

# **ABSTRACTS**

## **FIRST ANNUAL FOSSIL PREPARATION AND COLLECTIONS SYMPOSIUM**

Petrified Forest National Park  
April 10, 11, 12 2008  
Petrified Forest, Arizona

**Platform**

**FOSSIL PREPARATION TEST: AN INDICATION OF MANUAL SKILLS**

Bergwall, Lisa  
Field Museum of Natural History

When interviewing candidates for preparation positions, Field Museum preparators issue a skills test to evaluate basic levels of manual dexterity. The test requires the candidate to prepare the tail fin of a *Priscacara* fish specimen. Preparation proceeds one ray at a time, from the relatively large base to the more delicate tip. While an inexperienced individual is not expected to be perfect immediately, the preparation test allows evaluators to gauge ability to adapt to new equipment, techniques, or specimens. Monitoring progress and, hopefully, improvement, over the duration of the test is informative, regardless of whether the interview is for a volunteer or staff position. After several years of testing, a comparative “library” of specimens can be amassed, allowing evaluators to compare early test results with the abilities of an individual after development, and establish a baseline for minimum acceptance.

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Bergwall, L. 2008. Fossil preparation test: an indication of manual skills. First Annual Fossil Preparation and Collections Symposium, Abstracts of Papers 1:5

**Platform****MODERNIZING AMERICAN FOSSIL PREPARATION AT THE TURN OF THE 20<sup>TH</sup> CENTURY**

Brinkman, Paul

North Carolina Museum of Natural Sciences

By the turn of the 20th century, the institutional setting for American vertebrate paleontology had shifted from private collections into large, well-funded, urban museums, including the American Museum in New York, Pittsburgh's Carnegie Museum, and the Field Columbian Museum in Chicago. This shift ignited a fierce competition among museum paleontologists to display fossil vertebrates – especially gigantic Jurassic sauropods from the American West. Museums launched ambitious expeditions aimed at collecting exhibit-quality dinosaurs. The net result was an enormous influx of unprepared fossils. Getting these fossils into shape for study and display posed a number of novel challenges for fossil preparators. New material arriving from the field required room for temporary storage and dedicated laboratory space in which to prepare it. Adapting a basic fossil preparation lab to the needs of dinosaur paleontology often involved considerable extra investment in equipment and space. Finding, training and retaining skilled fossil preparators could be very expensive, also. The sheer volume of work, and its unique demands, led to increased specialization and professionalization among the science support staff. This, in turn, drove higher standards for the work, leading to important lab innovations. Preparators developed new techniques to handle the workload, some of which required expensive new machinery, entirely new systems (e.g., electricity, or pneumatic apparatus) or new spaces in which to operate the equipment, some of which produced particularly noxious dust, noise, or smells. The essential task of fossil preparation, usually performed in backroom or basement labs by low-paid minions working in relative obscurity, was a vital prerequisite for the higher profile work of publishing original research and putting fossils on display.

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Brinkman, P. 2008. Modernizing American fossil preparation at the turn of the 20<sup>th</sup> century. First Annual Fossil Preparation and Collections Symposium, Abstracts of Papers 1:6

