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Shawn Haugrud, Chair

Annual Meeting Committee
Conni O'Connor & Shane Tucker, Co-Chairs
Alan Zdinak, AMMP Board Liaison
Gregory Brown, Workshops Subcommittee Chair
Marilyn Fox, Abstracts Subcommittee Chair
Jennifer Cavin
Mariana Di Giacomo
Juliet Hook
James Preston
Patrick Wilson

AMMP Board 2020-2021
Lee Hall, *President*
Alan Zdinak, *Vice President*
Corinna Bechko, *Secretary*
Shane Tucker, *Treasurer*
Michelle Pinsdorf, *Member-at-Large 1*
Mariana Di Giacomo, *Member-at-Large 2*
Michael Holland, *Past President*

Association for
Materials&Methods
in Paleontology

#AMMP2021

Follow us on:

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YouTube Link, or search for Association for Materials and Methods in Paleontology

Our website: www.paleomethods.org

Purchase 2021 apparel, drinkware, and other products from the newly created AMMP Store. All proceeds will help fund the McCarty Student Travel Grant.

Cite abstracts as: Doe, J. 2021. Abstract title. Abstracts of the 2021 Annual Meeting of the Association for Materials and Methods in Paleontology, Virtual. p. X.

Welcome

Dear AMMP Members,

I am thrilled to welcome you to the 2021 Association for Materials and Methods in Paleontology Annual Meeting graciously hosted by our colleagues at East Tennessee State University and the Gray Fossil Site!

The past year has been historic, and we have all faced challenges due to COVID-19. Like most other organizations AMMP wisely cancelled its 2020 annual meeting over health and safety concerns. Then, our community was impacted by shutdowns, staff furloughs, and waves of layoffs.

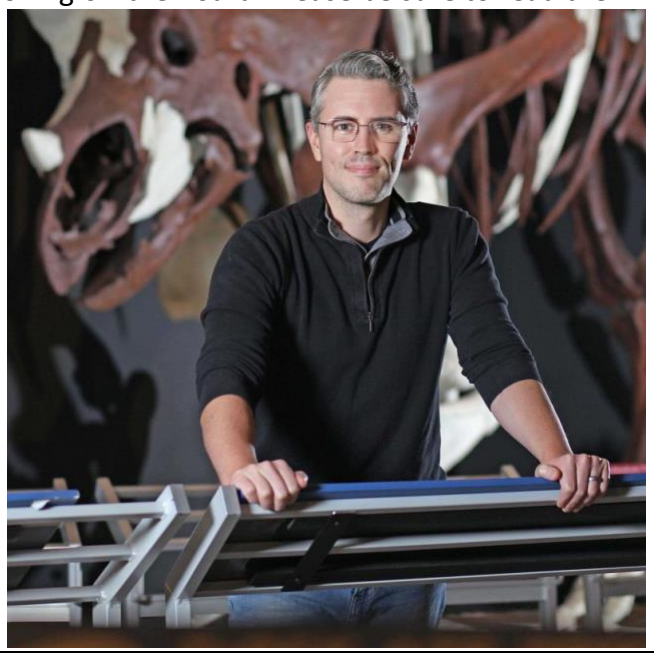
When I took office in the spring of 2020, the Board was face with difficult questions: Will an annual meeting in 2021 be possible? How does our association remain relevant in the span of a year when the world has effectively shut down?

We began with advocacy. When news of layoffs spread, the Board mobilized by issuing an official response statement in support of technical and collections staff. During a tumultuous summer of social movements highlighting the need for justice reform, AMMP added its voice the call of "Black Lives Matter".

The Board then set its sights on virtual meetings. Thanks to the efforts of Michelle Pinsdorf and others, the first AMMP webinar was held earlier this year and had a wonderful turnout. Look for more webinars to come!

Toward the end of 2020, many organizations were holding conferences virtually. After discussions between the Annual Meeting Committee, Host Committee, and the Board, the decision was made to hold the 2021 AMMP Annual Meeting online. So, here we are!

I want to thank the Annual Meeting Committee and the Host Committee who have put in countless hours of work to assure your meeting experience is as enjoyable and beneficial as possible. I also wish to thank the Elections Committee who have been working very hard to vet candidates for the Board positions this year. Alan Zdinak and Mariana Di Giacomo have served their terms with distinction and will be transitioning off the Board. Please be sure to read the bios of the candidates running for office this year, and **vote, vote, vote!**



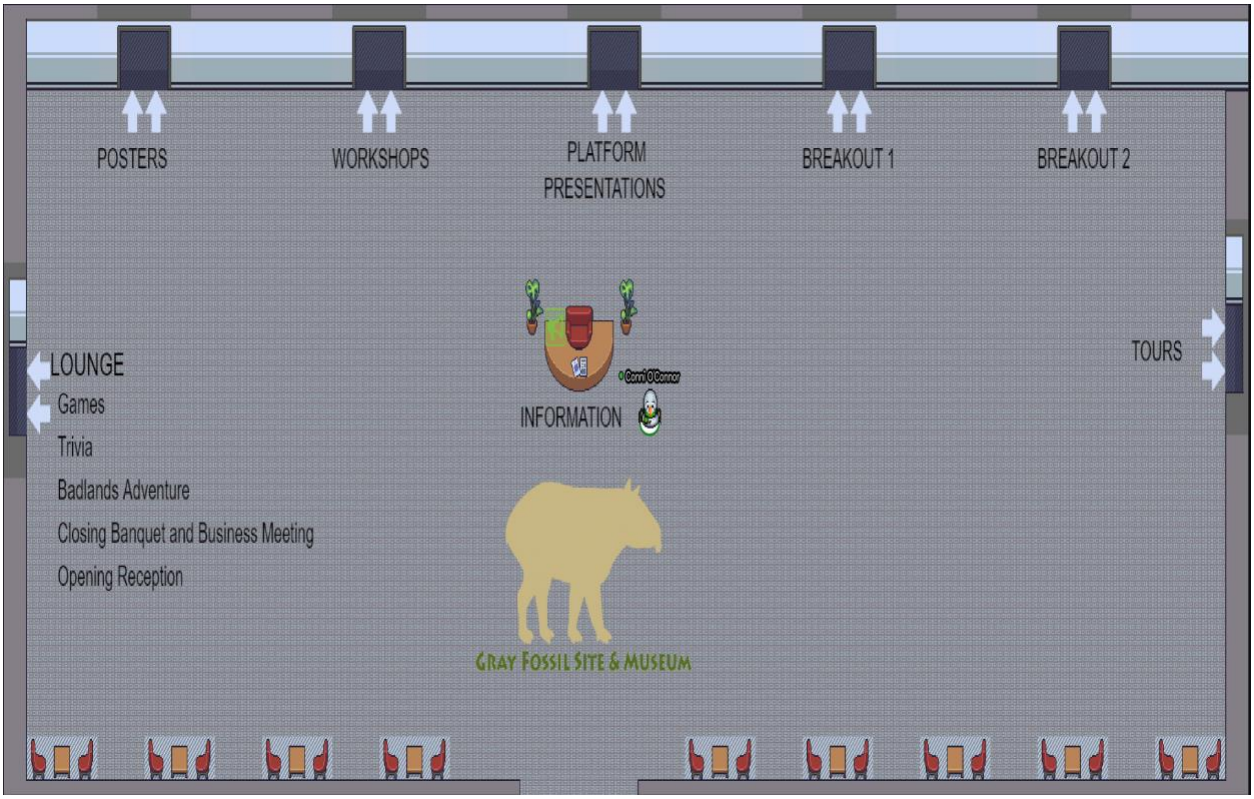
Finally, I wish to make a call to you for service. AMMP has several committees that work behind the scenes throughout the year and they are in need of more members. We welcome new ideas and enthusiasm, and with your help our Association will continue to grow and expand!

