0.35 to 0.63. Species with narrow diets show a smaller range of $\Delta^{13}C$ values than mixed-feeding species, suggesting that intraspecific dietary variation contributes to variation in $\Delta^{13}C$ values. We subsequently combined our data with published data on $\Delta^{13}C$ in large herbivorous mammals to further explore intraspecific variation. Of 16 species examined with $n \geq 15$, 75% showed a significant positive relationship between $\delta^{13}C$ and $\Delta^{13}C$ at the threshold of $p < 0.05$ (R^2 0.10–0.64), and 95% were significant at the threshold of $p < 0.1$. These results challenge the assumption that $\Delta^{13}C$ is static in herbivores, revealing significant intraspecific variation in most species examined that cannot be explained by gut physiology alone (e.g., hindgut vs. foregut fermenters) and may instead be driven by intraspecific dietary variation. Using a standard, constant offset vs. a calibrated, species-specific offset may have a profound impact on isotope-based dietary interpretations in fossil taxa.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Identifying sources of bias in modern avian preservation in the Paraguayan Chaco and their implications for future fossil interpretations

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Bird remains are notoriously rare in the fossil record in comparison to most other vertebrate groups. Studies of disparity and richness have found that even relatively weak biases in preservation transform our interpretation of the fossil record, emphasizing the importance of understanding sources of preservation bias. Both

bone density and predator preference have been implicated to control relative representation of skeletal elements in mammal assemblages. By comparing the physical characteristics of a range of modern bird skeletons to the relative representation of bird remains from a modern taphonomic dataset from the Pilcomayo Megafan in Paraguay (our proposed environmental analogue for much of the rock record), we will quantify the factors driving this imbalance between living communities and the fossil record. Over the course of four years, we have studied 476 vertebrate localities along the Pilcomayo Megafan (of which 21 preserve birds) and have recorded taphonomic, sedimentological, and ecological data from each.

Bone density has been quantified for a range of taxa that encompass both the size and ecological diversity within the living community of the Paraguayan Chaco, and we have developed predator preference indices for portions of avian carcasses. Minimum animal unit calculations show an underrepresentation of vertebral column elements and ribs, with an overrepresentation of appendicular and skull elements. The impact of each of these taphonomic characteristics on over- or underrepresentation were assessed via a generalized linear model. The model shows that although density does play a role in preservation potential, skeletal position (axial or appendicular) plays a larger role. An understanding of biases in modern avian bone preservation allows for paleontologists a clearer window into the lives of these charismatic but fragile dinosaurs throughout the geologic past.

Funding Sources: Funding from: David B. Jones Foundation, University of New Mexico, Grand Rapids Public Museum

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Symposium: Signal, noise, and eco-evolutionary opportunity: intraspecific variation in the vertebrate record (Friday, November 13, 2026, 8:00 AM)

Reconstructing ontogenies from adult variation

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Ontogeny is ecologically and systematically important and has received increasing research attention from paleontologists in recent decades. A major difficulty in the study of ontogeny from fossils is missing data; most species in museum collections are known from few specimens, and often exclusively adults. However, even datasets consisting only of adults record information about the ontogenetic trajectories which generate observed morphologies. Morphological changes during ontogeny are accompanied by changes in the distribution of individuals in morphospace. Given that adult morphospace distribution is influenced by both the variation present in juveniles as well as variation subsequently introduced by variable ontogenetic trajectories, intraspecific morphological variation generally increases across successive growth stages. This relationship between adult variation and ontogenetic progression suggests that, all else being equal, steeper or longer ontogenetic trajectories should correspond to greater variation in adult morphologies. It is therefore possible in principle to study details of underlying ontogenetic trajectories from adult-only datasets. Here we use Hamiltonian Monte Carlo to optimize estimates of juvenile trait values and the magnitude of ontogenetic change, demonstrating that estimates of ontogenetic parameters can be made accurately even from small datasets which lack observed juveniles. In analyses of simulated data with various sample sizes (n = 10–1,000), input values for the slope of ontogenetic trajectories and mean juvenile trait values fell within the 95% highest density interval of the posterior distribution in all cases. Using geometric morphometric data describing skull shape variation through ontogeny in extant crocodilians, we evaluated the power of this approach to estimate juvenile trait values and the magnitude of ontogenetic change from empirical data. We recovered similar accuracy, with estimates improved by using a logistic rather than linear model for ontogenetic shape change. The ability of this methodology to accommodate different growth models emphasizes its adaptability to variation in the features of biological datasets. Furthermore, our findings open the door to

studying ontogeny even in species for which growth series are not directly observable, facilitating a clearer understanding of a fundamental aspect of these species' ecology and evolution.

Funding Sources: Natural Environment Research Council through the Training, Research & Equity in Environmental Sciences Doctoral Landscape Award (TREES DLA) (grant number UKRI1325)

Technical Session XVII: Mesozoic mammals (Saturday, November 14, 2026, 1:45 PM)

New body mass estimates in mammals of the Morrison Formation (Late Jurassic, North America) using extant analogues and phylogenetic comparative methods

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Estimating body mass in many Mesozoic mammal species is complicated by the often limited fossil material available to make estimations from. In the case of many North American, Late Jurassic mammals, the most commonly preserved elements are dentaries and teeth. As such, body mass estimates for these species must be derived from various dimensions of the dentary and dentition. Previous studies have presented such estimates using linear regression models based upon datasets of extant analogues, including small-bodied metatherians and eulipotyphlans. Recent approaches to estimate an unknown metric (like body mass) of an extinct taxon have included the use of phylogenetic comparative methods, which is a significant consideration because many traits observed in a single taxon are not completely independent of their evolutionary relationships. In this case, small body size in a mammal, from a clade of small-bodied mammals, is likely not independent rather evolutionarily influenced. Here we use phylogenetic comparative methods to 1) test the strength of the relationship between molar row length, dentary length, and dentary depth with body mass using an extant dataset of metatherians and eulipotyphlans and 2) present updated body mass estimates for several Morrison Fm. mammals, now phylogenetically informed. Previous sample size and taxon breadth of the extant dataset were increased through measurements in the LACM Mammalogy Collection. We use phylogenetic subsets for relationships of the extant dataset and time calibrated trees from the literature that include relevant Mesozoic species to attach fossil taxa. Through phylogenetic independent contrasts, we find that dentary length and dentary depth (R^2 = 0.69 and R^2 = 0.84, respectively) have a stronger relationship with body mass in our extant dataset than molar row length (R^2 = 0.61). Our phylogenetically informed body mass estimates for Morrison Fm. mammals are larger than previous, non-phylogenetic estimates though are still consistent with previous findings of mass distribution within the assemblage. That is, there appear to be two mass groupings in Morrison Fm. mammals, one with taxa under approximately 50–75 g and the other above approximately 100 g (with some variation between dimensions used for estimation). Ultimately, we highlight the influence that phylogeny has on the body mass of these taxa and the importance of accounting for phylogeny in estimates where the original body mass is unknown.

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

After all these years, why can't we stay away? The Bighorn Basin as an archetypal "long record"

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Long continental records of vertebrate fossil assemblages are essential for understanding the drivers of terrestrial ecosystem change, and they provide empirical evidence of macroevolutionary and macroecological processes. The Bighorn Basin (BHB) of northwestern Wyoming, USA, is an archetypal "long record"—the Fort Union and Willwood formations host a stratigraphically dense succession of vertebrate fossil localities spanning the middle Paleocene through early Eocene, and the work continuing today traces a nearly uninterrupted line back to work that began in 1911. Consequently, the BHB is an exceptional natural laboratory for exploring biotic and environmental responses to the Paleocene–Eocene Thermal Maximum and other early Eocene hyperthermals, and its Paleogene fossil record has featured prominently in debates about the tempo and mode of evolution. Nevertheless, crews return to the BHB every summer to continue conducting paleontological and geological fieldwork. To open this symposium, we address a common question: why do we keep going back? As an answer, we review the history of paleontological research in the Paleogene of the Bighorn Basin, highlighting how persistent fieldwork has changed our perspective of the BHB record and the Paleocene–Eocene boundary. We then present a progress report on the Cretaceous Bighorn Project, which aims to extend the long Paleocene–Eocene record of the BHB down into the Upper Cretaceous. To date, we have identified four Cretaceous–Paleogene (K–Pg) boundary sections in the BHB, and we have discovered, surface-collected, and screenwashed microfossil bonebeds yielding diverse continental vertebrates at regular stratigraphic intervals from low in the "Mesaverde" Formation (lower–middle Campanian) to high in the Lance Formation (~5 m below the K–Pg boundary). Together, these ~100 new localities span the last ca. 15 Ma of the Cretaceous. Geochronological data are pending, but samples collected to date span near the entirety of this Upper Cretaceous fossil succession and into historical fossil localities from the lower-to-middle Fort Union Formation. These data will allow us to link Upper Cretaceous and lower Paleocene localities with more intensively studied localities from the upper Fort Union and Willwood formations. The BHB record is thus growing longer, and it has the potential to illuminate ca. 30 Ma of terrestrial ecosystem evolution, spanning both the end-Cretaceous mass extinction and Paleocene–Eocene Thermal Maximum.