**Platform****LESSONS FROM THE LAGERSTÄTTE: AN ASHFALL FOSSIL BEDS RETROSPECTIVE AND UPDATE**

Brown, Gregory  
University of Nebraska State Museum

Ashfall Fossil Beds in northeast Nebraska is a Miocene (Clarendonian) waterhole death assemblage containing fully articulated and associated skeletons of rhinoceroses, horses, camels, musk deer, birds and turtles preserved in death positions in volcanic ash. Subsequent to Ashfall's discovery in 1972, some of the fossils were excavated and removed to the Museum collections (1977-1979), some partially excavated and reburied (1988-1990), and others exposed, prepared in-situ and left in place under the protection of the "Rhino Barn", a structure providing limited control of environmental agents of deterioration (1991-2008). This thirty-year "experiment" has allowed us to observe differing modes and rates of deterioration and compare the efficacy of preservation strategies under various conditions. Collections made during the 1977-1979 field seasons, now housed in the University of Nebraska State Museum, present their own unique challenges. Approximately three thousand field jackets containing the remains of hundreds of individual skeletons were collected during this period. Each jacket was separately numbered and mapped and each contained perhaps only a part of a single articulated skeleton, or, more typically, parts of multiple skeletons of multiple taxa, associated elements and isolated elements, many of which were revealed only after preparation and thus not referenced in the field notes. Traditional collection databases such as Specify are incapable of tracking such complex associations of specimens or facilitating their full curation. Prior to a recent move and reorganization of these collections, we designed an inventory-based relational database capable of tracking all "objects" within the collection, regardless of their curatorial status, location or known associations. This database relates field notes, inventory observations, curator's notes and catalogue records and is an essential tool in re-uniting individuals that had become dissociated during collection, preparation and years of research. In addition, newly designed, stable support systems were constructed for skulls and other heavy, fragile elements to improve storage and assure safe handling. Construction of a new, much larger "Rhino Barn" will begin in 2008, allowing excavation, in-situ preservation and research to continue for many years to come.

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Brown, G. 2008. Lessons from the Lagerstätte: an Ashfall Fossil Beds retrospective and update. First Annual Fossil Preparation and Collections Symposium, Abstracts of Papers 1:7

**Platform**

EVALUATION AND CERTIFICATION OF FOSSIL PREPARATORS: IDEAS FOR THE FUTURE

Brown, Matthew  
Petrified Forest National Park  
and  
John Kane  
University of Heidelberg

Increased levels of specialization in the field of paleontology along with new methods of collecting and analyzing data from fossil specimens require a large body of knowledge and breadth of skill from fossil preparators. In order to advance the science of vertebrate paleontology, preparators must hold themselves personally and as a community to high standards of quality, safety, and ethics. Currently there is no widely accepted curriculum of training or standard of best practice for the prep lab, but many other professions demonstrate effective models. Evaluating and adopting these models while incorporating elements of successful existing institutional programs allows us to create a plan for professional development. This presentation examines the roles of educational institutions, professional associations, and the individual lab in training and evaluation of fossil preparators.

**Platform**

**ONE SAND GRAIN AT A TIME: FOSSIL PREPARATION UNDER THE MICROSCOPE**

Cavigelli, J.P.

Casper College, WY

Despite the popularity of charismatic megafauna fossils, many vertebrate (and invertebrate) fossils are actually quite small and need to be prepared with the aid of a microscope. Many of the techniques used for both field collecting and preparation of large fossils can be modified to be used under the microscope, but there are also many tools and techniques that are useful for microscope work. This talk will outline some tools, techniques and products found to be useful in microprep of fossils. From the microscope to needles, glues, air-abrasives and carbowax, and more.

**Platform**

**ADHESIVES FOR FOSSIL PREPARATION: A MINI-SEMINAR**

Davidson, Amy

American Museum of Natural History

This one hour seminar will cover basic information about how adhesives work and will have three components:

1) An Adhesives Quiz will be distributed to participants in advance of the Symposium and the answers will be distributed prior to the mini-seminar. This quiz will focus on four adhesives and two solvents commonly used in fossil preparation: Aron Alpha 201 Cyanoacrylate (Krazy Glue), Devcon 2 Ton Epoxy, Acryloid/Paraloid B72, Butvar B76, acetone and ethanol. Participants will be encouraged to return their completed quiz in advance, as this will help tailor the discussion.

2) Two 15 minute PowerPoint presentations:

**ADHESIVES AS LIQUIDS**

Adhesives work because they can flow as liquids that then solidify in extremely close contact with the surface to which they are applied. Adhesion of the two solids is due to secondary attractive forces and mechanical interlocking. In their liquid phase and in their setting mechanism, adhesives vary widely but all must be able to flow. Factors that affect flow such as viscosity, wetting and interaction of liquid adhesives with surface contaminants and entrapped air will be discussed, along with techniques to manipulate adhesive flow for the preparation of fossil vertebrates.