Have a wonderful conference, and I hope we will see each other in person next year!

Sincerely,

Lee Hall

President, AMMP



Gather: The Essentials

Minimum requirements for full participation in the meeting include:

- A reasonably high-speed internet connection,
- A computer running either Google Chrome or Mozilla Firefox browsers (for best results),
- A webcam and microphone (optional, but necessary if you wish to be seen and heard by others and take advantage of the interactive opportunities provided).

Depending upon your monitor size and settings, you may wish to experiment with different screen magnifications in your browser (click on the three vertical dots in the upper right corner of the Google Chrome browser or the three vertical lines in the upper right corner of the Mozilla Firefox browser). On many systems and screens, a magnification significantly below 100% gives the best view. Also try viewing your browser in a smaller window rather than full-screen. There are myriad computer/monitor configurations…you will need to experiment to find what works best for your system.

For the guidance below, please refer to the screenshot of a typical Gather screen at the end of this document.

Arriving

- When you click this link to join the meeting and arrive in AMMP's Gather space, you will need to sign in with the email you used to register for the meeting. You can choose to sign in through Google or have a magic link sent to your email which you will click on for verification.
- You may appear as an avatar named "Anonymous". You must change "Anonymous" to your preferred given name and full last name (Example: William Jefferson Smith, Jr., could enter "Bill Smith").
- At the bottom of your screen is a box with your avatar, your name, and a few other control icons. To change your name (especially from Anonymous!), click on your avatar in this box. In the pop-up dialog box you can change your name and, if you like, choose your preferred avatar image. Click "Save".
- To change other user preferences, click on your name at the bottom of your screen and on the **gear icon** on the left side of the screen.

Navigation Tools

- Use **Up, Down, Left, and Right arrow keys** on keyboard to walk around the space. For keyboards without dedicated arrow keys, use the keyboard letters W (up), A (left), S (down), and D (right).
- Pressing the **G key** allows you to "ghost" and walk through other people (handy when you are trapped in a crowd.) The **E key** will teleport you instantly to an open space if you really get surrounded and wish to make a quick escape!
- Pressing the **Z key** causes your avatar to dance and show appreciation.

Communicating

There are three primary ways to connect to people to have voice communication:

- **Proximity connections**. As you walk around the venue, you can hear and talk with anyone near you (proximity communication). You will not hear anyone outside of your proximity, nor can they hear you. As you or others move away, their audio and video feed will fade until you can no longer interact with them, just like in real life!
- **Private spaces** allow for private meetings/conversations with others within that private space. If someone is outside of the private space, even right next to you, they will not hear you, nor you them. Private spaces are usually denoted by a different color or pattern on the floor. When you are in a private space, the rest of the room becomes slightly shaded. A note pops up at the bottom of your screen whenever you enter a private space.
- **Spotlight**. A spot with a megaphone symbol. Spotlights allow the person standing on them to be heard by EVERYONE in the room (similar with a public address system). In general, spotlight spaces may be used for important announcements by moderators, by presenters,

or by audience members addressing questions/comments/announcements to be heard by everyone in the room.

- **Chat via Text**. By clicking on the **chat icon** on the bottom left side of your screen (the cartoon talk balloons), you can send text messages to everyone in the venue, just to those in close proximity to you, or to specific individuals. Check the chats frequently for important announcements.

Interactions with Objects

- Various objects can trigger certain actions and can contain:
  - An embedded website
  - An embedded image
  - An embedded video
  - An external call (to a Zoom meeting, for example)
  - A note object (a sign, brief instructions, descriptions, etc.)
- When you are within range of an object linked to an action, a small note will pop up at the bottom of the screen saying, "Press x to interact" or something similar. When you see this note, **press x** on your keyboard to initiate the interaction.
- When you are through with the interaction, press x again to return to your previous position.
- Although interactions can be associated with any object, pay special attention to TVs, screens, and note objects. Just press x when near them to view their contents.

Posters

- Posters will be available for viewing throughout the meeting, but be sure to attend the poster reception when presenters will be with their posters to answer your questions.
- During the poster session, step onto the "carpet" in front of the poster and **press x** to view the poster. Poster carpets are private spaces so you can talk with and hear anyone in the space without interference from adjacent posters or passersby.
- You can scroll up and down the poster by using your mouse wheel or move the poster in any direction by pressing and holding the left mouse button and "grabbing" the poster.
- When viewing a poster, there are two or three small icons on the right side of the poster. These magnify and demagnify the poster and provide a "pointer" that will cast a red circle onto a portion of the poster for emphasis during discussions.

Off-site Rooms

- Workshops, tours, field trips and the oral presentation session will use "off-site" Zoom Meeting or Zoom Webinar rooms.

- During the live workshop presentations, you will not be admitted to any workshops that you did not sign up for. After the meeting, until April 25, all registrants will have full access to all meeting content, including recordings of all workshops.
- When you go to one of the Gather rooms for these events, you will see a message at the bottom of your screen that you need to **press x** to be transported to the appropriate Zoom room. When you wish to leave the Zoom room and return to Gather, simply close the Zoom window and Zoom browser tab. In your Gather browser tab, click "Re-enter" to return to Gather.

Other Useful Tips

Finding People

- Click on the Attendees icon at the bottom left corner of the screen. Click on the person you wish to find. A dialog box presents two options of locating the person you wish to find:
  - **Locate on map** – results in a path that will lead you to that person.
  - **Follow** – results in your avatar immediately going to where that person is located. This is also handy if someone you are with wants to show you something somewhere in the space…you'll go with them automatically! Don't forget to "unfollow" them, though…stalking is not acceptable!
  - A third option, available to moderators only, is to "**spotlight**" someone from the attendee list or who is showing the "raised-hand" emoji. Spotlighting by the moderator allows that person to ask a question and can be heard by all people in the room.