Funding Sources: David B. Jones Foundation

Symposium: Major advances in late Paleozoic and early Mesozoic tetrapod paleontology: in memory of Hans-Dieter Sues (Saturday, November 14, 2026, 8:00 AM)

The paleoneurology of *Postosuchus kirkpatricki*, its convergence with theropod dinosaurs and implications for crocodylomorph origins

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Rauisuchidae is a family of pseudosuchian archosaurs ancestral to crocodylomorphs that went extinct by the end of the Triassic Period, 202 million years ago. However, unlike extant crocodiles, rauisuchids were fully terrestrial, relatively high metabolic hypercarnivores that were later converged upon by large theropod dinosaurs. Endocasts from three fossil specimens of *Postosuchus kirkpatricki* are described, including parts of the dorsal region of the brain, an impression of the olfactory bulbs and tract, along with much of the hindbrain to the medulla oblongata. CT scans of both type specimens, TTU-P 9000 and TTU-P 9002 and UMMP VP 7473 have provided 3D reconstructions of the posterior brain, several associated nerves and blood vessels, and the endosseous labyrinth. There are distinct floccular (auricular) lobes present and a markedly asymmetric labyrinth with a moderately developed lagena. The cerebral region is only represented by

a dorsal impression on the skull roof of TTU-P 9002 due to lack of good preservation of the laterosphenoids in any preserved specimens of *Postosuchus*. These endocasts indicate increased motor skills and sensory adaptations compared to that of other non-crocodylomorph loricatans, which supports the hypothesis that *Postosuchus* may have been bipedal. Although *Postosuchus* is a stem-crocodylian, the morphology of its posterior brain is more like that of large theropod dinosaurs (e.g., *Allosaurus* and *Tyrannosaurus*) than that of crocodiles. Since there is extreme morphological convergence between large theropods and rauisuchids, this is not surprising. Endocasts have important implications for understanding neuroanatomy and interpreting possible behavior and functional anatomy of extinct animals, thus any information that can be obtained from such structures is a welcome addition to the context of their function and behavior in life.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Lithostratigraphic and biostratigraphic distribution of Devonian fishes from Ohio limestones in the J. S. Newberry collection

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John Strong Newberry, between 1853 and 1875, provided the earliest descriptions of Devonian fishes from the limestones of Ohio. Early reports placed these taxa in the “Cliff limestone”, “Corniferous limestone”, and Columbus Limestone. The term “Delaware Limestone” was introduced by Edward Orton (1878) for the upper part of the carbonate sequence, including the “fish beds” Konzentrat-Lagerstätte in the lower part of the formation. In collections, specimens are commonly ascribed to the Columbus Limestone (Emsian–Eifelian), often erroneously, in part because lithostratigraphic data has not been updated on labels. Many primary type specimens, plus additional specimens amassed during the time that Newberry was Chief of the Geological Survey of Ohio (1860–1882), have been rediscovered in collections of the Orton Geological Museum; this includes material originally reposited at Ohio Wesleyan University. Lithologic information, and co-occurring invertebrates with Newberry’s fish specimens constrain the stratigraphic levels from which the fish taxa were first collected. Most of these early specimens were collected from the lower Delaware Limestone (Devonian, Eifelian) but some were collected from the upper Columbus Limestone (Devonian, Eifelian). Determination of the lithostratigraphic provenance of the original material provides constraints on the biostratigraphic zonation of these early-described taxa. New stratigraphic and locality information provided by the original specimens examined by Newberry follows: (1) The neotype of *Macropetalichthys rapheidolabis* is from the “fish beds” in the lower Delaware Limestone (Eifelian) at Columbus, Ohio. The lectotype of *Agassizichthys sullivanti*, a junior synonym of *M. rapheidolabis*, was collected from the upper Columbus Limestone (Eifelian) at Columbus, Ohio. The lectotype of *Agassizichthys manni*, also a junior synonym of *M. rapheidolabis*, is from the “fish beds” at Delaware, Ohio. (2) The name-bearing specimens of *Onychodus sigmoides* and its junior synonym *Onychodus hopkinsi* are from the “fish beds” at Delaware, Ohio. (3) Newberry’s type and/or examined material of *Machaeracanthus major*, *Machaeracanthus peracutus*, and *Machaeracanthus sulcatus* were evidently collected from the lower Delaware Limestone (Eifelian) at Delaware, Ohio; this seemingly provides a biostratigraphic marker, slightly above the Tioga B K-bentonite, within the lower Eifelian Stage.

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Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Good acids: establishing a preparation methodology for the removal of calcium carbonate from unstable bone

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Generally, baths of acetic acid solutions have been used to remove calcium carbonate coating from bone. For unstable bone, however, a bath is not possible without compromising the physical integrity of the specimens. Field jacketed, unstable bone with extensive calcium carbonate crust on the surface has required the establishment of a new methodology prior to stabilization for handling and research. The new procedure consists of the application of a 5% acetic acid solution with an eye dropper directly on the calcium carbonate affected areas, followed by manual removal of the softened calcium carbonate with a bamboo skewer. The final step consists of a distilled water rinse. This new procedure has been applied to jacketed ground sloth bones currently undergoing conservation treatment at the Quaternary Research Center of the Lubbock Lake National Historic Landmark. As areas of the bone are exposed after calcium carbonate removal, they are stabilized with a polyvinyl acetate solution of 0.5%, 1–2%, and 3%. After multiple treatments with the acetic acid solution, all calcium carbonate has been removed and stabilization now completed. While this methodology takes time, it is effective at removing the calcium carbonate coating while not damaging the unstable bone.

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Testing the utility of archosaurian enamel microstructure for making taxonomic assessments: *Alligator mississippiensis* enamel shows substantial ontogenetic variation reflecting scaling and changing biomechanical demands

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Enamel microstructure—the three-dimensional arrangement of enamel hydroxyapatite crystallites (schmelzmusters)—is generally considered a stable morphological character useful for taxonomic assessment amongst archosaurian reptiles. However, in mammals, enamel microstructure strongly reflects biomechanical demands dictated by feeding ecology. As such, similar schmelzmusters commonly evolve in distantly related taxa with convergent feeding ecologies. Large-bodied reptiles, including many crocodilians and non-avian dinosaurs, increase in body size by orders of magnitude throughout ontogeny. In the process they: 1) occupy multiple dietary niches, 2) exhibit changes to tooth form and size, and 3) experience substantially different dental biomechanical stresses due to changing bite forces and diets. The convergent nature of enamel schmelzmusters amongst mammals raises questions regarding the stability of the character in polyphyodont archosaurian reptiles. Here, I used scanning electron microscopy to observe and describe the enamel microstructures of caniniform and molariform teeth in the dentition of the American alligator (*Alligator mississippiensis*) across an ontogenetic range of individuals spanning from neonate to somatically mature adult. The results reveal substantial structural variability both across ontogeny and the tooth row. Neonate teeth exhibit layers of parallel-oriented crystallites—the primitive saurian condition. Later stages show increasingly complex microstructures with multiple crystallite bundles weaving into three-dimensional architectures. Such changes occur in both caniniform and molariform teeth, each ultimately reaching distinct end-stage morphologies. The marked differences between juvenile and adult microstructural phenotypes challenge the assumption that reptilian enamel microstructure is a stable taxonomic character. These ontogenetic changes may lead to false stemward taxonomic assignments owing to the phylogenetically plesiomorphic nature of juvenile schmelzmusters. Notably, the results imply that polyphyodonty may provide reptiles with the evolutionary opportunity to ecologically-tune enamel fabrics to meet the changing demands of their ontogenetically shifting niches—tuning that would be detectable in the fossil record. These findings emphasize the complexity of archosaurian schmelzmusters and suggest ontogenetic and biomechanical factors must be considered to fully characterize the microstructural spectrum of a given taxon.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Moving a fossil collection: the challenge of reduction

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The University of Texas Permian Basin's Geology Department, now more than 50 years old, has accumulated an extensive fossil collection over its history. Multiple relocations and decades of use, however, left the collection disorganized: specimens were often misplaced, mislabeled, or of insufficient quality for long-term curation. In spring 2026, the department relocated once again to a new facility 0.48 miles away that offered a more central campus location and updated infrastructure. The move presented a significant challenge: transporting an outdated and spatially sprawling fossil collection that included high-value vertebrate material. At the same time, it created an ideal opportunity to modernize and streamline the collection. Prior to the move, most fossils were stored in a single classroom containing wooden cabinets arranged in 12 rows of 14 drawers each, ceiling-height cabinets for large specimens, and metal cabinets housing the teaching collection. The teaching collection had previously been catalogued on the UTPB Fossil Collection website, establishing a model for how the general collection should be organized. Additional specimens were scattered throughout the room in unlabeled boxes. Because the new facility offered significantly less storage space—and because many specimens were of poor quality—the department elected to reduce the collection by approximately 50%, from ~3,500 to ~1,700 fossils. This reduction included the retention of high-quality teaching specimens, fossils with reliable species or locality data, and newly discovered dinosaur material awaiting description. Remaining specimens were donated to local geological societies to ensure they remained accessible to the community.

Each drawer was photographed, catalogued, and added to the existing online database. Specimens were then packed using bubble wrap and plastic film, with larger fossils boxed using the same method. Through this systematic evaluation, documentation, and packing process, the department completed a successful relocation and significantly improved the organization, accessibility, and long-term utility of its fossil collection.

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

The first documented case of malocclusion in sauropod teeth

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Although cranial elements of sauropod dinosaurs are exceptionally rare, isolated teeth are common finds even when body fossils are not preserved. The lack of cranial material combined with questions surrounding the growth and maintenance of animals of such immense size has led to a large body of work on sauropod feeding behavior, particularly in the 21st century. Consequently, most aspects of sauropod tooth anatomy (histologic composition, micro- and macrowear patterns, gross anatomy, and replacement rates) have been heavily exploited as the primary available source of information. It is perhaps surprising, then, that no reports of malocclusion or other dental pathology have been reported in the 120+ years of study. Here, we report five isolated teeth from the Mygatt-Moore Quarry (Upper Jurassic Morrison Formation, Brushy Basin Member) referrable to *Camarasaurus sp.* While morphologically typical in and of themselves, they each preserve wear patterns inconsistent with all previous reports and current understanding of jaw mechanics in that genus. These teeth all bear the typical wear facets present on the occlusal surface of the apex and carinae, indicating some degree of normal occlusion. However, large, subovate wear facets are additionally present on the facial (external) surface of the teeth, often extending basally past mid-height on the crown. The margins of these facets are often marked by thinned enamel as well as large chips in their margins as well, which is

atypical of the occlusal facets in sauropod teeth of this type. Other teeth referrable to *Camarasaurus* sometimes display slight polishing of this external face, but only to the point of obliterating the enamel texture: this is likely the result of incidental contact with food and never results in a facet. The wear surfaces examined here indicate extremely heavy tooth-tooth contact on that surface, consistent with prognathy of either the upper or lower arcades. These teeth are from multiple positions in the arcade (as identified from comparisons of the arcade in morphotypical specimens) and from multiple horizons in the quarry, indicating that this atypical conformation is not the result of a single abnormal tooth position or preservation of one atypical individual. Confounding this, the Mygatt-Moore Quarry is exceptionally fossiliferous, having produced several thousand dinosaur bones, hundreds of dinosaur teeth, and more than 2,700 mapped specimens, but no other atypical specimens of this type.

Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

A peculiar bonebed from the Lopingian upper Madumabisa Mudstone Formation of the Luangwa Basin, Zambia provides insights into neonatal growth rates in therapsid

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Fossil bonebeds provide snapshots into paleofaunal composition, paleoecosystems, intraspecific variation, and behavior. The information gleaned from bonebeds depends largely on the mode of formation as well as taxonomic composition. Here, we describe a peculiar bonebed of juvenile therapsid fossils from the late Permian upper Madumabisa Mudstone Formation of Zambia. Discovered in 2019 and revisited during two subsequent expeditions, the bonebed preserves very small neonates to medium-sized juveniles.