**FROM LIQUID TO SOLID AND BACK: PHASE CHANGE IN ADHESIVES**

All adhesives used in fossil preparation are applied as flowing liquids which set into solids, but through different setting mechanisms. Some solid adhesives can be made to flow again. A basic understanding of phase-change behavior on a molecular level enables the preparator to define the behavior they want for a particular specimen, and to choose the most appropriate adhesive.

This talk will present a basic introduction to solution and reaction setting mechanisms. Gross behavior during phase change such as set time, solvent retention, shrinkage, migration, resolubility and swelling, and the relationship between adhesion and cohesion will be linked to inter and intra-molecular bonding. Specific specimens with different phase-change behavior requirements will be presented as illustrations of the adhesive selection process.

3) Case Studies: The group will look at images of specimens which illustrate common problems. This will be a guided group discussion. Participants will be encouraged in advance of the Symposium to submit images of problem specimens for consideration by the group.

**Platform****PLEASE DON'T DROP MY BOX OF ROCKS!: PACKING METHODS FOR DOMESTIC AND INTERNATIONAL FOSSIL SHIPPING**

Hunt, ReBecca  
Augustana College

In March and April of 2006, Augustana College shipped fossils to two separate destinations, on either side of the North American Continent. The holotype specimen of *Cryolophosaurus* from the Lower Jurassic Hanson Formation of Antarctica was sent to Research Casting International in Trenton, Ontario (Canada). Casting of a new vertebral column based on specimens recently prepared since its original casting in 2002 was the goal of this shipment. Several of the twenty-one vertebrae sent have very thin and delicate post- and prezygapophyses preserved, and the safe arrival of these specimens was critical. A labyrinthodont skull from the Triassic Fremouw Formation of Antarctica was also shipped (domestically) during this time to Washington State for collaborative research purposes. This amphibian skull is extremely thin in areas and required extra attention in packing to insure no damage would occur during the shipping process. The safe packing of these vertebrate fossils for international and domestic transport was vital for the future study of these remains.

The fossils were packed in boxes constructed of 1/2 inch foamcore board with an interior of G-60 foam to help contour to the shapes of the individual fossils. The delicate and less robust vertebra of *Cryolophosaurus* along with the labyrinthodont skull were enclosed within individual clam-shell cradles constructed of a/c foam, ethafoam and plaster. The remaining fossils were wrapped in a protective soft sheet of Tyvek to act as an inert moisture barrier and placed within the box, to be followed by custom cut G-60 foam supports. The boxes were then placed within the interior of custom built crates for shipment. These crates were transported to their individual destinations by a chain shipping company. This process and the products used will be explained in this talk.

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Hunt, R. 2008. Please don't drop my box of rocks!: Packing methods for domestic and international fossil shipping. First Annual Fossil Preparation and Collections Symposium, Abstracts of Papers 1:11

**Platform**

**A CLOSER LOOK AT THE PREPARATION TECHNIQUES OF FOSSILS FROM THE FOSSIL BUTTE MEMBER OF THE GREEN RIVER FORMATION**

Holstein, James L.

The Field Museum of Natural History

The Fossil Butte Member of the Green River Formation in southwest Wyoming contains some of the world's most diverse and complete fossils. This 50 million year old locality represents a brief snapshot of a lake system that survived for 15 million years. There are two main fossil bearing deposits, the F-1 and F-2 layers, each posing unique challenges of excavation and preparation. Containing primarily fish, the locality has also yielded birds, reptiles, mammals, insects and plants. Preparation of these fossils require an understanding of the idiosyncrasies of the various fossil bearing layers and the subtleties of individual specimens. Application of proper preparation and conservation techniques will yield the best results and preserve the maximum amount of information.