Eliminating Extraneous Audio

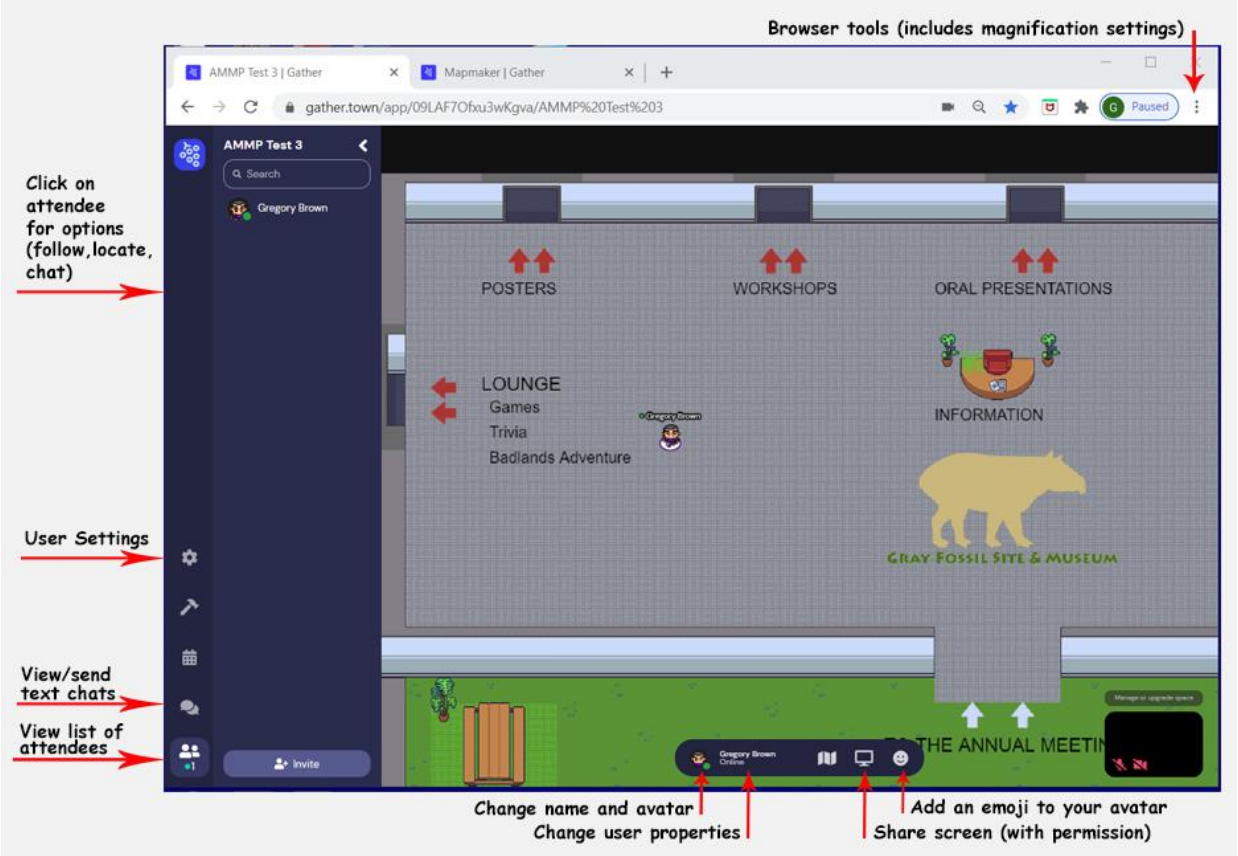
- If there is another participant that you do not wish to hear or see you can mute them and turn off their video. To do so, hover your cursor over their video box and click on the microphone and/or video camera icons to mute and/or turn off their video feed (to you only). This does not turn off their microphone or camera…it just prevents you from hearing or seeing them. This is especially useful when multiple people are viewing videos at the same time and you hear the audio stream from their video coming through their speaker and open mic. However, if you want to talk to someone you have previously muted you can turn on their audio and video by clicking again on the icons in their video box.
- Although Gather has filters to eliminate echo and other extraneous audio, it is a good practice (though not required) to mute your own audio when you are not speaking and wear headphones so that audio coming from your computer speakers does not get rebroadcast and cause feedback.

Emoticons/Emojis

- Various emoticons (emojis) can be found at the bottom of the screen by hovering over the smiley face. When you click on an emoji it appears over your avatar. Most emojis are temporary and will disappear within a few seconds.
- The **raised hand emoji** is a special signal to the moderator that you have a question. The raised hand will remain up until you toggle it off. When the moderator acknowledges you and "spotlights" you (see above), you can ask your question and be heard by everyone in the room, including the moderator/presenter.
- Emojis are numbered. You can also use your keyboard numbers to select an emoji directly.

Miscellaneous Tips

- If you cannot walk through a door, it is closed at that time. Try again later!
- If you are experiencing performance issues (choppy video, clipped audio), try turning off your video. It's nice to share our faces with friends, but the most important thing is being able to communicate with them!
- These and other possible performance enhancements can be found by clicking the gear icon (user settings) on the left side of the screen.



Schedule of Events ~ Overview

Monday – April 12	US Central Time	UTC
Gather Information Session	06:00 PM – 08:00 PM	23:00 – 01:00
Tuesday – April 13		
Working Group: Strategic Planning	08:00 AM – 09:45 AM	13:00 – 14:45
Break	09:45 AM – 10:15 AM	14:45 – 15:15
Working Group: Strategic Planning (cont'd)	10:15 AM – 12:00 PM	15:15 – 17:00
Lunch	12:00 PM – 01:00 PM	17:00 – 18:00
Workshops	01:00 PM – 03:00 PM	18:00 – 20:00
Break	03:00 PM – 03:15 PM	20:00 – 20:15
Poster Session	03:15 PM – 05:15 PM	20:15 – 22:15
Opening Reception	05:15 PM – ???	22:15 – ???
Wednesday – April 14		
Workshops	08:00 AM – 10:00 AM	13:00 – 15:00
Break	10:00 AM – 10:30 AM	15:00 – 15:30
Workshops	10:30 AM – 12:30 PM	15:30 – 17:30
Lunch	12:30 PM – 01:30 PM	17:30 – 18:30
Workshops	01:30 PM – 03:30 PM	18:30 – 20:30
Break	03:30 PM – 04:00 PM	20:30 – 21:00
Workshops	04:00 PM – 05:00 PM	21:00 – 22:00
Thursday – April 15		
Workshops	08:00 AM – 10:00 AM	13:00 – 15:00
Break	10:00 AM – 10:30 AM	15:00 – 15:30
Workshops	10:30 AM – 12:30 PM	15:30 – 17:30
Lunch	12:30 PM – 01:30 PM	17:30 – 18:30
Workshops	01:30 PM – 02:30 PM	18:30 – 19:30
Break	02:30 PM – 03:00 PM	19:30 – 20:00
Trivia	03:00 PM – 04:00 PM	20:00 – 21:00
Game Night	04:00 PM – ???	21:00 – ???
Friday – April 16		
Announcements	07:55 AM – 08:00 AM	12:55 – 13:00
Oral Presentations	08:00 AM – 10:00 AM	13:00 – 15:00
Break	10:00 AM – 10:20 AM	15:00 – 15:20
Oral Presentations	10:20 AM – 12:00 PM	15:20 – 17:00
Lunch	12:00 PM – 01:00 PM	17:00 – 18:00
Oral Presentations	01:00 PM – 03:00 PM	18:00 – 20:00
Virtual Group Photo in Lobby/Break	03:00 PM – 03:30 PM	20:00 – 20:20
Closing Banquet	03:30 PM – ???	20:20 – ???
Saturday – April 17		
Committee Meetings	08:00 AM – 12:00 PM	13:00 – 17:00
Gray Fossil Site Field Trip	12:00 PM – 04:00 PM	17:00 – 21:00

Strategic Planning

The Strategic Planning session will focus on our Association's goals and how to continue to fulfill our mission. We will find solutions to better serve our members and use this opportunity as a forum to discuss our strengths, weaknesses, and capacity.

What topics should we focus on? How do we make our work more meaningful? How do we engage with our members and those who want to join? Which resources are our members interested in getting from us? These and many more questions will be the core of the meeting, where we will establish priorities and a plan to execute them.

We welcome all who are interested in shaping the future of AMMP!

Facilitators:

Lee Hall, AMMP President
Museum of the Rockies, Bozeman, Montana, USA

Mariana Di Giacomo, AMMP Member-at-Large 2
Yale Peabody Museum of Natural History, New Haven, Connecticut, USA

What are the goals of a Working Group?

