2014 Preparators' Session Abstracts

TEACHING FOSSIL PREPARATION WITHOUT FOSSILS

BEHLKE, Adam D. B., Yale University, New Haven, CT, United States of America, 06511

The process of training a new fossil preparator involves an inherent risk of damage to a number of valuable fossil specimens as students learn the new preparation techniques. When large breaks occur, they can be repaired and used as a teaching moment during the training process. However, surficial damage to the fossil due to poor techniques is a different type of damage not easily repaired. If only there was a way to train new preparators in the proper techniques without damage to fossils. I wanted to find an alternative training program—one that would work without damage to any fossil materials, provide a realistic preparation experience, is easily evaluated by both the trainer and trainee, and is made of common items that are available to any institution.

My first attempt was done using blocks of wood embedded in Plaster of Paris. The blocks were then mechanically prepared with a pin vise to see how well the removal of wood from plaster approximated the removal of fossils from matrix. I used three different types of wood; pine, medium density fiberboard, and plywood.

All iterations yielded useable results, in that the plaster separated from the wood similar to fossils from any very fine grained matrix (e.g. Niobrara Formation). The plaster is an excellent synthetic chalky matrix. The different wood samples were not as promising. Preparation damage was easily identified on the pine blocks, but was harder to identify on the engineered wood blocks. As the wood is not as brittle as a fossil, it bent, whereas a fossil would break. A more accurate fossil substitute is needed to better approximate the experience of preparing fossil material.

My second attempt will be completed using fragments of a more fragile material: terracotta. I will again use Plaster of Paris for the matrix as it made a realistic substitute. It is possible to teach fossil preparation techniques without damaging fossils. Training can be completed using common materials to produce adequate analogs. This research is the first in a series of projects to train future preparators using these techniques.

A BETTER MODEL FOR TEACHING PALEONTOLOGICAL LABORATORY METHODS IN NORTH AMERICA

BROWN, Matthew, The University of Texas at Austin, Austin, TX, United States of America, 78758

Laboratory training in paleontology has historically been limited to apprenticeship and on-the-job training models, with options for academic or professional credentials being non-existent in much of the world. The absence of standardized training has impeded opportunities for the professional development of career track laboratory workers. In contrast, similar fields, such as art conservation, have been practicing research based advances and training since the early 20th century. The Fogg Museum at Harvard established one such program in the same year as a landmark work on modern methods in paleontology. However, training in art and artifact conservation continued to expand through the rest of the century, resulting in graduate level university instruction supported by an active literature and professional organizations. In the modern era, it has only been in recent decades that paleontology methods have had a popular venue, through platform and poster presentations at

professional meetings. Many of the techniques, philosophy, and best practices shared in these formats have not been committed to print outside of published abstracts.

To help facilitate the creation of a body of knowledge in the field, The University of Texas at Austin (UT) has coordinated several initiatives aimed at teaching core methods in laboratory, field, and collections practices. The cornerstone of this program is the Paleontological Lab Techniques course, now in its third semester of curriculum-based instruction; separated into lab and lecture components. This curriculum is based in part on past projects with California State University, San Bernardino, the United States National Museum, and the results of the 2011 Society of Vertebrate Paleontology Preparator's Grant Workshop. By formalizing the Paleontological Lab Techniques course, and proposing new field and collections courses in the Department of Geological Sciences, in addition to working with faculty in Anthropology and the Information School, UT has taken major steps forward in building an interdisciplinary program aimed at training the next generation of museum scientists.