The bonebed is located on a small mound (~2 x 1.5 m) with a productive layer consisting of a single plane of fossil material (~2–3 cm thick) that appears to be a primarily biogenic and monodominant bonebed. Currently, 91% of identified specimens (n = 35) are dicynodonts. Specifically, an ontogenetic series of postcranial material appears most similar to small juveniles of large-bodied rhachiocephalid dicynodonts. Some theriodont material is also present, including a partial serrated tooth and at least two proximal femora. Cranial elements are also preserved including a small dicynodont maxilla with a developing tusk and a theriodont maxilla with an erupting tooth. Axial and autopodial elements have been recovered in articulation, but most of the bones are disarticulated. Fossils lie horizontal in the bonebed and are generally, but not exclusively, linearly arranged along long axes. These data suggest minimal physical transport in forming the bonebed and this, in addition to its monodominant composition, suggest mostly biogenic formation.

Histological sampling of the dicynodont elements sampled has revealed woven-to-fibrolamellar tissue that is uninterrupted and reflects remarkably rapid growth. These tissues are consistent from the smallest to largest material sampled in both the humeri (6 cm–8 cm long) and femora (5 cm–7 cm long). These rapid growth rates provide insights into the mechanism by which rhachiocephalid dicynodonts achieved large sizes during the Permian. This histology also sheds light on the formation of the bonebed. Uninterrupted growth, even at the periosteal surface, suggests that if environmental stressors resulted in the accumulation of these individuals, it was a particularly sudden event. Continued histological sectioning, as well as mapping and sampling of this site will help to enlighten the snapshot that this rare bonebed has to provide into late Permian taxa and ecosystems.

Funding Sources: National Geographic 158R-18; National Science Foundation DEB-1701383

Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

Anatomical atlas and three-dimensional musculoskeletal model of the flight apparatus in the Southern Screamer (Anseriformes, *Chauna torquata*)

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The three bird species within the family Anhimidae (screamers) are of great interest to the big picture of avian evolution due to both their phylogenetic position and their unusual combination of features. As screamers are early diverging members of Anseriformes (waterfowl), which itself is an early diverging clade within the extant bird radiation, their anatomy may help shed light on that of the common ancestor of both Anseriformes and crown-group birds as a whole. To reveal new information about the wing anatomy of anhimids, we generated a three-dimensional musculoskeletal model of the flight apparatus of the extant southern screamer (*Chauna torquata*) using diffusible iodine-based contrast-enhanced computed tomography (diceCT). We found that the wing muscle anatomy of *Chauna* reflects the soaring flight style employed by anhimids, as opposed to the rapid continuous wingbeats used by most other anseriforms. In *Chauna*, this manifests as a more distal insertion of the pectoralis muscle on the humerus to facilitate slower, stronger wingbeats, and a reduction in the length of antebrachial muscle origins and insertions that serve to reduce the distal inertia of the wing. Our three-dimensional dataset represents a typical musculoskeletal system of a bird with strong flight capabilities. Our finding of a relatively high fidelity between flight-related muscles and osteological correlates of their attachment means that this dataset could prove useful in reconstructing the wing myology and making inferences regarding flight style in early Anseriformes such as presbyornithids. Looking further stemward, our dataset could be used in tandem with information from volant palaeognaths for reconstructions both in early crown group birds and birds just outside the crown group, helping to illuminate the origins of modern avian flight.

Funding Sources: Peter Buck Postdoctoral Fellowship, NSF Natural History Research Experiences internship

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Micro-CT reveals new elements of an embryonic specimen of *Camptosaurus*

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DINO 15624 is a specimen of presumed embryonic stage *Camptosaurus* from the Upper Brushy Basin Member of the Morrison Formation. It was originally collected from Dinosaur National Monument, Utah, in 1991 and subsequently described. Original assessment of the specimen, while descript, was limited by the technology available at the time. Recent reassessment of the specimen via micro-CT and 3D rendering has allowed for greater depth of analysis. Novel additions to the specimen via this method include discovery of left pedal elements adjacent to the previously known tibia and fibula. The newly discovered elements are interpreted as metatarsals I–III, the first phalanx of digits I–III, and a possible tarsal element. Five vertebrae previously described as caudal vertebrae are revised as dorsal vertebrae. Micro-CT imaging allows visualization of parapophyses and diapophyses on each transverse process and shows that the centra lack articular facets for hemal arches. Similarly to prior descriptions, current evaluations of the specimen also reveal a coracoid, humerus, scapula, two cervical vertebrae, and five other dorsal vertebrae (for a total of 10). A piece previously described as a suspected pubis fragment is reinterpreted here as a possible exoccipital. The most diagnostic features preserved are found in the scapula and coracoid. The scapula has a straight blade that

gradually widens dorsally. Although somewhat broken, it appears the acromion process did not form a strong distinct projection as in some non-dryomorphan ornithopods. It also has a distinct supraglenoid fossa. These features are all found in both *Camptosaurus* and *Dryosaurus*. The coracoid is somewhat quadrangular with a short ventrally directed process. Although previously described as being more similar to *Camptosaurus* than to *Dryosaurus*, this study finds these features equivocal. However, this specimen can be differentiated from *Dryosaurus* by the very reduced spinous processes on the preserved cervical vertebrae. These findings support the original identification of this specimen as *Camptosaurus* sp.

Technical Session I: Ungulates (Wednesday, November 11, 2026, 8:00 AM)

Late Hemingfordian-Barstovian NALMA biostratigraphy of the Tesuque Formation (Middle Miocene), Española Basin, north-central New Mexico

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The middle Miocene was a period of major climatic and ecological change that reshaped mammalian communities across North America. The Tesuque Formation of the Española Basin, New Mexico, preserves one of the most diverse late Hemingfordian–Barstovian terrestrial vertebrate records in the southwestern United States, spanning the Miocene Climatic Optimum (~17–14.5 Ma) and the subsequent Miocene Climatic Transition (~14.5–13.9 Ma). Despite its importance, regional biochronologic correlations have been hindered by complex basin tectonics and lateral facies variability. An 836-m-thick composite stratigraphic section from the Bureau of Land Management's Sombrillo Area of Critical Environmental Concern integrates mammalian fossil occurrences with laterally traceable volcanic ash beds, providing a temporally constrained framework for evaluating faunal turnover and paleoecological change. Analysis of 123 mammalian species from the Tesuque Formation reveals four discrete faunal turnover events at 17.241 Ma, 16.322 Ma, 15.343 Ma, and 14.397 Ma. The earliest assemblages are characterized by diverse browsing communities dominated by camelids, equids, rhinocerotids, and oreodonts that occupied warm, humid environments during the Miocene Climatic Optimum. Subsequent turnover events coincide with climatic cooling, floral turnover, and changes in basin environments. These shifts include increased camelid diversity during the climatic optimum, regional extirpation of palms after 15.343 Ma, increased abundance of antilocaprids, the appearance of gomphotheres, and the shift from communities dominated by C3 feeders to assemblages containing mixed feeders that exploit C3 and C4 vegetation during the Miocene Climatic Transition. The close correspondence between faunal turnover, environmental change, and independently constrained chronology demonstrates that climate was a primary driver of mammalian community restructuring in the Española Basin. These results refine late Hemingfordian–Barstovian biochronology and provide a high-resolution record of middle Miocene mammalian response to climatic change in western North America.

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Articulated freshwater actinopterygian from the Late Cretaceous Hell Creek Formation of South Dakota sheds light on the early evolution of Percopsiformes

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The fossil record of freshwater fish in the Late Cretaceous and early Paleocene is dominated by fragmentary and isolated fossils recovered through screenwashing techniques. While these fossils can provide information on general trends in diversity through time, they often lack the morphological information required to support diagnosis to any

but the most inclusive clades. Rare articulated specimens are central to building our understanding of the extinction and survival of freshwater fish across this critical period of Earth history, not only by allowing us to more confidently identify fragmentary remains, but also by populating stem lineages that inform character changes underlying the modern fauna.

Percopsiformes is a relatively small clade of freshwater fish that includes *Percopsis* and *Aphredoderus*, but also the amblyopsid cave fishes that inhabit subterranean karstic systems of the midwestern and southeastern United States. Molecular phylogenies generally reconstruct a post-Cretaceous–Paleogene (K–Pg) origin of crown Percopsiformes. A single percopsiform taxon is recognized from pre-K–Pg sediments, *Lindoeichthys albertensis*. Ambiguous relationships of *L. albertensis* support either a pre- or post-K–Pg origin of crown Percopsiformes, with corresponding changes to our understanding of K–Pg survival in this clade. Here, we present a new articulated fossil paracanthopterygian from the Hell Creek Formation (Maastrichtian) of South Dakota, USA, that elucidates the early evolution of Percopsiformes. Phylogenetic analysis recovers the new specimen, DMNH EPV.146282, on the stem of Percopsiformes or on the stem of Paracanthopterygii. The addition of a character that captures the paleoenvironment (marine vs. freshwater) of each tip taxon supports a position on the stem of Percopsiformes for the new taxon. Our results suggest that the Percopsiformes stem lineage invaded freshwater soon before the K–Pg, surviving the event in freshwater environments now considered as refugia from the worst effects of the bolide impact and subsequent climatic perturbations. The questionable crown affinities of both the new specimen and *Lindoeichthys* and the delayed appearance of clear crown Percopsiformes until the Late Paleocene support a post-K–Pg origin of the modern radiation, and that only the single, stem lineage of Percopsiformes needs to have survived the event to produce the modern diversity.

Funding Sources: US National Science Foundation (FRES 2317666 and 2403640), Lyda Hill Foundation, and M.L. and S. Kneller

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Poster Session 4 (Saturday, November 14, 2026, 4:30 PM)

Non-destructive mounting techniques for imaging of microfossils

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Microfossils provide invaluable insight into the smallest members of past ecosystems, but a suite of challenges are associated with imaging them for study and publication. Digital photography of small, complex teeth often results in glare from the enamel that can obscure detail (e.g., enamel ridges). Additionally, plasticine clay and certain waxes that are used for mounting are oil-based, easily transferring residues to fossil surfaces that are impossible to remove with water, and instead require acetone to remove (precluded if reversible glues have been used to stabilize the specimen). Further, long-term mounting of small fossils within waxes often entirely saturates the specimens in oil, substantially altering appearances. To mount microfossils for imaging, we enlist Elmer's washable school glue (polyvinyl acetate-based) and Crayola Model Magic air-dry clay (proprietary composition), both fully water-soluble, inexpensive, and accessible mounting compounds. For the smallest and most delicate fossils, the school glue method is ideal; unlike mounting media, like clay, in which delicate specimens can break when pressed into the adhesive, no pressure is placed on fossils when mounting. Further, following imaging, both school glue and model magic release instantly with water. We applied this method for the imaging of sub-millimeter avialan teeth from the Late Cretaceous Prince Creek Formation of northern Alaska. Under magnification, a thin layer of washable glue was spread by finger on the surface of an imaging stand, drying within tens of seconds, and a thin, damp paintbrush was

used to precisely place the fossils on the stand. Scanning electron microscope (SEM) images were taken with the University of Alaska Fairbanks Advanced Instrumentation Laboratory's Quanta 200 Environmental Scanning Electron Microscope. Unlike conventional SEMs, which operate in a high-vacuum environment and require specimens to be permanently mounted and irreversibly sputter-coated with a highly conductive thin metal film, this instrument operates at a low-vacuum mode, preventing the need to sputter-coat specimens. Following imaging, any glue residue was gently washed off with water. These non-destructive mounting techniques demonstrate that, when possible, one should opt for these water-based mediums.