- To encourage focused discussions about important topics
- To create a written standard or template document that can be broadly shared
- To post the results so that they are easily accessible

08:00A – 09:45A	**Working Group**
10:00A – 10:30A	**BREAK**
10:30A – 12:30P	**Working Group (cont'd)**
12:30P – 01:30P	**LUNCH**

Schedule of Events – Tuesday, April 13– Central Time
Workshops and Poster Session

01:00P – 03:00P Workshops

Basics of Digital Preparation with Open Source Software
Leader: Anne Kort
Location: Workshop A

Use of Micro-explosives (Ezebreak Microblaster™) at the Gray Fossil Site: A Miner's Guide
Leader: Dr. Steven Wallace
Location: Workshop B

03:00P – 03:15P BREAK

03:15P – 05:15P Poster Session (Authors will be present)

Adam D. Behlke
WHEN *GLYPTOTHERIUM* FLIES: RELOCATION OF A MOUNTED SPECIMEN TO A NEW BASE

David G. Carney
DIGITAL 3D IMAGERY AND MODELS OF THE GRAY FOSSIL SITE FROM DRONE CAPTURED PHOTOS: A WORKFLOW

Vicen Carrió
AN EVALUATION OF PROCEDURES FOR THE REMOVAL OF ADHESIVES DURING THE CONSERVATION OF FOSSIL SPECIMENS FROM 19TH CENTURY EXHIBITIONS AT NATIONAL MUSEUM OF SCOTLAND (NMS)

Linsly J. Church, Norman Wuerthele, and Amy C. Henrici
PROTECTING TWO-DIMENSIONAL SLAB FOSSILS VIA REMOVABLE LIDS WITH CLEAR POLYESTER FILM WINDOWS

Cornelia A. Clarke, Stephany Potze, and Stevie L. Morley
IMPROVED PREPARATION METHODS FOR CRANIAL MATERIAL FROM PROJECT 23, A LATE PLEISTOCENE ASPHALTIC DEPOSIT AT RANCHO LA BREA, CALIFORNIA

Matthew S. Eads and Laura E. Wilson
EFFICIENCY OF PHOTOGRAMMETRY THROUGH MESHROOM FOR OUTREACH AND EDUCATION 3D MODEL RECONSTRUCTION

Mireia Ferrer-Ventura, Angélica Torices, Raúl San Juan-Palacios, and Pablo Navarro-Lorbés
THE USE OF THE TEAS TRIANGLE TO REMOVE AGED MATERIALS APPLIED TO FOSSILS: AGED HYDROGENATED POLYMER (BLUE-TACK®) ON *HYPSILOPHODON FOXII* IN IGEA (LA RIOJA, SPAIN)

Misty Haji-Sheikh and Virginia Naples
RESTORATION OF THE ARTICULAR DISK AND CANINE TOOTH ALVEOLUS REPOSITIONING INCREASES THE ACCURACY OF BITE MECHANICS ANALYSES IN *SMILODON FATALIS*

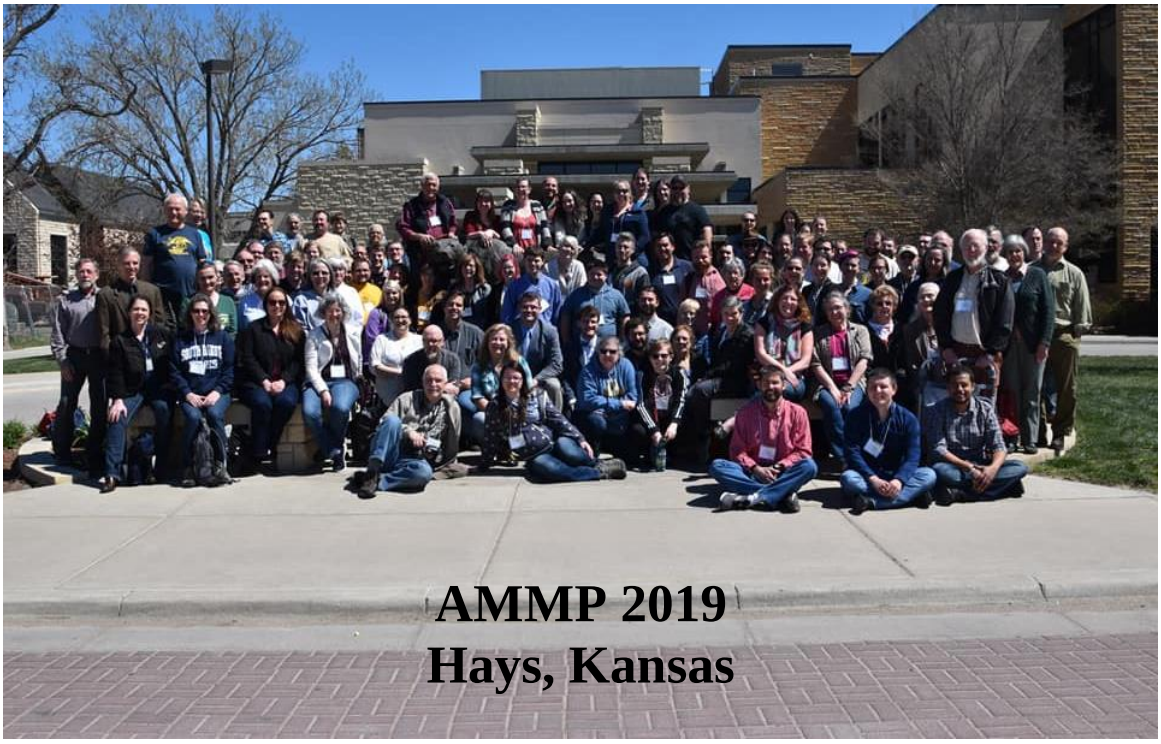
Andrew Heckert
GEOLOGY 3264—AN UNDERGRADUATE COURSE IN PALEONTOLOGICAL LABORATORY TECHNIQUES—WHAT HAPPENS WHEN THOSE THAT DO NOT PREPARE FOSSILS TEACH PREPARATION?

Stevie L. Morley and Stephany Potze
CHANGE IN ASPHALTIC LATE PLEISTOCENE FOSSILS IN RESPONSE TO ASPHALT-REMOVAL WITH A VARIETY OF SOLVENTS: A CONTINUING INVESTIGATION

Edward Shelburne
A METHOD FOR PRODUCING ARCHIVAL FOAM INSERTS QUICKLY AND ECONOMICALLY USING PRE-MADE TEMPLATES

Trisha Zissler, William J. Sanders, and Jeffrey A. Wilson
A METHOD FOR EFFICIENT AND SAFE MOLDING OF LARGE, COMPLEX FOSSILS AND SUBSEQUENT GENERATION OF INEXPENSIVE, HIGH-FIDELITY CASTS

05:15P – ??? Opening Reception (Lounge) – Welcome by Blaine Schubert, Museum Director



Schedule of Events – Wednesday, April 14– Central Time

Workshops

08:00A – 09:00A

Your Volunteers and You: A Comprehensive Guide to Building and Maintaining a Strong Volunteer Base
Leaders: Hillary Cepress-McLean, Marcy Keller
Location: Workshop B

08:00A– 10:00A

Adhesives and Consolidants: Principles and Practice
Leader: Gregory Brown
Location: Workshop A

10:00A – 10:30A BREAK

10:30A – 11:30A

Paleo SciComm: Bringing Science to the Public
Leaders: David Moscato, Dr. Chris Widga
Location: Workshop B

10:30A – 12:30P

Intro to Butvar B-76 Webbing and Other Techniques
Leaders: Shawn Haugrud
Location: Workshop A

12:30P – 01:30P LUNCH

01:30P – 02:30P

Your Volunteers and You: A Comprehensive Guide to Building and Maintaining a Strong Volunteer Base
Leaders: Hillary Cepress-McLean, Marcy Keller
Location: Workshop B

01:30P – 03:30P

Broken Bones: Materials & Methods for Backing and Gap Filling
Leader: Marilyn Fox
Location: Workshop A

03:30P – 04:00P BREAK

04:00P – 05:00P

Cavity Mounts
Leader: Alan Zdinak
Location: Workshop A

08:00A – 09:00A

Plastic Screen Box Construction and Use
Leader: Shawn Haugrud and Bruce Fischer
Location: Workshop A

08:00A– 10:00A

Plaster Basics and More
Leader: Vicki Yarborough
Location: Workshop B

10:00A – 10:30A BREAK

10:30A – 12:30P

Basics of Digital Preparation with Open Source Software
Leader: Anne Kort
Location: Workshop A

Use of Micro-explosives (Ezebreak Microblaster™) at the Gray Fossil Site: A Miner's Guide
Leader: Dr. Steven Wallace
Location: Workshop B