THE RENOVATION OF THE VERTEBRATE PREPARATION LAB AT THE NATIONAL MUSEUM OF NATURAL HISTORY, SMITHSONIAN INSTITUTION

JABO, Steve, Smithsonian Institution National Museum of Natural History, Washington, DC, United States of America, 20013-7012; KROEHLER, Pete, Smithsonian Institution National Museum of Natural History, Washington, DC, United States of America; PINSDORF, Michelle, Smithsonian Institution National Museum of Natural History, Washington, DC, United States of America

The East Wing of the National Museum of Natural History was completed in 1964, and included the Vertebrate Paleontology Preparation Laboratory (VP Lab) on the Ground Floor. The research staff had a strong hand in the design of its laboratories, and the VP Lab consisted of a fairly large series of rooms totaling over 3,000 square feet, including an acid lab. It was spacious and equipped with all the modern accoutrements of the day. Except for a renovation of the acid lab in 1991 and the addition of a particulate extraction system in 2004, along with some cosmetic alterations, the infrastructure of the VP Lab has basically remained the same for five decades.

A major donation for the renovation of the Paleontology Halls exhibits enabled the Museum to receive Federal funding to renovate the building's HVAC systems, including those in the East Wing. The logical place to start was the Ground Floor and the labs, as they were going to be needed for the exhibit renovation and continued research prep. This would all have to be done on an extremely compressed timetable.

The NMNH's Office of Facilities, Engineering & Operations (OFEO) and the architects were very receptive of the needs of the lab staff and were valuable resources in the VP Lab's design. Continuous, seamless, chemical-resistant, light grey resin countertops line the work stations and contain a 6" backsplash, in which are located the electricity, compressed air gauges, and quick connects. There are smooth resin floors at the microscope stations to aid in locating errant fragments, and the microscope boom arms are suspended from the walls to remove the microscope from the tabletop and to be less susceptible to vibration. Low wattage yet very bright LED light sources with goosenecks and light rings sit out of the way on the backsplash. The particulate extraction system was reconfigured and the room balanced so that all the filtered air could be exhausted from the building instead of having to recirculate half of it. The renovated acid lab contains stainless steel tanks, spill pits, a shower, eye wash stations, a ½ ton hoist on a track, and hoods for hydrofluoric acid work and small volume acetic acid work.

IMPROVING EFFICIENCY AND OUTPUT OF INDOOR SCREEN WASHING FACILITIES

CAPOBIANCO, Christopher, Royal Tyrrell Museum of Palaeontology, Drumheller, AB, Canada, T0J 0Y3; REDMAN, Cory, Royal Tyrrell Museum of Palaeontology, Drumheller, AB, Canada

Microvertebrate fossil localities, or microsites, have always been an integral part of the research program at the Royal Tyrrell Museum of Palaeontology (RTMP). The museum's screen washing facility has gone through many alterations since the RTMP was founded in 1985. In the 1980's and 1990's, the majority of the museum's screen washing was done in the field, utilizing water sources near the microsites or using plastic bins onsite. In 2005, all of the RTMP's screen washing was moved indoors due to the restrictive field season in Alberta. An indoor setting is ideal for screen washing because it can be conducted year-round in a controlled environment. However, space, water supply, and the frequency and ease in which sediment that has already passed through the screens can be removed are all factors that have to be considered when an institution is setting up an indoor screen washing facility. The RTMP has addressed some of these issues by using plastic recycling bins with wheels and livestock watering troughs on elevated wooden platforms with heavy-duty castors to hold the water for screen washing and allow for easy transportation of screened sediment outside for dumping. Since 2012, all screen washing boxes have been built using plastic siding and stainless steel components as a long term replacement for the aging wooden screen washing boxes. Increasing the number of usable boxes is critical for increasing efficiency since indoor labs do not have access to the sun and wind to accelerate the drying of microvertebrate matrix. Extra boxes allow screens to be changed out while previously washed matrix finishes drying. The RTMP has experimented with several different techniques to try and increase the efficiency of their indoor screen washing facility, including using bubblers, shaker screens, and garden sprinklers. While many institutions have had great success with each of these methods, the RTMP has cast off each of these approaches, largely due to the difficulty of long-term maintenance. Since 2013, the RTMP has been washing all microvertebrate concentrate in three percent hydrogen peroxide to further reduce the microvertebrate matrix concentrate that needs picking. The RTMP currently has 61 screens, with 12 troughs, in two rooms, allowing the museum to process over 12 metric tons of material in the last two years. Although this represents a large-scale, indoor screen washing facility, any institution can reap the benefit from indoor screen washing by optimizing their set-up in any space that is available.