Funding Sources: National Science Foundation grants EAR 1226730 (to PSD and GME) and 1736515 (to PSD, GME, and JJE)

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Reevaluating the extinct insectivourous mammal "*Leptacodon*" *munusculum*: Implications for the understanding of placental mammal diversification

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Nyctitheriidae is an extinct family of small mammals known from the early Cenozoic of North America and Eurasia. Their early appearance—early Paleocene, To2 NALMA (~61 Ma)—makes them of interest for understanding the radiation of eutherian mammals near the start of the Cenozoic. However, the relationships within Nyctitheriidae and to other mammal clades remain contentious, compromising their utility for informing broader mammalian macroevolutionary hypotheses. The nyctithere genus *Leptacodon* has become a particularly problematic wastebasket taxon for species exhibiting plesiomorphic features. The dubious monophyly of *Leptacodon* has long been recognized, with recent phylogenetic analyses continuing to highlight its polyphyletic nature. One of many species assigned to *Leptacodon* is *Leptacodon munusculum*. While *L. munusculum* is widely acknowledged to likely be generically distinct, formal reassignment has been hindered by the lack of a confidently assigned upper dentition. Here we describe previously known but poorly documented craniodental material from the *L. munusculum* type locality, including a partial maxilla preserving P3–M2. This material has enabled the first detailed morphological comparisons of *L. munusculum* upper dentition with that of other nyctitheres. Our comparisons confirm that *L. munusculum* differs from other *Leptacodon* species, including the type species, *L. tener.* The most striking difference between the upper dentition of *L. munusculum* and *L. tener* is the greatly reduced hypocone and posthypocrista of M1 and M2 in *L. munusculum*. We also verify similarities between the lower dentition of *L. munusculum* and the genus *Pontifactor*, but based on differences in the upper dentition, we disagree with the proposal that *L. munusculum* may be assigned to *Pontifactor*. Preliminary phylogenetic analyses using a new morphological matrix of nyctitheres fail to recover a monophyletic *Leptacodon*, further supporting the removal of *L. munusculum* from the genus. Reevaluating diversity within Nycitheriidae has valuable implications for better understanding mammal diversification during the early Cenozoic. While the uncertain placement of nyctitheres among eutherian mammals still poses limitations on their utility, further clarifying nyctithere systematics has the potential to refine broader ideas on the timing and speed of the eutherian mammal radiation following the end-Cretaceous extinction.

Funding Sources: Arizona State University - School of Life Sciences

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Technical Session XV: Dinosauria IV: a mostly "bird-hipped" bonanza (Saturday, November 14, 2026, 8:00 AM)

Multicontinental distribution of an enigmatic avialan clade increases known richness and ecological breadth of Late Cretaceous birds

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Late Cretaceous avialans represent a key window in bird evolution immediately prior to the radiation of crown birds and are critical for contextualizing the evolution and diversification of modern birds and their differential survival across the end-Cretaceous (K–Pg) mass extinction. Late Cretaceous bird diversity is traditionally thought to have been dominated by Enantiornithes, and less so, Ornithurae, consisting of Ichthyornithes, Hesperornithes, and rarely, ambiguous near-crown or crown birds. While the Early Cretaceous avialan record benefits from several terrestrial localities with exceptional preservation, the Late Cretaceous ornithurine record is most complete for specialized birds found in marine sediments. However, an untold number of taxa are only known from fragmentary, isolated elements from terrestrial formations, precluding our understanding of the true richness and global distribution of avialans at the end of the Mesozoic. One stark exception is the Mongolian *Apsaravis ukhaana*. While initially hailed as a critically informative taxon, and one of the few near-complete terrestrial Late Cretaceous birds, its tendency to cause instability in phylogenies often results in its exclusion. Here, we describe a suite of new avialan fossils from several Late Cretaceous North American formations that express morphological congruence with *Apsaravis*. These fossils position the previously understudied Palintropiformes as a geographically widespread clade of ornithurine birds spanning the late Campanian to end-Maastrichtian. Phylogenetically informed predictions demonstrate that these birds rapidly evolved remarkable adult body size disparity, including one of the largest known Mesozoic avialans. Further, while enantiornithines are traditionally considered the dominant land birds of the Mesozoic, the Palintropiformes exhibit evidence of a ground-specialist ecology, deviating from the typical shorebird ecology exhibited by ornithurines. We present the first tip-dated Bayesian phylogenetic tree for Mesozoic avialans utilizing a new, refined dataset of temporal ranges, demonstrating that Palintropiformes represents a derived avialan radiation prior to the diversification of crown birds. Their broad biogeographic range, unique ground-specialist ecology, and remarkable body-size disparity evolved rapidly over their ten million years of evolutionary history prior to the K–Pg extinction, positioning them as an important component of Late Cretaceous ecosystems.

Funding Sources: The Royal Tyrrell Museum Cooperating Society

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Digital segmentation of a vertebrate-rich Richards Spur fissure-fill block using micro-CT data

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The Dolese Brothers Limestone Quarry near Richards Spur, Oklahoma, has yielded a diverse vertebrate assemblage preserved in chalky early Permian fissure-fill deposits within Ordovician Arbuckle Limestone. Terrestrial animals were likely trapped in open fissures or transported into them by rainfall and runoff after death. The locality, referred to in the literature as Richards Spur, Fort Sill, or the Dolese Quarries, is interpreted as having formed in a semi-arid paleoenvironment with monsoonal periods that promoted the infilling of fissures with sediment and skeletal remains. Its fauna includes early reptiles, early synapsids, and a diverse array of temnospondyls, making Richards Spur one of the most significant records of early Permian vertebrate diversity. This study examines a large matrix block containing multiple individual organisms collected no later than 2001. Because multi-individual blocks are not typically cataloged under a single specimen number, references are made to accessioned numbers assigned to identifiable individuals within the block.

The matrix block has remained largely unprepared and unassessed, leaving many internal components undesignated. Micro-CT scans were conducted at the University of Texas High-Resolution X-ray CT Facility in 2024, and the smaller portion of the block was manually segmented using Materialise Mimics Core version 27.0. Segmentation revealed skeletal elements from multiple body regions, including material consistent with the captorhinid reptile *Captorhinus* and the dissorophid temnospondyl *Cacops*. Many fossils within the block exhibit density anomalies that complicate digital identification and segmentation. High-density anomalies are interpreted as pyritization on fossil surfaces, while low-density anomalies remain more difficult to assess. Some individual elements also display two distinct densities, a pattern that may relate to the absorbent nature of spongy bone and is consistent with taphonomic observations from the site.

The segmented specimen, along with the larger block from which it was removed, is densely populated with skeletal material. The resulting digital model provides a basis for estimating skeletal volume relative to matrix and for interpreting the taxonomic and anatomical composition of the larger block. This study demonstrates the value of micro-CT data and manual segmentation for the non-destructive analysis of densely packed, unprepared fossil-bearing blocks.

Symposium: Long continental records of vertebrate faunal change (Wednesday, November 11, 2026, 8:00 AM)

The Hell Creek Project: A long-term, multi-disciplinary investigation of the mass extinction and biotic recovery across the K–Pg boundary in eastern Montana, USA

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The Cretaceous–Paleogene (K–Pg) mass extinction was a transformational event in Earth history. One of the best study systems in the world to investigate the changes in terrestrial ecosystems associated with this event is the Hell Creek area of eastern Montana, USA (and regional extensions), in the Williston Basin. Since 1972, multidisciplinary teams of researchers have collaborated to collect and analyze paleontological and geological data from this area with the aim to hone our view of the K–Pg events to ecologically relevant scales. A high-resolution and high-precision chronostratigraphic framework has been built by a combination of litho-, chemo-, bio-, and magnetostratigraphic data and radioisotopic age determinations; it encompasses the last ~1 million years of the Cretaceous and the first ~1.2 million years of the Paleocene and includes precise placement of the K–Pg boundary. Extensive collecting efforts from hundreds of localities in the Hell Creek and Fort Union formations have amassed collections of thousands of fossil plants, invertebrates, and vertebrates (macro and micro) that provide a robust, detailed understanding of the biota from three North American land mammal "ages": Lancian, Puercan, and early Torrejonian (To1 interval zone). Integration of the local fossil database within the chronostratigraphic framework has provided the basis for many iterative studies of the K–Pg mass extinction and recovery and ensuing early Paleocene radiations. Most recently, we have targeted key gaps in fossil sampling, chronostratigraphy, and geological context of the study system and have applied novel approaches (e.g., food web modeling) to more rigorously test our hypotheses. Results show that minor biotic changes occurred in the hundreds of thousands of years before the K–Pg, whereas major biotic changes occurred at the K–Pg boundary, with the magnitude and selectivity of the extinctions having varied widely across taxa as did the rate of recovery. Current and future research aims to (1) expand the temporal scope by sampling older and younger biotas, (2) better document and correlate vegetation and paleoclimate records with the vertebrate fossil record, and (3) expand our view

beyond coastal lowland paleoenvironments of the Western Interior of North America to other areas, such as India, Spain, Bolivia, and Colombia.