12:30P – 01:30P LUNCH

01:30P – 02:30P

Advanced Storage Jacket Techniques
Leader: Alan Zdinak
Location: Workshop A

02:30P – 03:00P BREAK

03:00P – ??? Trivia/Game Night (Lounge)

Schedule of Events – Friday, April 16 – Central Time
Platform Presentations (Q&A to follow individual presentations)

07:55A **Welcome/Announcements**

08:00A **Tiara M. Ruppert**
CAPTURING CURIOSITY: VISITOR ENGAGEMENT AT THE STERNBERG MUSEUM FOSSIL PREP LAB

08:20A **Laura E. Wilson*, Rachel Unruh, and Reese Barrick**
A NEW WAY TO MUSEUM: EDUCATIONAL PROGRAMMING BORN FROM COVID

08:40A **Kayleigh A. Johnson**
REINVIGORATING THE VOLUNTEER PROGRAM AT THE MUSEUM OF GEOLOGY DURING THE COVID-19 PANDEMIC

09:00A **Alaina A. Fike*, and Anthony Maltese**
WHAT SHALE WE DO? CREATING A PANEL MOUNT FOR A *PLATECARPUS* EMBEDDED IN SHALE USING UPDATED MATERIALS

09:20A **Darren H. Tanke**
OLD DINOSAUR DIGS WITH POOR SITE DATA RECORDING + PRIOR SAMPLING OF ARTICULATED/ASSOCIATED SKELETONS + TIME TO ERODE AWAY ALL TRACES OF PRIOR DIGGING = A RESEARCH AND COLLECTIONS CONUNDRUM FOR MODERN VERTEBRATE PALEONTOLOGISTS

09:40A **Jared R. Heuck**
PREPARATION OF A COMPLETE SKULL OF THE LATE CRETACEOUS TURTLE *DENAZINEMYS NODOSA* FROM THE KAIPAROWITS FORMATION OF SOUTHERN UTAH

10:00A – 10:20A BREAK

10:20A **Natalie G. Toth* and Salvador Bastien**
FLIPPING GIANT DINOSAURS: A HOW-TO GUIDE FOR ROTATING MASSIVE, DELICATE FOSSILS

10:40A **Eric K. Lund*, Lisa L. Herzog, and Lindsay Zanno**
COLLECTION AND PREPARATION OF A NEARLY COMPLETE *TRICERATOPS PRORSUS* SKULL PROVIDES OPPORTUNITY FOR PUBLIC EDUCATION IN MATERIALS AND METHODS IN PALEONTOLOGY

11:00A **Hillary Cepress-McLean**
WHAT HAPPENED TO THAT FIELD JACKET? A CASE-STUDY ON RECOVERING FOSSIL MATERIAL WHEN (ALMOST) THE WORST OCCURRED

11:20A **Shane T. Tucker* and Jeff Grooms**
THE SILT BUCKET CHALLENGE: LESSONS LEARNED FROM PROLONGED SCREEN TIME

11:40A **Leya D. Collins*, Andrew T. McDonald, Brett S. Dooley, and Muffie N. Mendleson**
PALEOTOOLS VS. STONE TOOLS: AN UNOFFICIAL MAINTENANCE GUIDE

12:00P – 01:00P LUNCH

***Presenting author**

01:00P **Michelle M. Pinsdorf**
COMPACTED FIBERGLASS ARMATURE FOR SUPPORTING SMALL FOSSIL SPECIMENS

01:20P **Larkin McCormack*, James Biddle, Janet Gillette, and David Gillette**
DEVELOPMENT OF HANDLING AND STORAGE PROCEDURES FOR RADIOACTIVE AND RADON GAS BEARING PALEONTOLOGY COLLECTIONS

01:40P **Juliet A. Hook**
MARINE FOSSILS FROM THE COALEDO FORMATION: A CASE STUDY ILLUSTRATING THE WORKFLOW TO PREPARE AND SHIP AN UNCURATED COLLECTION

02:00P **Lisa L. Herzog*, Aubrey Knowles, and Luka Rolleri**
PRELIMINARY ASSESSMENT OF THE USE OF HYDROGEN PEROXIDE TO MANAGE PYRITE DECAY IN FOSSIL SPECIMENS AT NORTH CAROLINA MUSEUM OF NATURAL SCIENCES (NCSM)

02:20P **Salvador Bastien**
STREAMLINING ARCHIVAL CRADLE CONSTRUCTION

02:40P **Carrie L. Herbel**
VERTEBRATE FOSSIL CASTING METHODS USING A SIMPLE ROTATIONAL CASTING MACHINE: A PRIMER FOR THE BEGINNER

03:00P – 03:30P **Virtual Group Photo in Lobby/BREAK**

03:20P – ??? **Business Meeting/Closing Banquet (Lounge)**

Schedule of Events – Friday, April 16 – Central Time
Business Meeting and Closing Banquet

03:00P **BUSINESS MEETING**

Please join us to learn more about AMMP and how you can become involved in shaping the Association. We exist because of you and we want your feedback! Feel free to raise any questions or suggestions during the open forum after the Officer Reports.

CLOSING BANQUET

AWARD PRESENTATIONS

(AMARAL LEGACY AWARD, AMMP SERVICE AWARD, MCCARTY STUDENT TRAVEL GRANT)

FUTURE PLANS/CLOSING REMARKS – AMMP PRESIDENT

Colleagues at East Tennessee State University and the Gray Fossil Site have shared some of their recipes to give us a taste of the local cuisine. Make them ahead of time to enjoy during the Closing Banquet as though we were all together in Johnson City. Recipes listed on pages 59-60.

The In Memoriam video is available on the Gather site in the Poster room.

Election Results will be posted on the website by Sunday, April 18.

GRAY FOSSIL SITE

Excavations Tour

In this tour the history of the discovery of the site will be covered, as well as excavations and significant finds over the last 20 years. The tour will drop in on active excavations in TP1-2015 aka the Mastodon Pit and see what is popping up in the first few weeks of the 2021 dig season. Lab and Field Technician Laura Emmert supervises the crew in the pits and will be on hand to speak with tour participants.

Screening Tour

Prior to the COVID outbreak our screening and sediment picking operation was generating over 10,000 specimens annually, extracting every fossil from the 20 tons of material we excavate at the Gray Fossil Site each year. The newly constructed screening barn will be able to dramatically improve that when we are fully operational again. While its location at the back of the site will necessitate a pre-recorded tour, we will have a live Q & A at the end of the tour with Lab and Field Manager Shawn Haugrud as well as Volunteer Jim Southerland, who supervises our screening operation.

Schedule of Events – Saturday, April 17 – Central Time
Post-Meeting Field Trip

Preparation Lab Tour

Tour our 2,200 square foot fossil preparation lab, where we process everything from miniscule ostracods to the massive proboscidean. Get a glimpse of our micro-fossil processing and fossil prep including the ever present tapirs as well as ETMNH 305, our nearly complete proboscidean skeleton. Lab and Field Manager Shawn Haugrud will discuss the unique challenges of working with Gray Fossil Site material, as well as the techniques used to preserve these important finds for future generations.

Collections Tour

We are a relatively young organization and had accumulated 20,000 catalogued specimens in our first 18 years, but in 2019 alone we added 10,000 specimens, and we look forward to getting back into gear this year. Our collections are predominately a repository for material excavated from the earliest Pliocene Gray Fossil Site (GFS) itself, but there is also a significant collection of Pleistocene cave material as well as specimens from Saltville, Virginia. With the GFS taxa list over 210 and climbing, our collections house several holotypes and many significant animal, plant, and fungi specimens that are informative for understanding forested ecosystems and evolution of some familiar lineages today, as well as the loss of others. Dr. Steven Wallace, Curator and Site Director at the GFS, will lead the tour.