A SONG OF BLASTING AND FIRE: EUROPASAURUS HOLGERI

KNÖTSCHKE, Nils, Dinosaurier-Park, Münchehagen, Germany; MASTROIANNI, Marco, Dinosaurier-Park, Münchehagen, Germany; WINGS, Oliver, Niedersächsisches Landesmuseum, Hannover, Germany

The Late Jurassic dwarf sauropod dinosaur *Europasaurus holgeri* from the Langenberg Quarry near Goslar, Lower Saxony, Germany, is one of the best known sauropods worldwide. The material belongs not only to at least 20 individuals, it also contains different ontogenetic stages and two adult morphotypes. During almost 15 years of work with *Europasaurus*, various methods have been applied during excavation and preparation of the bone-bearing marine micritic limestones. Special geological conditions in the active quarry prevent normal excavation methods. The limestones and marls are overturned and incline with 60°-70°. Quarrying proceeds along strike by explosive blasting, exposing the beds only in cross section at >20 m high walls and not along bedding planes. This, and the very patchy distribution of bones in the stratum, make in situ discoveries extremely rare and excavation very difficult. Most bones were retrieved in smaller blocks from heaps of debris after blasting. In this situation, the small size of *Europasaurus* bones (humerus length: 12-45 cm) compared to other sauropods are a clear advantage because they receive less damage during the explosions. Still, many bones are severely damaged, resulting in large bone puzzles. Half broken limb bones or ribs are quite easy to stabilize and fix, but fragile vertebrae with multiple breaks or delicate cranial elements require endless patience and elaborate preparation skills.

Another disaster affected the material the night of October 4-5, 2003: a big fire, caused by malicious arson, razed the DFMMh/FV laboratory and exhibition hall, destroying 106 bones, including the best semi-articulated axial material. The fire not only destroyed 15% of the bones prepared at that time, it also harmed most unprepared blocks in storage, damaging exposed bones and causing a black, charred surface. Firefighting water had an additional damaging effect on the hot and dry limestone blocks, breaking them further apart. The unique situation described makes the preparation of *Europasaurus* bones a very difficult task and a major challenge. Because most taphonomic context was destroyed during blasting, blocks containing several bones are carefully documented in 3D with photogrammetry. Special techniques, methods, tools and ideas developed during our preparation involve surface-structure-transfer of missing bone fragments with epoxy resin and the in situ preparation of large limestone blocks from all sides to access the maximal scientific information.

TRANSFER PREP OF AN EOCENE BIRD FROM THE GREEN RIVER FORMATION, WY.

VAN BEEK, Constance, Field Museum, Chicago, IL, United States of America, 60605

The Green River Formation of the Eocene Epoch is famous for its vast array of beautifully preserved taxa. The fine-grained limestone can record the finest details for posterity, including ephemeral specimens of plants, insects, even feathers. While not common, bird fossils have been discovered in the limestone and can range from a single feather to a fully articulated specimen. Usually, bird fossils are found as a single specimen on one slab. When an exquisitely preserved complete 52 million year old bird with feathers was discovered in the 'split-fish layer' from southwestern Wyoming as a slab and counterpart, it presented a challenging opportunity to attempt 'transfer prep' of the specimen's bones onto one slab.

Bird fossils are notoriously delicate. Their bones are small, thin and hollow; and feathers are essentially a carbon stain showing what type of feather it used to be. Regarding this specimen, all features were present: skull, entire skeleton, feathers. The most important feature (the skull) was on the left slab, as well as its feet and claws. Some of the limb bones and half of the furcula were also on the left slab. The feathers and a greater percentage of the bones were better preserved and more intact on the right slab.