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Holstein, J. 2008. A closer look at the preparation techniques of fossil from the Fossil Butte Member of the Green River Formation. First Annual Fossil Preparation and Collections Symposium, Abstracts of Papers 1:12

**Platform**

**EVALUATION AND CERTIFICATION OF FOSSIL PREPARATORS: AN OUTSIDERS VIEW**

Kane, John

University of Heidelberg

and

Matthew Brown

Petrified Forest National Park

Experience during the 1970s in pediatric psychology demonstrated that training, evaluation, certification and periodic re-certification are absolutely essential in providing quality treatment and service delivery to children with severe behavior disorders. However, resistance to certification was intense and was resolved only after a series scandals and litigation. Resistance was a product of an antiquated model of treatment. This model was replaced by a more flexible paradigm accompanied by intensive efforts to train, certify and supervise “front line child behavior analysts and change agents”. In many respects the current discussion and model of doing science in paleontology appear to be similar to the discussions encountered in the 1970s. The presentation will briefly describe the development and will draw parallels relevant to the practice of preparation. The brief experience of the presenter as a novice preparator strongly suggests the need for specific training and supervision. Finally the author will point out why the current preparator “role model” needs to be rethought and perhaps revised. The model of preparator as the guarantor of quality data perhaps needs greater exposition.

**Platform**

**THE PREPARATOR: A SURVIVOR'S GUIDE**

Madsen, Scott  
(Retired)

Working as a professional preparator can be a joyous, fulfilling and rewarding occupation, but it is not without its hazards to life, limb and psyche. This talk will examine some of those hazards and suggest practical tips on how to achieve a safe and happy work environment. Information from past talks and preparator surveys regarding occupational health will be presented with updates and case studies. Topics will include: dust and fume evacuation systems; radon hazards; common injuries sustained in the field and lab. Preventative measures to combat these hazards will be addressed including a discussion of the "Safety Culture" in the work place, the need for baseline physicals and suggestions on how to get what you need to mitigate safety issues- a safe workplace should be seen as a right, not a luxury. Additional topics will include a discussion of means to achieve a more prosperous and fulfilling career through the use of formal and informal mentoring programs, moonlighting and employee development opportunities. The reality of achieving these goals for all may be greatly facilitated by preparators taking it upon themselves to create a professional society or organization to represent our common interests.

**Poster**

**FROM THE CRADLE TO THE WATERBOARD: HANDLING LARGE BONES WITH LIMITED RESOURCES**

Madsen, Scott (Retired)

Dale Gray

Tom Nelsen

The closure of the Quarry Visitor Center at Dinosaur National Monument in 2006 due to safety concerns meant that dozens of awkward and fragile specimens had to be prepared for removal to temporary storage “facilities” (2 garages and a trailer). Rugged and functional storage and transportation systems needed to be made quickly. Numerous experiments were conducted using AC filter foam, different weaves of fiberglass and various types of plaster to create stable, clean and light-weight beds for bones, but most of these techniques and materials were found to be too cumbersome for mass production and inadequate for the intended purpose. The 2-piece fiberglass and hydrocal cradles as described by Jabo, Kroehler, and Grady in 2005 provided the best model for a practical solution; however, we modified their technique by eliminating the use of clay. This poster will illustrate how we rapidly produced many custom form-fitted cradles using 1/16th inch foam, a single layer of double-bias fiberglass and hydrocal.

Some specimens, particularly complicated vertebra, are best stored upright for better viewing by researchers as well as the structural integrity of the specimen. A low-profile hydrocal base was constructed for a large vertebra as it lay on its side in a sand table by building a wood frame, (the “Waterboard”) placed inches from the centrum and lined with a plastic bag; this was then filled with hydrocal and removed to create a perfectly form-fitted base.

Additionally, a partially jacketed 2000 lb sacrum that could not be lifted off the table was given a base by rocking the specimen fore and aft and gradually adding layers of hydrocal to the underside. The end result is a sturdy stand that could be lifted onto a wheeled pallet that allows for easy viewing and transport. These and other storage techniques and materials will be illustrated in this poster.

**Poster**

**ROTTEN WOOD IN SAND: DIFFICULT PREPARATION OF A LARGE THEROPOD SPECIMEN**

Maltese, Anthony  
Rocky Mountain Dinosaur Resource Center

A difficult combination of soft matrix, low overburden, and a high degree of specimen articulation posed special problems in the recovery of a *Daspletosaurus torus* skeleton. Traditional jacketing and mechanical preparation yielded unsatisfactory results. Mechanical preparation proved impossible without consolidation of both the fossil material and the surrounding matrix. Techniques were developed for the stabilization, transportation, and preparation of the original fossil material.