Workshop Descriptions

ADHESIVES AND CONSOLIDANTS: PRINCIPLES AND PRACTICE
Level: Intermediate
Leader: Gregory Brown, University of Nebraska State Museum (retired)

This workshop will cover basic principles of adhesives and consolidants and their properties to provide the necessary foundational understanding needed to guide your decision-making process in answering the following questions:

- Is a consolidant/adhesive actually needed?
- If so, which type is appropriate? Reaction (thermosets), solution (thermoplastics) or emulsion/dispersion?
- Having made that decision, how do you then decide which of the many available products to use?

Once the basic principles and properties of these adhesive types are presented, we will provide more detail on various solution adhesives since they are the most commonly used in preparation. Finally, we will narrow our focus to Paraloid B-72 (an acrylic copolymer), regarded by conservators as one of the most stable and thoroughly tested polymers available for use as a consolidant and adhesive in conservation and preparation in many fields, including paleontology. Practical methods for the use of Paraloid B-72 will follow as a series of demonstrations including but not limited to the following topics:

- The effect of solvent choice on solution working properties.
- Good solvents and poor solvents and their effect on consolidant performance.
- How to efficiently prepare mixtures to specified concentrations.
- Various methods of application as a consolidant and an adhesive.
- Glass transition temperature and its effect on the properties of solid (set) polymers.
- Reversal of adhesive joins and manipulation of set joins by heat.
- The problems of polymer penetration, retention and migration.

This will be a demonstration with voice and/or text interaction.

ADVANCED STORAGE JACKET TECHNIQUES
Level: Intermediate
Leader: Alan Zdinak, Natural History Museum of Los Angeles County

Well-designed storage jackets are an important component of any preventive conservation strategy. This workshop will feature a prerecorded video demonstrating ways of using polyethylene foam to reinforce storage jackets, different methods of fabricating liners, strategies for dealing with awkwardly shaped specimens, and designing rolling jackets. Participants will then be able to interact with the workshop leader in a live Q&A session.

Prerequisite: prior instruction in or experience making clamshell style storage jackets.

This will be a demonstration with voice and/or text interaction.

BASICS OF DIGITAL PREPARATION WITH OPEN SOURCE SOFTWARE

Level: Beginner

Leader: Anne Kort, Indiana University

CT scanning has become increasingly important in paleontology for preparation, research, and digital preservation. However, expensive software and a steep learning curve can prohibit newcomers from taking advantage of this versatile technology. In this workshop, we will teach participants how to process CT data from a beginner level using three free, open source software packages: 3D Slicer, Meshlab, and Blender. The resulting mesh can be used for a variety of methods like geometric morphometrics or finite element analysis, 3D printing, or sharing 3D data. Participants will learn:

- Differences in formats of 3D data and how to choose a format
- How to convert and resample CT data in Slicer
- Tools for segmenting CT data in Slicer
- How to export a 3D mesh from Slicer
- Tools for cleaning meshes in Meshlab
- Tools for viewing and reshaping meshes in Blender

Each participant will need a Windows or Macintosh computer with at least 8GB RAM. A dedicated graphics processor and 16GB (or more) of RAM are recommended for better performance. The computer should have Slicer, Meshlab, and Blender preinstalled.

https://download.slicer.org/ (download the stable release)
https://www.blender.org/
http://www.meshlab.net/

This will be an interactive workshop with attendee hands-on participation.

BROKEN BONES: MATERIALS & METHODS FOR BACKING AND GAP FILLING

Level: Intermediate

Leader: Marilyn Fox, Yale Peabody Museum of Natural History

This workshop will discuss when and why a preparator might want (or might not want) to support a glued join or fill a gap when fossil fragments are glued together. We will discuss kinds of joins, external supports and when those might be appropriate, why a gap might or might not be filled and with what materials, and different bone bandage materials. We will explore various materials that could be used as bone bandages (mulberry paper, fine fiberglass fabric, carbon fiber mesh) and discuss which might be best for a given project. Gap filling materials like adhesive mixed with matrix, cellulose powder or marble dust will also be explored. Participants will be mailed samples to use to follow examples at home.

This will be an interactive workshop with attendee hands-on participation.

Materials were sent to registrants pre-meeting.

CAVITY MOUNTS
Level: Beginner
Leader: Alan Zdinak, Natural History Museum of Los Angeles County

Pre-recorded videos (already on the AMMP YouTube Channel) demonstrate creating cavity mounts for long term fossil specimen storage. Basic and advanced cavity mount techniques are covered. This workshop will provide an opportunity for participants to interact with the workshop leader in a live question and answer session.

This will be a demonstration with voice and/or text interaction.

INTRODUCTION TO BUTVAR B-76 WEBBING AND OTHER TECHNIQUES
Level: Intermediate
Leader: Shawn Haugrud, East Tennessee State University/Gray Fossil Site

The ability of Butvar B-76 in solution to form filaments presents an opportunity to use this polymer in creative ways. This workshop will begin with a discussion of material properties and will include a brief virtual tour covering the historical use of these techniques on specimens at the Gray Fossil Site. Participants will then be guided through several exercises creating and applying Butvar B-76 filler webbing to provided practice forms and learning basic application of simple webbing, 3-dimensional webbing, and sheeting.

Participants will receive a package with technical information, samples, and working materials to use during the virtual workshop. 3D printed Butvar B-76 mesh panels will also be supplied for practice application techniques. Participants should provide their own Personal Protective Equipment (PPE) suitable for working with solvent based adhesives.

This will be an interactive workshop with attendee hands-on participation.

PALEO SCICOMM: BRINGING THE SCIENCE TO THE PUBLIC
Level: Beginner
Leader: David Moscato and Dr. Chris Widga, East Tennessee State University/Gray Fossil Site

Educating the public about the work of the scientific community is an essential service we must embrace. This workshop will begin with a presentation by Dr. Chris Widga and David Moscato, who will present the science communication initiatives being used at the Gray Fossil Site to bring the science of the lab and field to the general public. Following this will be an open discussion where participants can ask questions, seek advice, share their own successes, and discuss the best practices for science communication in paleontology.

This will be a demonstration with voice and/or text interaction.

PLASTER BASICS AND MORE

Level: Beginner

Leader: Vicki Yarborough, Geobiology and Geosciences Research Group at Virginia Tech

Having plaster problems? Creating strong plaster involves more science than most people realize. This workshop investigates three different types of plasters and gypsum cements (DAP plaster of Paris, USG Hydrocal FGR 95, and USG Hydrocal White) to demonstrate the steps required to produce "good" plaster and some of the pitfalls to avoid that result in "bad" plaster. This workshop will help you choose the right plaster for your project whether in the lab or the field. We will also demonstrate the proper way to mix plaster. Different types of plaster and gypsum cements have varying recommended plaster/water ratios, soaking times and mixing times to develop full set strength. All, however, share a similar process: Lightly sift the plaster into a clean container of clean water, allow it to soak undisturbed for a prescribed time, then energetically mix mechanically or by hand. Setting then takes place by exothermic chemical reaction. We'll also discuss and demonstrate:

- The best ways to avoid making weak plaster that can put your specimen at risk.
- How to adjust plaster viscosity to control set times and manipulate it to suit your goals.
- How temperature and humidity affect set time.
- Some of the different barrier materials to use between plaster and your specimen.
- Tools that can make your mixing and shaping plaster easy or a chore.
- How to add fresh plaster to set/dry plaster and have it adhere.
- Some materials and methods that can accelerate, slow, or inhibit setting, or result in weak plaster.

Finally, we will discuss a few health and safety concerns that are essential in keeping you (and your facility's pipes!) safe.

Understanding how and why plaster does what it does and following the manufacturer's instructions for the product you are using are keys to making consistently good plaster.

This workshop will be a demonstration with voice and/or text interaction.