After initial dissent on my part, and persistent insistence on the curator's part, it was finally decided that as much bone material as possible on the left slab was to be removed and transferred to the right slab. The goal was to make one complete bird fossil, containing as much original material as possible. If a bone could be removed from the left slab, it would be carefully dissected off and then transferred into place in its negative impression on the right slab. The bone, now glued into place, could then have the excess matrix removed, and it would join the rest of the skeleton and feathers on the right slab. As much of the left slab as possible was to be left intact for 'destructive sampling'.

While a daunting project, the bird's bones proved robust enough to manipulate after careful consolidation of all bones (left and right). Great care was taken to consolidate only bone material. After using extremely fine tools and precise application of glue and consolidants, most of the skeleton was eventually assembled on to the right slab, with minimal destruction to the left side.

This project begged some difficult questions, including ethical ones. "Is this really necessary?" "What is the purpose of this?" At what point does a preparator say, "No!", to drastic alteration of an important specimen? What is the argument for/against a project of this nature?

EXCAVATION AND PREPARATION OF FOSSILS PRESERVED IN LOOSE SAND

FITZGERALD, Erin, University of Chicago, Chicago, IL, United States of America, 60637; SERENO, Paul, University of Chicago, Chicago, IL, United States of America

Methods for excavation and preparation of vertebrate fossils depend to a great extent on the nature of the surrounding matrix, which is usually composed of sedimentary rock composed of particles held together by siliceous or calcareous cement. Matrix of this sort, which varies in hardness and in resistance to fracturing and crumbling, is amenable to time-honored excavation procedures using burlap and plaster jackets. When the cement that holds the matrix together is virtually absent, however, some adjustments in protocol are necessary. Paleodune sand, for example, can be cement free, as was the case at Gobero, a vertebrate-rich early Holocene archaeological site in the Niger Republic. After taking undisturbed sediment samples for pollen and chemical analysis, we used museum-grade consolidant to function as cement. To maximize the penetration of consolidant, we concentrated first on the block perimeter, using spray bottles to maintain and then jacket an edge, leaving the top of the block open. We continued this process, extending the jacket under the block. Then we saturated the block from above with consolidant, allowing it to dry and harden over several days. Finally, the block was capped and the jacket turned. When the jacket was opened in the laboratory, the perimeter of the jacket was maintained as support until the burial was fully exposed. In this way, we preserved human skeletons and grave goods with all bones and artifacts in their original positions and exposed above and below in relief on a thin slab of hardened sand.

BAROSAURUS ON THE HALF SHELL: A TWO PIECE STORAGE JACKET DESIGN FOR LARGE OR FRAGILE SPECIMENS

FOX, Marilyn, Yale Peabody Museum, New Haven, CT, United States of America, 06520-8118; ZDINAK, Alan, Yale Peabody Museum of Natural History, New Haven, CT, United States of America; YARBOROUGH, Vicki, Yale Peabody Museum of Natural History, New Haven, CT, United States of America

In the course of completing the move to new compactorized storage of O.C. Marsh's dinosaurs at the Yale Peabody Museum, an unusual challenge presented itself. A large cervical vertebra from *Barosaurus lentus* needed a new storage jacket. The old jacket, made in 1916, was heavy, awkward to move, and did not adequately protect the specimen. The Peabody has created hundreds of storage jackets for large specimens, and has adopted a standardized design. The basic design, as reported previously, consists of a one piece medium density fiberboard (MDF) and custom formed Hydrocal FGR-95 and fiberglass base to fully support the specimen. For this specimen, however, once the vertebra was removed from the old jacket and transferred to the sandbox it became apparent that the Peabody's standard support jacket design would not suffice. Due to the specimen's size (39" x 21" x 9") and fragility, the team felt they would not be able to maneuver it out of the sandbox and into a one piece support jacket without serious risk of damage. The specimen needed to be fully supported at every moment to prevent breakage. The solution: a two piece support jacket. A lightweight Hydrocal FGR-95 and fiberglass shell was molded against the side of the specimen. This lightweight shell was intended to support the specimen while it was moved. An independent—and stronger—base was built to conform to the bottom of the shell from MDF, Hydrocal FGR-95, and fiberglass. The specimen was then placed in the lightweight shell to safely move it onto the base. Now the specimen rests in the nested shell and jacket, securely supported against breakage, yet accessible for research.