Funding Sources: Hell Creek Project and NSF-EAR (2321341)

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

The dinosaur record from the Upper Cretaceous of Pakistan: New material, synthesis, and prospectus

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The Indian Plate migrated across more than 83˚ of latitude in the last 300 million years, from a position near the South Pole to one north of the Tropic of Cancer. This transition is associated with physical changes (e.g., Himalayan orogeny), geological changes (e.g., Deccan Traps), and biological changes (e.g., interchange between Gondwana and Laurasia). Our understanding of the biotic history of the Indian Plate has relied heavily on the geological and paleontological record of present-day India, owing to its large size and lengthy history of scientific research. This is especially true for the Cretaceous–Paleogene extinction event and continental paleobiogeography. Despite a long history of discovery that reaches back to 1828, the identity and taxonomy of Indian dinosaurs have remained complicated, owing to profligate naming of taxa and uncertainty surrounding the age of fossiliferous horizons, both of which remain the focus of ongoing research. Collecting efforts in the Upper Cretaceous Vitakri Formation of central-western Pakistan over the last 25 years have yielded a sizable collection of continental archosaur remains that rival the collections known from India and preserve elements not yet known from the Indian Plate, such as cranial remains of titanosaurian dinosaurs and notosuchian crocodylians. As such, Pakistani fossils provide valuable information about Indian Plate paleobiogeography and extinction. Here we review fossiliferous localities and named dinosaur species from the Vitakri Formation and describe titanosaur material collected by a joint Geological Survey of Pakistan–University of Michigan team. Preserved bones, which represent several individuals and more than one species, include elements from the cervical, dorsal, and caudal series, girdles, and limb skeleton. Similarities between the titanosaurs from Pakistan and western India (Gujarat) indicate that some are the same taxon or sister taxa. The Vitakri Formation may be most similar in age to localities in Gujarat—which are now known to be the oldest Deccan Trap-associated Late Cretaceous horizons in India—but confirmation awaits geochronological data from Pakistan. We conclude that several factors have historically limited inference of phylogenetic relationships of Indo-Pakistani titanosaur species, including the nature and preservation of the collections themselves, as well as phylogenetic character sampling and resolution of titanosaur interrelationships.

Funding Sources: National Geographic Society (CRE 8127-06), National Science Foundation (EAR-1736606)

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Evaluating osteological correlates of masticatory muscle architecture: a myological approach to the reconstruction of the bite force and gape of extinct primates

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Jaw gape and bite force are important dietary variables related to a muscle's fascicle length (FL) and physiological cross-sectional area (PCSA), respectively. Variation in these masticatory muscle architecture variables correlates with dietary specialization in many mammals, including primates. Despite the myological components of the masticatory apparatus being crucial in

understanding masticatory biomechanics, as soft tissue does not fossilize, prior reconstructions of the masticatory apparatus of extinct primates have almost exclusively focused solely on direct dietary and anatomical correlates. Though FL and PCSA cannot be directly measured on skeletal remains, they can be approximated using osteological proxies of the masticatory adductors, which may allow us to reconstruct the masticatory abilities of extinct primates with more fidelity. To this end, through the combination of previously published muscle data and novel osteological measurements, we have established osteological correlates of masticatory muscle architecture. To encompass the body size breadth and theoretical dietary diversity of extinct primates (e.g., from omomyids to ancestral hominins), we have incorporated myological data from 40 extant taxa (22 strepsirrhines and 18 anthropoids), spanning the extant body size range of the order. In total, we established 39 linear measurements, consisting of origin-to-insertion measurements as well as cranium- and mandible-only proxies to allow applicability to incomplete fossil remains. Our correlates were adjusted for body mass, then the proxy residuals generated were regressed against the residuals of the FL variables. The best proxies for average and temporalis FLs were related to temporalis attachments, likely due to the temporalis being the largest of the primate masticatory adductors. Interestingly, while the R-squared values were much higher for the masseter FLs, the temporalis proxies performed the best for these FLs, likely due to the temporalis' size relative to the other adductors. Furthermore, the medial pterygoid FLs performed poorly, possibly also related to the medial pterygoid's small size and less defined origin area. Our results suggest that, through the establishment of viable cranial and mandibular muscle proxies, it is possible to use even fragmentary fossil remains to evaluate the myological components of the masticatory abilities of extinct species, allowing for more faithful reconstructions of dietary behaviors.

Funding Sources: This project was funded through the NC State Office of Undergraduate Research and the National Science Foundation (IRES-18-54244)

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Two new multituberculate skulls from the Goler Formation (California, USA) support the existence of a distinct mammalian province on the west coast of North America during the late Paleocene

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Multituberculates were among the most numerically abundant and diverse constituents of North American mammalian faunas from the Late Jurassic through late Paleocene. Yet, that fossil record comes predominantly from the Western Interior and consists mostly of isolated teeth and jaw fragments. Here, we describe two new multituberculate skulls from the upper Paleocene (Tiffanian North American Land Mammal Age) portion of the Goler Formation, which crops out in the El Paso Mountains of the Mojave Desert in California and was deposited along the ancient west coast of North America. Both skulls were scanned using micro-computed tomography and segmented to generate three-dimensional reconstructions. The first skull, RAM 9048, is nearly complete and preserves all upper and lower tooth positions. RAM 9048 shares dental similarities with both the cimolodontid *Cimolodon* and the neoplagiaulacids *Parectypodus* and *Neoplagiaulax*, but it exhibits a unique mosaic of traits that preclude its assignment to known taxa. The p4 closely resembles species of *Cimolodon*—it is large (length = 6 mm), symmetrically arcuate, has a distally inclined mesial face, projects dorsally above the lower molars, and possesses a large mesiobuccal lobe. The p3, although broken, also appears to have contributed to the mesial portion of the p4 blade, as in *Cimolodon* and unlike neoplagiaulacids. The upper and lower molars and P4, however, most closely resemble those of neoplagiaulacids in shape and cusp counts. Scanning electron microscopy is underway to determine whether the enamel microstructure of

RAM 9048 is gigantoprismatic (as in cimolodontids) or microprismatic (as in neoplagiaulacids). The second skull, RAM 9663, represents a large (27 mm from just posterior to the orbits to the tip of the snout), slightly dorsoventrally crushed partial cranium, preserving fragments of the incisors and distorted remnants of P1–4 and M1. Wear and damage to the dentition in RAM 9663 makes definitive taxonomic identification difficult. Nonetheless, its P4 is very long relative to M1 (P4:M1 = 1.48), precluding its assignment to candidate larger bodied Paleocene–Eocene multituberculate taxa, such as *Neoliotomus* or Taeniolabididae. Study of these specimens is ongoing, but it is likely that RAM 9048 and RAM 9663 are both new additions the mammalian fauna of the Goler Formation, contributing to a growing body of evidence of a distinct late-Paleocene mammalian biogeographic province on the west coast of North America.

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Hiatal control on the turnover of mammalian assemblages in the middle Eocene Washakie Formation, Wyoming

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One of the long-standing concerns of paleobiologists is the identification of major faunal turnovers in the fossil record, which are generally thought to arise as a response to exceptional climatic or environmental stress. However, prior to evaluating such possibilities, one should be confident that the stratigraphic pattern of taxonomic first and last appearances does not simply arise from hiatuses, or gaps in sediment accumulation, which can concentrate range endpoints along a single horizon. This challenge is especially pronounced for vertebrate fossil records in terrestrial settings, where fossil remains are typically scarce and in which the sedimentary record is often subject to long phases of sediment starvation or bypass and subaerial weathering. Here, I develop a framework for estimating the relative magnitude of hiatuses and test for the extent to which major hiatuses coincide with mammalian faunal turnovers in the Eocene Washakie Formation of Wyoming. I find that, while the formation contains signatures of high-magnitude, seasonally variable flooding regimes that result in rapid deposition, nearly all range endpoints of mammalian genera are still associated with major hiatuses. In addition, some of the faunal turnovers that previously appeared to have occurred suddenly actually proceeded in a more stepwise and gradual fashion. The significance of these findings extends beyond the Washakie record, and this work provides a model for reevaluating fossil records in other intermontane basins in the western United States.

Funding Sources: Paleontological Society, Society for Sedimentary Geology

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

The first occurrence of a probable pachycephalosaurian hyoid element

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Derived from the second pharyngeal arch, the hyoid complex is a free-floating midline structure that is situated posteroventrally to the lower jaw. While there are osseous structures that do not articulate with others—such as dermal ossifications, dinosaurian ossified tendons/myosepta, and the mammalian baculum/baubellum—the hyoid complex is one of the few "free floating" bony elements across the vertebrate bauplan. In terrestrial vertebrates, the hyoid complex is an important structure for vocalization, feeding, and respiration. A gracile, delicate, and multicomponent structure in close proximity to heavily predated tissues, the hyoid complex is not a taphonomically favored structure; and yet, despite these taphonomic challenges, within Dinosauria, the primary osseous portion of the hyoid complex, the ceratobranchial, is well

documented within many clades—save Pachycephalosauria. Previously, there were no known or suspected ceratobranchials reported from any pachycephalosaurian, making it one of the few osseous elements entirely unknown from this clade. Here, we report on a bony element which we hypothesize to be a right ceratobranchial from the holotype of the late Maastrichtian "*Dracorex hogswartsia*." This element was found associated with the holotypic material—though never reported—and its overall morphology, such as being anteroposteriorly elongate and transversely thin (e.g., "rod-like"), is congruent with ceratobranchial morphology from other dinosaurian taxa. If our identification is correct, this not only marks the first occurrence, and one of the remaining "blank spots" of the pachycephalosaurian skeleton to be "filled in," but also has potential physiological and osteohistological implications for better understanding this enigmatic dinosaurian clade.

Technical Session XIV: Return of Reptile'O'Rama: Triassic time (Friday, November 13, 2026, 1:45 PM)

Archosauromorph micro-bonebeds from the Lower Triassic Fremouw Formation of Antarctica reveal new insight into polar reptile ecology and life history

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The Fremouw Formation of Antarctica preserves the southernmost record of Early Triassic-aged terrestrial ecosystems that developed in the aftermath of the end-Permian mass extinction. Among the tetrapod constituents of this early Mesozoic assemblage are the archosauromorphs. There are currently two named archosauromorph taxa known from the Fremouw Formation and at least one unnamed taxon based on a large, isolated humerus and several vertebrae. Of these, *Prolacerta broomi* is the best known, with several isolated skulls hypothesized to be juveniles, as well as the largest individual specimen of *P. broomi* yet described. Other referred materials include five small (~40 cm^2) fine sandstone blocks collected from the Cumulus Hills field area around the Shackleton Glacier that contain hundreds of small bones referable to Archosauromorpha that have only recently been revealed due to the application of computed-tomographic (CT) scanning techniques. Recent digital preparation of these CT scans shows that each of these small blocks contains between two and a dozen tiny archosauromorph individuals in a single layer. Cranial, vertebral, and appendicular elements that represent each of these individuals are consistent in body size with each other and with previously described specimens suggested to represent juvenile *P. broomi*. Additionally, the morphology of these smaller specimens is consistent with larger Antarctic specimens referred to *P. broomi*. Histological analysis of large *P. broomi* specimens shows that they lack indicators of rapid growth, as would be expected early in life history or among juveniles enjoying parental care. Micro-CT data reveal juvenile tissues in smaller *P. broomi* individuals that are not present in the large-bodied sample, suggesting remodeling through life. Thus, the histology of these individuals provides a unique glimpse into the life histories of these animals that is otherwise lost in adult specimens. These micro-bonebed specimens allow us to test previously postulated growth stages in large Antarctic *P. broomi* individuals, describe early growth patterns that may be remodeled in adult specimens, and provide potential explanations for preservation differences between small and large individuals. Together, these data have the potential to reveal intriguing new insights regarding growth and life history strategies for some of the earliest archosauromorph taxa to emerge in the Mesozoic, specifically from a polar environment.