PLASTIC SCREEN BOX CONSTRUCTION AND USE

Level: Beginner

Leader: Shawn Haugrud and Bruce Fischer, East Tennessee State University/Gray Fossil Site

The workshop will begin with a brief introduction to the screening program at the Gray Fossil Site and the rigorous practices necessitated by its production goals and standards for data.

We will then discuss the negative aspects of more traditional wooden screen boxes that led to us adopting the newer plastic design a few years ago.

We will demonstrate the many advantages of our newer designs and provide a materials list and step by step instructions for building them.

This will be a demonstration with voice and/or text interaction.

USE OF MICRO-EXPLOSIVES (EZEBREAK MICRO-BLASTER) AT THE GRAY FOSSIL SITE: A MINER'S GUIDE

Level: Advanced

Leader: Dr. Steven Wallace, East Tennessee State University/Gray Fossil Site

This workshop will be a beginner's "how to" for the Ezebreak system that is used to remove large limestone boulders from the Gray Fossil Site (GFS) and some of the many issues associated with those procedures. No prior experience is needed.

Topics to be presented include an overview of previous methods and a discussion of the pros and cons to the use of micro-explosives as well as a description (form and function) of all equipment used/needed for the Ezebreak system.

A step-by-step demonstration, including use of "live" cartridges, follows:

- MSDS and manuals
- General site preparations (description and reasoning)
- Cartridge placement (single cartridge & head, multiple cartridges, multiple heads, and combinations)
- Preparation and drilling
- Cleaning of drill holes and associated preparation
- Proper cartridge deployment
- Proper head "seating"
- Minimization of rock "throw"
- Safety procedures prior to detonation
- Proper detonation
- Cleanup and removal
- Protocol for "misfire"

A Question and Answer session for participants will wrap up the workshop.

This will be a demonstration with voice and/or text interaction.

YOUR VOLUNTEERS AND YOU: A COMPREHENSIVE GUIDE TO BUILDING AND MAINTAINING A STRONG VOLUNTEER LEADER BASE

Level: Beginner

Leaders: Hillary Cepress-McLean and Marcie Keller, Perot Museum of Nature and Science

Having a solid core of skilled paleontology volunteers working in a collections, exhibit, or lab space is a requirement for the success of a program. However, for some institutions or programs, that might be easier said than done. In this workshop, we will discuss multiple aspects of how to identify your volunteering needs, how to build relationships with your community to gain access to volunteer prospects, some basics on how to train and manage your volunteer group, what best retention practices are, and what to do if you are having conflicts with certain volunteers. The goal of this workshop is to provide some basic tips and tricks to hopefully inspire programs to build a volunteer core of their own or perhaps help modify an already existing group.

This workshop will be a demonstration with voice and/or text interaction.

Abstracts, Alphabetical by Primary Author

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STREAMLINING ARCHIVAL CRADLE CONSTRUCTION

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Plaster supports have been used in paleontology for at least one hundred-fifty years. The techniques used for stabilizing fossils in the field have often been modified for storage and transport of prepared specimens. However, materials employed for field collection including burlap, casting plaster, cotton bandages, and paper linings may eventually degrade and are typically substituted with materials such as polyethylene foam, polyester felt, fiberglass, and cement reinforced plaster for long-term durability. Some techniques for building archival cradles are time intensive and demand a high level of skill, including sewn liners fitted to fossils or edges carefully sculpted from wet plaster to hide trimmed fiberglass ends. Here we present the method developed at the Denver Museum of Nature & Science, which, in addition to producing high quality archival jackets for fossil security in collections and on exhibition, is optimized for use by volunteers and interns for greater productivity. Our cradles are constructed using slow-setting FGR plaster and reinforced with two types of fiberglass. These materials are applied to fossils inverted in a sandbox with a sheet of plastic to prevent plaster from spilling onto the fossil. We primarily utilize stronger woven fiberglass but find that an outer layer of matted fiberglass is more easily used to create a smooth finish. A fitted lining of polyester felt is easily shaped with hot-glued folds when necessary, and aluminum conduit is embedded where it provides lighter weight support than additional layers of fiberglass and plaster. Some fossils too fragile or cumbersome to handle and flip outside of their supports are cradled on top and bottom with bolts connecting the two sides. We suggest allowing plaster feet to cure while right side up and weighted for optimal balance. Finally, cradles are trimmed with an angle grinder, smoothed with an electric sander, and sealed with a thin mixture of Paraloid B-72 in acetone to prevent plaster dust from shedding off of the surface.

WHEN *GLYPTOTHERIUM* FLIES: RELOCATION OF A MOUNTED SPECIMEN TO A NEW BASE

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The Smithsonian Institution National Museum of Natural History renovated the Fossil Hall and wanted to include the *Glyptotherium arizonae* specimen that was in the old hall on display. The specimen was mounted many years ago on a robust joist deck with mahogany trim. This deck was too large for the new space and did not match the new aesthetic. The base could not be trimmed down to fit in the smaller space because of the joist construction. The specimen has numerous bolts though the carapace and complete disassembly of the mount was deemed too risky for the health of the specimen. The mount consists of two pipes bolted to the base and a rainbow-shaped band of steel with supports on the inner side of the carapace. These two supports are independent, and we were concerned that torque on the pipes could damage the carapace. The selected option was to fabricate a new base and transfer the mounted carapace onto it.

To keep the pipes from moving during the transfer, 2x4 boards were bolted on either side of the pipes to create a clamp. Grooves for the pipes were cut into the boards to increase the clamping strength. Additional 2x4 boards were attached to the pipes below and perpendicular to the previous clamped boards to create stable lifting points outside of the carapace. The specimen was unbolted from the base and lifted into the air with two chain hoists and lifting straps. A spreader bar was used to prevent the straps from rubbing on the carapace. Once the pipes were lifted clear, the old base was wheeled away, and the new base pushed into place. The specimen was lowered on to the new base and secured in place.

Although, this is not to recommend that anyone rush out and lift mounted specimens, if done slowly, and all of the contact points with the base are locked in place, it should be possible to create a new base for any specimen.

DIGITAL 3D IMAGERY AND MODELS OF THE GRAY FOSSIL SITE FROM DRONE CAPTURED PHOTOS: A WORKFLOW

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As paleontologists begin to ask more detailed and narrowly directed questions, technology and data collection have become paramount. Technologies such as surveying equipment, geographic information systems (GIS), and statistical programming are now more involved in research. Paleontologists at the Gray Fossil Site (GFS) in Gray, Tennessee are incorporating these technologies to better understand what this early Pliocene-aged sink-hole environment was like. The GFS contains a wealthy spatially surveyed fossil collection. Fossil locality data combined with high grade aerial imagery of the site gives researchers the ability to visualize the site in ways not possible before. 3D scanning of fossils is gaining much popularity and the form of high-resolution aerial imagery discussed in this study has some of the same promising qualities (i.e. data sharing, data manipulating, data comparing).

A Dà-Jiāng Innovations (DJI) Maverick drone equipped with a high-resolution camera was flown over the GFS at 30 meters for site wide imagery and 3 meters for high resolution imagery of an excavation pit. The flights were carried out using the DJI GO app, which is used to create automatic flight plans to capture aerial imagery of the site. This flight plan captures many images each with an associated locality. This allows the images to be uploaded into a GIS such as ArcGIS Pro so they can be mosaiced together into a single image. This study compares workflows used to convert these aerial photographs into other helpful data such as below meter accuracy digital elevation models (DEMs) and three dimensional orthomosaics. ArcGIS Pro is capable of handling and observing all the post processing, but, MetaShape seemed to create better map products. Problems with imagery are addressed, such as renderings of features present in the images (cars and trees) and possible workarounds are provided such as creating smaller flight plans to reduce “noise” resulting from imaging sensitivity. ArcGIS Pro provides a place to view these products alongside other mapped objects such as fossil material, but also allows the files to be compressed and stored in a geodatabase so they can be shared digitally.