**Platform****A PALEONTOLOGY LABORATORY APPROACH TO RADON HAZARDS,  
DETECTION, AND MITIGATION**

McCullough, Gavin

Arizona Museum of Natural History

Radon is a colorless, odorless radioactive gas that occurs as a product of radium or uranium decay. In recent years, radon has been identified as a serious health hazard in residential and industrial environments, the EPA estimating that about 20,000 lung cancer deaths are radon-related. Radon poses a risk of lung cancer to non-smokers, and a far greater risk of lung cancer to smokers. Recently the AZNMH tested its paleontology laboratory and storage vaults for radon, based on observations that the parent sediments contain uranium. After testing with store-bought radon detectors followed up by testing by an environmental/industrial safety company, we discovered that Pliocene fossils collected from southeastern Arizona are sources of elevated radon levels (above 4 pCi/L, the EPA “action level”). Immediate action included 24-hour active ventilation, simple dust control measures, and increased passive ventilation during work hours. The results of our action are that paleontology lab radon levels have steadily decreased at a rate of 0.10 pCi/L per week. In addition, we are scheduled to receive an industrial-grade ventilation system as part of a safety upgrade allowance. Radon detection is inexpensive and mitigation is not complicated, but health risks due to radon exposure can be severe. Radon testing should be emphasized as part of environmental safety regimes in laboratory and industrial situations that work with fossils, rocks, or create mineral dust as part of their work.

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McCullough, G. 2008. A paleontology laboratory approach to radon hazards, detection, and mitigation. First Annual Fossil Preparation and Collections Symposium, Abstracts of Papers 1: 17

**Poster****THE USE OF LINEAR COLLAPSIBLE FOAM FOR MOLDING FOSSIL FOOTPRINTS IN THE FIELD**

Nolan ,Thomas C. - WIPS / Denver Museum of Nature and Science

Rob Atkinson - WIPS

Bryan Small - Denver Museum of Nature and Science

Time in the field is a valuable commodity and any method that shortens the time making an impression in the field translates to more time available for exploration. Additionally, transportation of the materials can be difficult and a burden. Current methods of copying fossil footprints entail the use of liquid latex, Plaster of Paris, or silicon rubber that is poured or brushed into the footprint, allowed to harden, then removed. This often leads to residue material left at the site, damage to the fossil and expenditure of long periods of time. The use of linear collapsible foam (the same foam used to take impressions of body parts for orthotics) eliminates the residue, does no damage, is inexpensive, and produces a high quality impression of the footprint within minutes. The foam has a density of from .7 to 2.8 pounds per square inch and can be ordered in various thickness and size. The cost of the foam is competitive with other molding materials. The lighter density foam was deemed too friable to use, however, the denser foams proved ideal for taking impressions. There are limitations using this method. Objects that have undercuts, even slight ones, will not copy and the foam will be damaged when removed; transportation of the material must be made in a single lid cardboard box to prevent damage to the impression; and large area footprints requiring large sheets of the foam may require multiple people to compress the foam into the object. Once taken a master cast of the impression is made using Plaster of Paris or Water Putty, at this point the foam impression is destroyed removing it from the hardened cast. Organic based casting materials can not be used because of adsorption of the liquid into the foam and possible reactions with the foam. Once made the master copy retains the details and sharpness of the original fossil. This method produces a copy of the subject within a few minutes in the field and it is easier to transport the materials into the field and back. Finally, the master cast can be used to make a latex mold to produce additional copies if required.

**Platform**

ANALYSIS OF MISTAKES CORRECTED AND PERPETUATED IN MULTIPLE MOUNTS OF PLACERIAS GIGAS AND RESIN CAST CONSERVATION PROBLEMS. (Original presentation at SVP in 1996, re-presented at this meeting because of immediate relevance)

Reser, P.K., Retired  
and  
Geiser, R.M., Retired

Late in 1987 our museum delivered a mount of Placerias to Petrified Forest National Park Arizona. It was then moved several times and altered by third parties. It also suffered from ultraviolet degradation and temperature extremes because it was placed behind unfiltered windows. These factors exacerbated the original fabrication, anatomical, and materials flaws. Mounts are composites of materials but also of real and restored bone parts from different individuals, and current scientific opinion. Anomalies are certain and only resolved by the process of fitting together the whole three-dimensional animal.