Funding Sources: NSF ANT-2313242; NSF ANT-1341304; NSF ANT-1947094

Technical Session XI: Paleogene Period (Friday, November 13, 2026, 8:00 AM)

Persistence through the PETM: Paleoecology of *Coryphodon* revealed by dental microwear texture analysis (DMTA)

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Coryphodon (extinct Order Pantodonta, Family Coryphodontidae) was highly abundant in North America from the late Paleocene through the late Eocene. The tapir/hippo-like *Coryphodon* lived through the Paleocene–Eocene Thermal Maximum, one of the most dramatic periods of climate change in the Cenozoic. While prior research has focused on morphology and stable isotope analysis, this study uses DMTA as an additional proxy to clarify the dietary behavior of *Coryphodon*. DMTA measures surface-texture features preserved on tooth enamel via three variables: 1) complexity (*Asfc*) assesses the consumption of hard foods such as woody-browse, nuts, and seeds; 2) anisotropy (*epLsar*) assesses the consumption of soft/tough foods such as leaves; and 3) textural fill volume (*Tfv*) assesses feature depth and size. The DMTA results indicate *Coryphodon* had a somewhat broad diet, as the values are not tightly clustered. *Coryphodon* DMTA values indicate consumption of medium-hardness foods (moderate *Asfc* values) without intense directional mastication (low-to-moderate *epLsar* values) and smaller feature size (low *Tfv* values). To parse dietary possibilities, comparisons were made to extant tapirs due to hypothesized similarities in skeletal proportions (stout and robust limb bones), ecology (semiaquatic forest dwellers), and diet (obligate browsers). When compared to extant tapirs, *Coryphodon* has *Asfc* values that are significantly greater than *Tapirus pinchaque* and *Tapirus terrestris* and *epLsar* values that are significantly lower than *Tapirus pinchaque* and *Tapirus terrestris*. However, both *Asfc* and *epLsar* values are statistically indistinguishable from *Tapirus bairdii*. *Coryphodon Tfv* values are indistinguishable from all tapirs. When considering all three DMTA variables, *Coryphodon* DMTA values are highly similar to *T. bairdii*, tapirs that are known to consume hard seeds, fruit, and woody browse—in contrast to more folivorous tapirs that consumed a higher proportion of tough foods (e.g., *T. pinchaque*).

Funding Sources: National Science Foundation Graduate Research Fellowship Program (Grant No. 1937963 and 2444112)

Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Upwelling as a driver for the globally unique marine mammal fauna of the Bahía Inglesa Formation, Chile

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The densely fossiliferous Late Miocene–Pliocene Bahía Inglesa Formation of north-central Chile offers a unique opportunity to evaluate the long-term influence of the Humboldt (Peru) Current, the world's largest eastern boundary current, on marine mammal communities in the Southeastern Pacific. We test the hypothesis that the distinctive marine mammal assemblage of the Bahía Inglesa Formation developed as a consequence of persistent Humboldt Current-driven upwelling and high marine productivity, resulting in a fauna that is compositionally distinct from contemporaneous marine mammal assemblages elsewhere. To evaluate this, we analyze stable organic carbon ($\delta^{13}C_{org}$), total nitrogen, and C/N ratios from 33 samples of sedimentary organic matter to reconstruct regional productivity and upwelling conditions during deposition. We compare the taxonomic composition of the Bahía Inglesa marine mammal assemblage with other Neogene marine fossil assemblages worldwide using published occurrence records of Cetacea, Sirenia, Carnivora, and Xenarthra from the Paleobiology Database. If Humboldt Current-driven upwelling was a primary driver of marine mammal community structure, we predict that geochemical proxies will indicate sustained high-productivity upwelling conditions in the region since at least the Late Miocene, and Bahía Inglesa will have greater faunal similarity to other southeastern Pacific upwelling sites than to

contemporaneous marine mammal assemblages from other ocean basins. Our results show evidence for a shift to persistent upwelling during deposition in the Late Miocene and demonstrate that the Bahía Inglesa and Pisco Formations comprise globally distinctive marine mammal assemblages relative to other Neogene coastal faunas. Bray-Curtis (BC) analyses show that Pisco and Bahía Inglesa are the closest compositionally (BC = 0.6), but all other formations have a BC of 0.75 and higher when compared to Bahía Inglesa. Declines in marine mammal diversity during the Pliocene coincide with major oceanographic reorganizations associated with the closure of the Central American Seaway and Late Miocene–Pliocene climatic cooling. These findings identify the Bahía Inglesa Formation as an important archive for investigating the links among ocean circulation, marine productivity, climate change, and the evolution of marine mammal communities in the Southeastern Pacific.

Funding Sources: Western Interior Paleontological Society (WIPS), Karl Hirsch Memorial Grant

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Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Osteohistological assessment of *Anatotitan* supports synonymy with mature *Edmontosaurus annectens*

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Anatotitan, a large-bodied hadrosaurid, was historically recognized as a distinct species based on its elongate, low-profile skull and subtle cranial traits. Later work proposed that these features resulted from taphonomic crushing and that *Anatotitan* represents a mature *Edmontosaurus annectens*. Morphometric analyses have supported this view, suggesting that *Anatotitan* reflects an ontogenetic endpoint of *E. annectens*.

To further test this hypothesis, we histologically sectioned the right humerus of specimen CCM V 1938.8 at its minimum diaphyseal circumference. The external surface exhibited significant muscle scarring, worn periosteal texture, and extensive cartilage attachment areas, which are general indicators of an older individual. Internally, the cortex consisted of dense Haversian bone with multiple generations of secondary osteons that obliterated primary bone tissue. These features extended outward through the cortex and in some cases nearly to the periosteal surface.

Six zones of parallel-fibered and lamellar vascular orientation, separated by growth marks (GMs), were present. Two of these zones may contain double or triple GMs. At least three tightly spaced GMs near the periosteal margin suggest the onset of an external fundamental system and skeletal maturity. Retrocalculation dated the first GM to ~3.5 years, consistent with *E. annectens* from the Ruth Mason Dinosaur Quarry (RMDQ), South Dakota. Growth modeling indicated 95% asymptotic size was reached by nine years, matching the pattern exhibited by *E. annectens*.

Both CCM V 1938.8 and AMNH 5730 fell within the late adult size class of the RMDQ distribution. Some *E. annectens* specimens from RMDQ surpassed them in size, suggesting *Anatotitan* falls within *E. annectens* variation.

Alternative explanations for cranial differences, such as sexual dimorphism or late-stage cranial remodeling, are plausible. However, large *E. annectens* skulls from RMDQ do not show the distinctive cranial traits seen in *Anatotitan*. These differences are best explained by taphonomic distortion. Our results support the interpretation that *Anatotitan* represents a mature, deformed *E. annectens*, not a distinct taxon.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Paleoenvironmental preferences of nesting dinosaurs in the Late Cretaceous Gobi Basin, Mongolia

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Fossil eggshells are among the most informative vertebrate trace fossils. Within the parataxonomic framework (Veterovata), eggshells can be assigned to ootaxa that correspond to particular dinosaur clades. Remarkably, even small shell fragments preserve diagnostic characteristics, allowing researchers to improve biodiversity data and study reproductive behavior. The Cretaceous post-rift sedimentary sequences of the Gobi Basin, Mongolia, contain one of the world's richest records of dinosaur fossils and, correspondingly, eggs and clutches of non-avian dinosaurs and birds, providing a unique opportunity to study nesting-site specificity. Here, we compare assemblages across paleoenvironments to test whether dinosaurs living in the Gobi Basin exhibited nesting habitat preferences. We collected >150 fossil eggshell fragments from 33 Late Cretaceous sites in the Gobi Desert of Mongolia, spanning the Turonian through the Maastrichtian (~94–66 Ma) and representing fluvial, lacustrine, and aeolian depositional environments, including Bayn Shire, Bor Tolgoi, Dzamyn Khond, Khongoryn Els, Teel Ulaan Chaltsai, Tögrögiin Shiree, Udyn Sayr, Ulaan Khuree, Yagaan Khovil, and the surrounding regions of Baishin Tsav. We classified eggshells based on surface ornamentation, crystal growth patterns, and shell-unit microstructure in cross-section using petrographic microscopy, scanning electron microscopy, and electron backscatter diffraction techniques. We find that Elongatoolithidae, eggs laid by oviraptorosaurian theropods, are ubiquitous, recovered from all sampled paleoenvironments and nearly every site, whereas other morphotypes have heterogeneous distributions, indicating that select dinosaur clades exhibited preferences for nesting sites across different environmental conditions. Eggshell classification at specific localities improves biodiversity data by documenting the presence of clades otherwise unknown or unidentified in the skeletal record. For example, the egg-rich, skeleton-poor fluvial floodplain deposits of Teel Ulaan Chaltsai. We identify the Teel Ulaan Chaltsai ooassemblages as consisting of Ovaloolithidae and Spheroolithidae, respectively, and are associated with maniraptorans and ornithopods, which are otherwise undocumented at this locality by skeletal remains. This work establishes a regional framework to address current gaps in understanding dinosaur reproductive habitat selection and improve biodiversity data in the Gobi Basin, Mongolia.

