

2012 Preparator's Poster session abstracts

NATIONAL PARK SERVICE VERTEBRATE COLLECTIONS AT THE SMITHSONIAN: COLLABORATION TO SUPPORT SCIENCE AND STEWARDSHIP

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The Smithsonian Institution's National Museum of Natural History maintains paleontological collections from approximately fifty units of the National Park System. A large percentage of these fossil specimens were collected prior to the area being administered by the National Park Service. Therefore a database does not currently exist that enables efficient searches for NPS fossil specimens. In 2012, the National Park Service worked with staff from the Natural History Museum to begin a pilot project to inventory and photograph these fossil collections. The initial work focused on three specific inventories: Charles Gilmore's Paleozoic vertebrate ichnofossils from Grand Canyon National Park; Remington Kellogg's Pleistocene vertebrate fossils and coprolites from Rampart Cave, Grand Canyon National Park; and, Lloyd Logan's Pleistocene vertebrate fossils from Musk Ox Cave, Carlsbad Caverns National Park. Each of the collections was inventoried, photographed and any archival information and associated field notes were scanned and entered into the Museum's collection database. Historic images were also scanned for each collection. The information obtained is being used to support research, resource management and curation at the respective parks. This pilot work is the foundation of much more extensive collaboration to inventory other National Park Service paleontological resources in the Smithsonian's collections.

THE BACTERIAL FLORA OF REPOSITORY FOSSILS: SOURCES, SURVIVAL AND REMOVAL

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Microbes are well known for their ability to degrade a wide range of substances, including rock and bone. Fossils are generally of similar composition as the rock matrix that they are found in, suggesting that microbes known to weather rocks may also affect fossils. Although there is considerable attention and effort applied to the preservation and conservation of fossils for long term storage, research concerning the detection and prevention of microbial growth is lacking in the scientific literature. Given the premise that microbes could damage fossils, our research question focuses on the presence of bacteria on fossils that are stored in repositories. Roughly twenty fossil bones, varying from early Triassic to late Pleistocene in age, were tested for presence of culturable bacteria. Some of these fossils were unprepared while others had been cleaned and curated. Fossils were swabbed with sterile cotton tip swabs which were streaked onto R2A and nutrient agar plates. Colonies that grew over time were identified using staining and biochemical tests. Additional experimental protocols were also used to determine the state of bacteria found on the fossils. Bacteria that were present on these fossils were extracted into microcentrifuge tubes and were heated to near boiling point to kill vegetative cells, selecting those that produce spores to survive. Initial results from both experiments indicate that microbial counts on stored fossils are relatively low and that the bacteria that are present are predominantly gram-positive, chained bacteria, with evidence that the microbes are in an active, vegetative state on fossils. The persistence of human-derived microbes was also investigated by the addition of concentrated solutions of the ubiquitous human skin bacterium *Staphylococcus epidermidis* onto decontaminated fossils. Human-derived microbes were determined to survive on fossils for relatively short durations, with 98% of *S. epidermidis* dying off within 24 hours. The most effective decontamination method was placing fossil specimens in

an incubator at 95°C for 15-20 hours, although this is impractical for most specimens. Ethanol and acetone were also tested as potential antimicrobial agents, but were found to be ineffective in thoroughly reducing microbial populations, with acetone being the lowest in effectiveness. We are currently identifying bacteria isolated from the fossils in an effort to determine if they are primarily human-derived or soil-derived. This work paves the way for examination of potential bacterial degradation/modification of fossils.

CONTROL OF HAZARDOUS PARTICULATE EXPOSURE DURING FOSSIL PREPARATION THROUGH THE USE OF LOCAL EXHAUST SYSTEMS

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Preparation of fossils for scientific study involves a variety of chemical and physical methods to remove the rock matrix surrounding the specimen. The matrix may contain several elements, depending on its geological source, that pose potential health hazards to the preparator from inhalation of airborne particulates generated during physical preparation. The elements of most concern to health (due to carcinogenicity and progressive pulmonary diseases) include respirable-sized particles of crystalline-free silica, asbestos fibers, and radioactive particles. A local exhaust ventilation (LEV) system was installed in the National Museum of Natural History's Vertebrate Paleontological Preparation Lab to reduce staff exposures. The LEV consisted of six capture (snorkel-type) hoods on flexible ducts, connected to hard ductwork leading to a combination High-Efficiency Particulate Air filtered cyclone plus bag house dust collector. The flexible LEV hoods are easily positioned over the rock matrix work area for efficient removal of preparation generated particles and vapors from associated chemicals. Analysis of personal exposure (breathing zone air) samples collected during various representative tasks associated with the preparation of vertebrate paleontological specimens indicated that use of the LEV both reduced and controlled staff exposures to silica-containing dust to within permissible exposure limits established by the U.S. Occupational Safety and Health Administration. Redesign of the ductwork is needed to reduce excessive sound pressure levels, which currently necessitate hearing protection for comfort over prolonged work periods. The use of respirators is not required when using this LEV system, although staff is still enrolled in the Institution's respiratory protection program for use when working in field conditions or at other sites without the benefit of local exhaust.

STYLUS SHARPENING INSTRUMENT FOR FOSSIL PREPARATION

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Air scribes and pin vises fitted with carbide needles are commonly used to prepare vertebrate fossils but the stylus-point becomes dull or breaks over time. Styli are traditionally sharpened manually with a hand-held or a desk top rotary tool fitted with a diamond grinding disc. These manual sharpening processes are imprecise and the resulting point of the newly sharpened stylus is off-center. This can cause inaccuracy and inefficiency in the preparation of fossils. To overcome the imprecision of manual sharpening processes, a stylus sharpening instrument can be custom built from locally available and inexpensive parts. The instrument is composed of two assemblies each with a variable speed hand-drill motor mounted on a base board. Three stylus shaft holders that are aligned and fixed to the base board hold a stylus in a stable position.

The positions of holders are adjustable depending on the length of styli. The first motor rotates the stylus through an O-ring belt connecting the motor's main shaft to a rubber pulley which is attached to the stylus. Different sized pulleys are used according to the stylus' diameter. The second motor powers a grinding disc, and this grinding assembly is attached to the base board with a swivel mount that allows the operator to pivot the assembly freely. The grinding assembly has two operator handles to enable the operator to sharpen the stylus to a desired angle. Preparators in the Dinosaur Laboratory of Museum of Nature and Human Activities use a 3/4 inch 400 grit double-sided diamond cut-off wheel for sharpening styli, but grinding discs of various grit size and diameter can also be mounted on this assembly. The motors are powered by rechargeable batteries so that the instrument is portable in the laboratory and at excavation sites. A plexiglass cover is mounted over the grinding parts for safety. This instrument allows preparators to easily and safely sharpen styli with precise, centered points.