In September of 1991 we completed another mount for the New Mexico Museum Of Natural History And Science articulated at one extreme of the range of movement of the vertebral column. This configuration changed our concept of Dicynodont posture but also repeated distortions of the pectoral girdle originally introduced by ribs restored in an arc too wide to allow the sternum to articulate with the scapula-coracoids.

In 1996 a corrective overhaul of the first mount (existing mount at Petrified Forest) was undertaken. We found serious delamination between the W.E.P. cast material and adhesives, fillers, and paint except where filled polyester resin (Bondo) was used. We found that rib restorations had to be re-contoured, the the restoration of the proximal humeri prevents assumption of the posture seen in the standard published figure, the feet are probably misinterpreted, and no fossil mount is 100% accurate.

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Reser, P. and R. Geiser. 2008. Analysis of mistakes corrected and perpetuated in multiple mounts of Placerias gigas and resin cast conservation problems. First Annual Fossil Preparation and Collections Symposium, Abstracts of Papers 1: 19

**Platform****THREE-DIMENSIONAL PREPARATION OF A LATE CRETACEOUS STURGEON FROM MONTANA**

Vanbeek, Constance  
Field Museum of Natural History

The Cretaceous fossil record of sturgeons (Acipenseridae), while plentiful, has not been known for well-preserved or complete sturgeons. The poor quality and fragmentary nature of the known material have made them of limited value to studies on the comparative anatomy and phylogenetic significance of fossil sturgeons. When an unusually well preserved specimen of a new, undescribed taxon arrived at the Field Museum on loan from the Museum of the Rockies, it presented an opportunity to fully prepare the most complete fossil sturgeon yet known.

Because the specimen was so unique in its completeness, it was necessary to fully expose and then disarticulate all elements for research. This entailed removing previous consolidants that had been applied for stabilization of the fossil; and preparing elements in such a way that high-resolution images, both photographic and illustrative, would reveal the fine details. An important consideration was strengthening the fragile bones yet still being able to disarticulate them while undergoing this very thorough and detailed preparation. That dichotomy proved to be a persistent theme throughout the preparation of this remarkable specimen.

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Van Beek, C. 2008. Three dimensional preparation of a Late Cretaceous sturgeon from Montana. First Annual Fossil Preparation and Collections Symposium, Abstracts of Papers 1: 20

**Platform**

**PETRIFIED FOREST NATIONAL PARK REPHOTOGRAPHY: PHOTOGRAPHY AND DIGITAL IMAGING PROJECT, 120 YEARS OF PHOTOGRAPHIC HISTORY**

Williams, T. Scott

Petrified Forest National Park

This project focuses on several objectives relative to the park: 175 photographic images were re-photographed in this survey to utilize photography from the park's collection that could provide a basis of data to answer specific questions about the effects of erosion over time and to measure the extent of erosion that has occurred over the past 120 years. This project will provide a visual history of the park that traces human exploration and impact on the land and resources before Petrified Forest was a monument and beyond. Utilization of rephotography for interpretation of the park resources will educate visitors and to attempt to record resource loss (e.g., petrified wood).

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Williams, T.S. 2008. Petrified Forest National Park rephotography: photography and digital imaging project, 120 years of photographic history. First Annual Fossil Preparation and Collections Symposium, Abstracts of Papers 1: 21

**Platform**

**REDISCOVERY: MANAGING THE VERTEBRATE FOSSIL COLLECTION AT  
PETRIFIED FOREST NATIONAL PARK**

Williams, T. Scott  
Petrified Forest National Park

This talk will discuss the development and management of museum collection at Petrified Forest National Park since 2002. A selection of vertebrate fossils that were rediscovered in the collection and conserved will be highlighted emphasizing the importance of museum collections for preserving the heritage of the fossil resources at the park and for furthering scientific endeavors.