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Romer Prize Session (Thursday, November 12, 2026, 8:00 AM)

Tectonic influence on heteromyid ecomorphology in the Miocene Dove Spring Formation

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Topographically complex regions are hotspots for biodiversity, yet it remains unknown whether local-scale tectonic activity produces detectable ecomorphological change in the vertebrate fossil record. Heteromyid rodents, an ecomorphologically diverse family with a fossil record spanning more than 25 million years in North America, peaked in species richness during the middle Miocene, coinciding with rapid tectonic activity in the Basin and Range Province, their modern richness hotspot. The Clarendonian Dove Spring Formation (Mojave Desert, California) preserves a continuous heteromyid record spanning three discrete tectonic phases of Basin and Range extension: early basin extension (~12.0–10.5 Ma), basin rotation and translation (~10.5–9.3 Ma), and late basin extension (~9.3–8.0 Ma), which altered regional basin connectivity and coincided with ongoing cooling and aridification. To assess ecomorphological trends, I measured 371 individual teeth from *Cupidinimus* and *Perognathus* in the Dove Spring Formation at the Natural History Museum of Los Angeles County. I quantified two dental ecomorphological proxies, (1) occlusal area

as a body size proxy and (2) hypsodonty index as a dietary abrasiveness proxy and then tested for differences across tectonic phases using Kruskal–Wallis tests with pairwise comparisons. Results show the strongest ecomorphological signal between the early extension and rotation phases. Median occlusal area increased by ~25% from early extension to rotation and continued increasing into the late extension phase. Median hypsodonty decreased by ~16% from early extension to rotation, and by the late extension phase, had returned to a similar median value as the early extension phase. Together, these results indicate that the magnitude and direction of body size change were decoupled from diet abrasiveness. These results demonstrate that heteromyid ecomorphology changed in relation to tectonic activity in the Dove Spring Formation. The transition from basin extension to rotation, which changed basin connectivity, coincides with documented large mammal turnover, likely having an indirect influence on the ecomorphological shift observed in heteromyids as a result of vegetation change and trophic interactions. These findings suggest that the fossil record of small mammals in tectonically active basins preserves ecomorphological signals of landscape change, offering new opportunities to investigate how local tectonic regimes shape diversity over time.

Funding Sources: Natural History Museum of Los Angeles County and Stony Brook University Department of Ecology and Evolution

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Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Cretaceous leftovers: behavioral implications of theropod tooth marks on hadrosaurid cranial elements from the Upper Cretaceous of western North America

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Although tooth marks on fossil bones have been studied since the late 1980s, little is known about the behaviors that produce them. Logically, tooth marks produced during feeding should be concentrated on high-economy elements, defined as those associated with abundant edible soft tissue. However, there is currently no standard methodology for documenting the distribution of tooth marks on skeletal material. Here, I conduct the first large-scale composite mapping survey of tooth marks left by carnivores on dinosaur skeletons (here hadrosaurid skulls). The survey includes 265 tooth marks across 58 isolated or articulated cranial elements, representing 46 individuals recovered from various Upper Cretaceous formations in North America. Composite mark maps were created by isometrically scaling and overlaying simple line drawings to show the approximate locations, dimensions, and orientations of the tooth marks on each element. Most tooth marks (64.2%) occur posterior the orbit, particularly on the lateral surfaces of jugals and dentaries, and are inclined 20–40° from the dorsoventral axis of the skull. In an articulated skull, the cranial musculature is located medial to several elements, including the jugal, thus inhibiting access to such tissues. This suggests the existence of other, more laterally positioned tissues along the side of the face, lateral to the jugal, that were being regularly targeted during feeding. Numerous skulls also remained at least partially intact even when tooth marks were present and/or many elements on one side of the face were missing. Many of these intact skulls had not been fully utilized, and some may have even had skin in place on one side of the head at the time of burial. When the skulls in our dataset are considered in decreasing order of completeness, the more complete and thus less heavily utilized skulls tend to show marks only in high-economy regions, consistent with behavioral trends observed in modern large carnivores. Comparatively wide spacing among marks that appear to have been inflicted by adjacent teeth during single bites identifies tyrannosaurids as likely tracemakers for all but two of the 16 specimens that could be considered. In 11 of these 14 specimens, the tyrannosaurid likely had a tooth row length between 240 mm and 480 mm. These results demonstrate that tooth marks can be used to identify systematic carcass processing behaviors and associate them with a general type of tracemaker in the fossil record.

Technical Session X: Dinosauria III (Friday, November 13, 2026, 8:00 AM)

Reconsideration of sauropodomorph wide-gauge hypothesis based on a large trackway dataset

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Sauropodomorphs acquired the largest body size among terrestrial animals in Earth's history, with body weights an order of magnitude larger than any other taxonomic groups. Therefore, this group provides a unique opportunity to extract information about how large body size constrains locomotion, which cannot be obtained solely from extant animals.

The aim of this study is to clarify the evolution of sauropod locomotion, focusing on gauge (width between left and right pes) from trackway data. Trackway fossils are discovered in almost every formation from all geological epochs and regions when dinosaurs existed, and their abundance far exceeds that of body fossils. Trackways directly preserve the trackmakers' movement, making them useful for estimating the locomotion of extinct animals.

Previous studies focused on trackway gauge, the width of the trackway, as a key indicator of sauropodomorph locomotion. It was proposed that wide-gauge trackways became dominant in later periods, and this trend has been interpreted as an adaptation for supporting heavier body mass, particularly in derived titanosaurs.

We collected locomotor data from described sauropodomorph trackways (N = 690). In this analysis, we focused on trackway gauge, which was calculated from the pace, angulation, and stride length of each trackway. We analyzed the temporal changes of trackway gauge and its relationship with body size. Sauropodomorph trackway gauge showed no temporal changes ($p > 0.05$ across all epochs), contradicting the previous "wide-gauge" hypothesis. Additionally, trackway gauge showed negative allometry with pes length, which was used as a proxy for body size (regression slope: 0.78, 95% confidence: 0.69–0.87). These results indicate that wide-gauge locomotion was not a derived trait shared among more evolutionarily advanced sauropodomorph clades, but rather an adaptation to gigantism on an individual level. Contrary to previous assumptions it became narrower as body size increased. This may have enabled more upright, columnar limb posture adapted for weight-bearing, while also reducing mediolateral movement of the center of mass and improving locomotor efficiency. This study contributes to a reassessment of the evolution of sauropodomorph walking posture, which has previously been estimated from a limited number of body fossils and track samples, through an analysis based on a large trackway dataset.

Funding Sources: Sasakawa Scientific Research Grant (No.2025-5015) by the Japan Science Society

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Technical Session XVI: Crocodylians & marine reptiles + Paleontological Practices: Preparation & Scientific Methods (Saturday, November 14, 2026, 8:00 AM)

Technical Session V: Vertebrate assemblages (Wednesday, November 11, 2026, 1:45 PM)

Deep-time diversification dynamics of non-amniote tetrapods across Phanerozoic environmental crises: quantitative insights from the DeepBone database

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The macroevolutionary transition of non-amniote tetrapods during global biocrises remains central to understanding terrestrial ecosystem assembly. Traditional deep-time biodiversity reconstructions, typically resolved at the genus- or species-occurrence level, are highly susceptible to heterogeneous preservation and sampling biases or artifacts. Here, we present the first comprehensive specimen-level Phanerozoic diversification framework for non-amniote tetrapods, based on more than 15,500 fossil

specimens representing more than 3,000 species-level taxonomic units from the DeepBone database. Using Bayesian birth–death framework implemented in PyRate, we reconstructed time-continuous speciation, extinction, and lineages-through-time (LTT) trajectories from the Late Devonian to the Cenozoic. We further evaluated their relationships with terrestrial paleoclimate proxies, including atmospheric pCO_2, global mean surface temperature, and aridity. Our analyses capture a highly dynamic evolutionary history punctuated by multiple ecological crises and faunal turnovers. The Carboniferous Rainforest Collapse (CRC) acted as an asymmetric ecological filter: semiaquatic batrachomorphs declined sharply as habitats shrank, while reptiliomorphs, including early amniotes, expanded across increasingly open, arid landscapes. Across the early–middle Permian transition, preservation-corrected models reject a prolonged "Olson's Gap" and instead support a genuine non-amniote turnover associated with intensified aridity and major atmospheric pCO_2 fluctuations. Most notably, temnospondyl-dominated assemblages exhibited a rapid diversification response following the end-Permian mass extinction (PTME), triggering a pronounced Early Triassic spike in lineage richness. Covariate analyses indicate this opportunistic radiation was jointly driven by hyperthermals and ecological release, enabling short-lived disaster taxa to rapidly exploit destabilized post-extinction ecosystems. This crisis-adapted advantage collapsed amid Middle Triassic environmental stabilization and archosaurian competition. In contrast, derived dissorophoids gave rise to modern Lissamphibia, which underwent sustained post-Jurassic diversification before experiencing dramatic Neogene expansion. Integrating these divergent trajectories within a continuous 370 Ma framework demonstrates that terrestrial vertebrate evolution was profoundly mediated by the shifting, climate-dependent ecological roles of the amphibian lineage.

Funding Sources: The National Natural Science Foundation of China (42130209)

Symposium: Local & global drivers of late Quaternary extinctions (Thursday, November 12, 2026, 1:45 PM)

The bioenergetics of extinction and the ephemeral nature of mammalian megafauna

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Body size constrains trophic interactions, shaping the feasibility of species' populations. Over macroevolutionary timescales, these constraints feed back to shape selection on body size and diet. We develop a bioenergetic, three-level trophic framework—typical of terrestrial mammalian ecosystems—to explore how bioenergetic trade-offs emerging from predator–prey interactions constrain coexistence. We show that interactions among predators, prey, and subsidies destabilize populations at both small and large sizes, matching observed limits to predator size and diet. These instabilities constrain coexistence and highlight a feasible predator size range of ca. 40–110 kg, spanning the mean size of terrestrial Cenozoic hypercarnivores. The dynamics giving rise to these predictions also suggest that decreased dietary selectivity confers a fitness advantage to larger carnivores that wanes at the largest sizes, aligning with diet estimates for contemporary and Pleistocene species. Finally, we show that even slightly increased predator reliance on prevalent subsidies can increase the extinction risk of the largest herbivores. In the context of the Pleistocene extinctions, this suggests that minimal reliance of human populations on alternative dietary resources (such as vegetation) could set the necessary conditions for the extinction of megaherbivores. Overall, our framework underscores that ecological pressures emerging from trophic interactions and rooted in energetics may drive the selective forces shaping many observed macroevolutionary patterns.

Funding Sources: NSF-EAR-1623852; NSF-DMS-2424994

Colbert Prize Session (Wednesday, November 11, 2026, 4:30 PM)

Direct identification of steppe bison (*Bison priscus*) diet utilizing phytolith dental inclusions

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Understanding Pleistocene megaherbivore diets can inform interpretation of ecological niches—data of which may have ramifications for understanding factors contributing to their success and demise. This study utilizes dental phytolith extraction analyses to identify floral dietary components of the model organism *Bison priscus* (steppe bison) from a radiocarbon-dated (12,980 +/- 40 years BP) skull of this taxon (University of Alaska Museum of the North, UAMES 54616) from Alaska. Phytoliths were isolated from both the external tartar and the internal plant-matter plugs found in a fossa of the upper left third molar using acid dissolution. The inclusions were examined using polarizing light microscopy and assigned to diagnostic clade morphotypes using extant reference specimens. The results revealed a mixture of conifer, broadleaf tree, and grass-type phytoliths. These results are congruent with interpretations from microwear and isotopic studies and demonstrate the usefulness of phytolith analyses to directly reveal diets of extinct taxa. Future application of this tool for dietary studies may unveil new aspects of extinct herbivore paleoecologies, their relationships with the floral environment, and inform understanding of dental form and function in paleobiological studies.