BREAKS, REPAIRS, AND ESSENTIAL COMPETENCIES FOR VERTEBRATE FOSSIL PREPARATORS

DAVIDSON, Amy, American Museum of Natural History, New York, NY, United States of America

Repair of specimens is one of the most common tasks for fossil preparators and in often viewed as mindless glue jobs or just sticking pieces back together. Good, long-lasting repairs address the root cause of damage and require thought and considerable competency. In fact, all of the 14 Essential Competencies for the Professional Vertebrate Fossil Preparator, proposed by the 2012 Austin Workshop, are involved in repairs. Every ear at the American Museum of Natural History, hundreds of specimens are delivered broken to the lab with requests for repair. A close look at many of these specimens reveals previous repairs in a typical pattern of multiple parallel joins made with different materials. This pattern is evidence of a cyclical history of breaks and repairs. Competent repairs can overcome this cycle.

Examples are discussed within the framework of the Essential Competencies. Prior to any treatment, the physical nature of the specimen and the task at hand are assessed and an end goal determined (Critical Thinking). Vertebrate fossils must be appreciated as brittle, complex composites of

natural bone and matrix minerals (Understanding of Fossils as Biological and Geological Materials) combined with aging adhesives, coatings, consolidants and fillers (Understanding of Adhesives). The root cause of most damage is the inability of the specimen to resist flexing. Competent repairs require an intuitive feeling for inflexibility, vulnerable shapes and self-destructive weight (Aptitude for Fossils as Materials). Repairs may employ techniques to increase resistance to flexing (Use of Preparation Techniques) or reduce the chance of flexing by means of external supports, which are often a key component of competent repairs (Use of Archival Housings). Alternatives to joining should be considered (Ethics of the Use of Specimens). If a repair involves joining, the reconstructed specimen must resist deterioration for as long as possible (Understanding of Conservation Principles and Ethics), but remain usable for research (Participation in the Science of Paleontology). Materials and techniques used for repairs should always be recorded in laboratory records for future reference (Documentation and Record Keeping).

SIMPLE FORENSIC METHODS FOR PALEONTOLOGICAL DIAGNOSIS

EKLUND, Mike, The University of Texas at Austin, Austin, TX, United States of America, 78758; BROWN, Matthew, The University of Texas at Austin, Austin, TX, United States of America

Paleontological research is faced with a challenge on a regular basis; namely, determination of ‘real‘ data in specimens under study. Fossils are frequently modified during the processes of collection and preparation. This modification includes addition of adhesives and gap fillers, removal of matrix, bone, or other fossilized materials, and in some cases composite elements that represent different individuals or even different taxa. These additions can misrepresent or obscure anatomical features. Sometimes this is inadvertent, the result of structural or aesthetic treatments, but sometimes the intent is fraudulent misrepresentation of the fossil remains. Whatever the motivation, this issue applies whether interpreting modern or historic specimens. Fossil preparation, collection management, and research based on those specimens all face the same observation and evaluation issues. Many diagnostic tools, like traditional X-ray, High Resolution X-ray computed tomography, Synchrotron X-ray tomographic microscopy, Scanning electron microscopy, and Energy-dispersive X-ray spectroscopy are available to researchers, but can be costly or not available on a widespread and regular basis. Low-tech alternatives abound, in some cases wetting a specimen with water often reveals evidence of introduced material. It has long been known that ultraviolet light (UV) has usefulness as an effective diagnostic tool. Differing material components may fluoresce at wavelengths distinct from surrounding materials, highlighting areas that bear closer microscopic or chemical investigation to determine whether the element in question is original to the organism. UV imaging equipment is universally available and affordable, making it a logical choice as a standard practice in helping to evaluate and document specimens. The process of creating a specimen requires manipulation of natural objects, therefore diagnostic methods like UV analysis should be integrated into the regular laboratory documentation and investigation workflows.