Funding Sources: Charles A. McCallister Biological Studies Student Support Fund

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Technical Session II: Permian Period (Wednesday, November 11, 2026, 8:00 AM)

Cranial Anatomy of amphibamiform dissorophoid temnospondyls from the early Permian cave system of Richards Spur, Oklahoma, revealed by neutron tomography

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Amphibamiformes are Permo–Carboniferous dissorophoid amphibians characterized by a number of features, including significant miniaturization and are generally considered to be stem lissamphibians. Notably, members of the Amphibamiformes display reduced cranial elements, the appearance of more batrachian-like dentition, increasingly oversized orbits, otic notches, and interpterygoid vacuities. Throughout their known history, anatomical descriptions have primarily been conducted after mechanical preparation. This often led to described specimens still remaining at least partially encased in their initial matrix and prevented thorough anatomical evaluations. In this study, complete skulls of the three known amphibamiformes from the Richards Spur locality in Oklahoma, the amphibamid *Doleserpeton*, and the micropholids *Pasawioops* and *Tersomius*, are reinvestigated. This investigation, using high-quality neutron-computed tomography (nCT) and histological thin sections of jaws referred to these taxa, represents the first complete review of the cranial anatomy of these early-diverging stem lissamphibians, offering new insights into their crownward stepwise transition. For example, comparisons between these taxa reveal a clear crownward trend in the decrease in the size of the palatal fangs and in the marginal dentition, and the reduction and apparent size-related loss of plicidentine in *Doleserpeton*. The newly discovered skull of *Tersomius* is of particular interest, as its relationships among amphibamiformes remains poorly resolved, with phylogenetic analyses producing differing tree topologies. CT rendering and study of the anatomy of the new complete *Tersomius* skull provides valuable new comprehensive cranial data about this early diverging amphibamiform and raises the possibility that it represents a new species of

Tersomius, distinct but closely related to the described *Tersomius texensis*. Notably, this new specimen appears distinct in having significantly enlarged palatal tusks and additional fangs on the palatine. Overall, it is expected that new data currently being analyzed through rendering of our nCT scan data will provide detailed information on the internal cranial, neurocranial and mandibular anatomies of these important taxa, improve resolution in amphibamiform phylogeny, and help resolve important aspects of evolutionary changes along the lissamphibian stem.

Funding Sources: NSERC Discovery Grant RGPIN-2025-06513

Poster Session 2 (Thursday, November 12, 2026, 4:30 PM)

Ancestral histological growth series identified in basal Ceratopsia

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Psittacosaurus is an important Eastern (China, Mongolia, Russia) clade of early horned dinosaur (Ceratopsia) known from many complete specimens and was one of the first dinosaurs studied histologically to recover microanatomical growth patterns in long bones. Recently, osteohistological work has been done for *Yinlong downsi, Liaoceratops yanzigouensis,* and *Protoceratops andrewsi.* Previous histological work on these taxa was limited to describing variation of "juveniles" and "adults," but without recovering growth series. The goal of this study was to recover growth series using cladistic methods; the advantage of a cladistic approach is that it combines all relevant developmental data into a single hypothesis. Qualitative and quantitative skeletal characteristics of the tibia, femur, and fibula were obtained from the literature and compiled into data matrices. Histological growth series were derived for four taxa: *P. mongoliensis*, *P. lujiatunensis*, *P. sibiricus*, and *Y. downsi.* Comparison of growth characters across all histological growth series were done and a conserved ancestral histological growth series was identified for Ceratopsia. This ancestral growth pattern consists of six shared growth characters (synontomorphies) of the tibia: first, parallel fibers in the outer cortex at five years of age, followed by the presence of poorly developed erosion cavities and the formation of endosteal bone, and, finally, the presence of secondary osteons at seven years of age. Aside from the ancestral growth series for Psittacosauridae, all ancestral growth series are based on data from the tibia, reflecting the limited histological sampling of other long bones in the literature. The results identified only a small fraction of all histological characters are actually present in the ancestral growth series, reflecting the need for additional histological work in the clade.

Poster Session 3 (Friday, November 13, 2026, 4:30 PM)

Quantifying the impact of the auction market on vertebrate fossils

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In light of recent multi-million-dollar auctions of dinosaur skeletons, the aim of this project was to quantify the impact of auction sales upon vertebrate fossils. Data was obtained from the online archives of Sotheby's, Christie's, and Bonham's spanning from 1999 to 2025, including lot number, title, species, location, date, and sale price. These data were used as the foundation to assess the impact of auctions on specific groups of fossil vertebrates and their geographic extent. There are currently 128 lots from Sotheby's (2019 to present), 466 from Christie's (1999 to present), and 1,647 from Bonham's (2005 to present). The estimate of the sum of sales are as follows (these estimates account for inflation): Sotheby's, $107M; Christie's, $46M; Bonhams, $12M.

Out of 2,241 entries, the proportions per vertebrate group are as follows: Dinosauria, 29.0% (651); Actinopterygii, 19.3% (n = 432); Mammalia, 19.1% (n = 427); Chondrichthyes, 13.9% (n = 311); marine reptiles, 5.3% (n = 119); Testudines, 2.9% (n = 64); Aves, 2.8% (n = 62); Crurotarsi, 1.4% (n = 32); basal Tetrapoda, 1.2% (n = 26); Squamata, 1.0% (n = 23); placoderms, 0.6% (n = 13);

Pterosauria, 0.4% (n = 10); basal Sarcopterygia, 0.3% (7); lungfish, 0.1% (n = 2); and 1.1% (n = 25) lots from other or unknown taxa.

The top four sources of fossil material are the USA with 59.1% (1,325 lots), Germany with 5.7% (127 lots), Morocco with 5.5% (123 lots), and Russia with 3.6% (80 lots). In terms of the illicit fossil trade, 18 lots of small reptiles, 18 dinosaur eggs, and 17 fish are from Brazil and China, current fossil export from which is prohibited. There were also 16 lots from Bonham's which contained Myanmar amber that contain remains of Squamata and Aves remains.

In summary, the evidence shows that all major vertebrate clades are treated as merchandise and vertebrate fossils are exploited globally, though certain groups have higher value and popularity, and legally protected fossils do surface in the public market.

Technical Session XVIII: Paleontological Practices: Education & Outreach (Saturday, November 14, 2026, 1:45 PM)

Prehistoric Wisconsin: A new paleontology exhibit and its impact on museum reach

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The Weis Earth Science Museum (WESM) in Menasha, Wisconsin, was shut down in spring of 2025 following the closure of the University of Wisconsin–Oshkosh, Fox Cities campus, with which it was associated. Its collections were acquired by and relocated to the History Museum at the Castle (HMC) in Appleton, Wisconsin. This created a unique opportunity to bring new paleontology and geoscience-focused exhibits and outreach programming to northern Wisconsin communities. Incorporating the WESM collections into the HMC has expanded its capacity for local K-12 schools to supplement their natural science classes through field trips and classroom programs, thereby broadening its reach. New field trip programs focusing on natural history were offered starting in fall of 2025. In spring of 2026, the HMC opened two new exhibits, *Gallery of the Earth* and *Prehistoric Wisconsin*, featuring minerals and fossils from the WESM. Since these new natural history offerings began, we have experienced broadened reach reflected in increased attendance and revenue. Following the debut of our new exhibits and educational programs (i.e., guided tours, interactive presentations, etc.), the HMC has seen a 35% increase in field trip attendance and double the number of field trip bookings relative to the previous school year. Since the opening of *Prehistoric Wisconsin* in March of 2026, general attendance has increased by 25%, gift shop sales have increased by 44%, and new museum memberships have nearly tripled relative to 2025. Consequently, total revenue from school programs, general admission, gift shop sales, and new memberships has increased by 22%. Paleontology is a convenient gateway science for approaching a wide variety of national science curriculum standards across all grade levels. It is ideal for teaching science as a changing process and addressing how scientists develop and test hypotheses. The success of new paleobiology and geoscience-focused exhibits in a semirural community is encouraging as public trust in scientists and the positive impact of science continues to steadily erode. We hope our successes in educational development at the HMC can be used as an effective template for small-to-medium sized museums in similar communities.

Funding Sources: Outagamie County, Dr. & Mrs. Leonard Weis & Family, Community Foundation for the Fox Valley Region, Miron Construction, David L. & Rita E. Nelson Family Fund

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Poster Session 1 (Wednesday, November 11, 2026, 4:30 PM)

Comparing feeding traces across the Upper Cretaceous coastline of the Western Interior Seaway: new insights into paleoecological interactions and taphonomic record on vertebrate microfossils from the Iles, Williams Fork, and Judith River Formations

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Fossil tooth marks preserved on vertebrate microfossils provide important clues about paleoecological interactions, particularly predator–prey relationships and scavenging behavior in ancient ecosystems. Previous studies of feeding traces on fossil bone have usually focused on larger, more charismatic taxa, leaving smaller-bodied taxa from the Late Cretaceous comparatively understudied. Here, we document a variety of bone surface modifications across three Upper Cretaceous units: the Iles, Williams Fork, and Judith River Formations. Spanning north-central Montana to northwestern Colorado, these localities represent a temporal range (~9 Ma) and a broad latitudinal transect (7 degrees) along the western margin of the Western Interior Seaway. These units preserve abundant vertebrate microfossils that accumulated in coastal plain settings bordering the Western Interior Seaway. The faunal assemblages are very similar among these three formations (e.g., Ankylosauridae, Ceratopsidae, Hadrosauridae, Theropoda, Testudinata [*Adocus* sp.], Crocodylia, Chondrichthyes [*Myledaphus* sp.], Osteichthyes [Lepisosteidae and *Paralbula* sp.], and Amphibia); are the feeding traces similarly comparable? Preliminary results indicate that tooth mark morphology is generally consistent across the three formations, with shallow scores and pit marks dominating the assemblages. The primary difference lies in the skeletal elements that preserve traces. In the Iles and Judith River Formations, tooth marks occur most commonly on ossified tendons and long bone fragments. In the Williams Fork Formation, they are more common on turtle shell fragments. The tiny size of the feeding traces (millimeter size range) suggests that they were produced by small-bodied scavengers and predators, including theropod dinosaurs, crocodilians, gar fish, and mammals. These feeding traces, alongside body fossils, provide novel insight into the paleoecology and faunal composition of ancient vertebrate communities that inhabited Campanian–Maastrichtian ecosystems of northwestern Colorado and northern Montana.

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