AN EVALUATION OF PROCEDURES FOR THE REMOVAL OF ADHESIVES DURING THE CONSERVATION OF FOSSIL SPECIMENS FROM 19TH CENTURY EXHIBITIONS AT NATIONAL MUSEUM OF SCOTLAND (NMS)

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The oldest registered fossil specimen (1812.1.9902, petrified vermes) in the palaeontological collection of the National Museum of Scotland (NMS) dates back to 1812. The collection contains thousands of specimens consolidated with adhesives in the 1800s. Today these adhesives have aged badly, having changed colour and become brittle leading to some parts of the fossils falling apart, which makes their removal urgently needed. Unfortunately, little information is available on the origin or types of materials that were used during previous conservation treatments. In order to shed more light on these adhesives, testing with water, IMS (de-ionised alcohol), acetone and peroxide were conducted on small areas to identify the best removal technique without damaging the specimens. From these observations, water was the most effective removal treatment. Adhesives were softened by brushing the area with room temperature water and then removed mechanically with a scalpel. In parallel, a set of micro-samples (c. 1 mg) from several types of adhesives were removed for molecular analysis using Fourier-Transformed Infra-Red Spectroscopy (FT-IR). Samples of adhesive were selected based on their colour, physical properties and also how they reacted during removal with water, as it was observed that several samples displayed effervescence in contact with water. Adhesives found in old collections are known to be mainly from horses, rabbit and fish but other materials might have been used to as wax. FT-IR analysis confirmed the use of animal glue, although we were unable to identify the animal adhesive used, we found other materials in the samples such as: gum, shellac, cellulose nitrate and natural resin. Future analysis might involve proteomic analysis. This work allows us to better understand how these types of collections were preserved in the past. The combination of conservation work and analytical techniques is particularly useful in identifying degraded organic materials.

WHAT HAPPENED TO THAT FIELD JACKET? A CASE-STUDY ON RECOVERING FOSSIL MATERIAL WHEN (ALMOST) THE WORST OCCURRED

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The Kikak-Tegoseak site on Alaska's North Slope was worked by Perot Museum of Nature and Science (PMNS) crews from 2004-2007. The quarry is in the Late Campanian-Paleogene Prince Creek Formation, at a horizon estimated to date to 68.5Ma-70Ma. The quarry excavated part of a dense bonebed consisting mainly of *Pachyrhinosaurus perotorum* elements. Complexities of field operations, partnered with frequent winter-like weather during the summer 2006 season resulted in one field jacket and its block (field number 06AF8-3-1 J) being heavily damaged during removal. First, the field jacket plaster failed to set up properly, and the crew was forced to wrap the block in a plastic tarp and ropes to contain it. Then, during the helicopter lift to remove it from the quarry, the field jacket smashed into the adjacent bluff twice. The block was ground-shipped back to PMNS in Dallas, Texas, where it remained in storage until the summer of 2019. When the tarp was opened, the full extent of the damage was revealed. The field jacket had failed and much of the block was broken into gravel, granule, sand, and even dust-sized pieces. Steps were immediately taken to maximize fossil recovery from the badly damaged block. First, a careful visual survey of the material was made, and documentary photos taken to archive locations and associations of pieces. A grid pattern for the block was established to retain context and associations of pieces. Only then did volunteers and staff expose and remove fossil bone from the remaining matrix. The grid system and photo archives proved important aids in finding fits, reconstructing elements, and maintaining potential associations between pieces. Surprisingly, multiple identifiable bones were eventually reconstructed from pieces smaller than 1 square millimeter. The main adhesive used throughout the process was Butvar B-76 dissolved in acetone, mixed to different viscosities. Despite the severity of the damage to the block 06AF8-3-1 J, staff and volunteers recovered a surprisingly useful collection of *Pachyrhinosaurus* specimens added to the collection of Arctic Alaskan dinosaurs at PMNS.

PROTECTING TWO-DIMENSIONAL SLAB FOSSILS VIA REMOVABLE LIDS WITH CLEAR POLYESTER FILM WINDOWS

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The Vertebrate Paleontology collection at Carnegie Museum of Natural History includes many large, flat, essentially two-dimensional slab fossils encased in open wooden boxes. Due to their large size, these fossils rest on open shelving where they are susceptible to dust accumulating on their surfaces. To ameliorate this issue in the past, dust covers were made using plastic sheeting stapled to a wooden frame that rested directly on the specimen inside its encasing box. These frames were difficult to remove because they fit tightly and lack handles. Over time much of the plastic sheeting has shattered and become too unstable to clean. Our initial plan to rehabilitate these frames involved replacing the plastic sheeting with polyester film, adding handles for easier removal, and adhering felt to the bottom of the frame to provide cushioning. After retrofitting two frames, we determined that this was not the optimal way to protect the specimens. The felt made the fit even tighter, and the handles were useful but lacked durability.

Thus, we developed a method for making a lid with a window using archival materials that include blue board or foam core, hot melt glue, 3M 415 double-sided tape (well tested; minimal off gassing or discoloration), and 4 mil or higher polyester film such as Melinex 516 (the stiffer the better). The lid is made to be slightly larger than the outside dimensions of the encased specimen. A window is cut from the middle of the lid, leaving enough surrounding border for stability and for securing the polyester film to the lid's underside with double-sided tape. For specimens larger than the standard size of blue board or foam core, two-part lids with windows were designed and constructed such that the two parts interlock but also separate easily for removal. These lids provide an excellent means to cover, yet still view, encased flat fossils. For specimens that project above their encasing box, Ethafoam blocks can be glued to the underside of the lid to elevate it. A label sleeve may also be attached to the lid using double-sided tape. Although dust may accumulate, its removal from these more stable materials is much easier.

IMPROVED PREPARATION METHODS FOR CRANIAL MATERIAL FROM PROJECT 23, A LATE PLEISTOCENE ASPHALTIC DEPOSIT AT RANCHO LA BREA, CALIFORNIA

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A study at Rancho La Brea (RLB) included 6 solvents and 48 fossils from Deposit 14 of 'Project 23' - an excavation of Late Pleistocene asphaltic deposits. This follow-up study explored the effects of the solvents: Aerotron, Butyl cellosolve (BC), D-limonene (D-lim), Ecolink 1171 (Ecolink), Novec 73DE (Novec), and n-Propyl Bromide (nPB). Methods involved ambient temperature soaking and manual cleaning of bird femora, canid metapodials and vertebrae. Soaked fossils were submerged for 24 hours. nPB proved most efficient for matrix removal in soaking trials and Novec for manual cleaning trials.

Assessments over a 9-month period determined the effects of solvents on changes in odor, color, mass, and integrity. This period was sufficient to discern changes in the specimens. Assessment will recur annually to observe continued changes. All Cal/OSHA and institutional H&S procedures were followed for both this follow-up study and the original study, including PPE use.

Aerotron and Novec had no solvent odor after nine months. BC, nPB, and Ecolink had only mild odors. D-lim retained the strongest odors. Odors were assessed qualitatively by a single observer.

Changes in fossil color were monitored using a Canon 6D camera, Canon MP-E 65mm 1-5x macro zoom full frame lens and compared using Munsell soil color charts. An insignificant number of specimens displayed color change. Mass fluctuations stayed within +/-1g, suggesting that these solvents do not affect fossil mass over time.

Humidity levels were highest in winter, when fossil deterioration rose across all groups. Specimens treated with Novec and Aerotron had the least change. nPB and D-lim specimens changed moderately in bone integrity. Fossils prepared with BC and Ecolink had the highest frequency of cracking, flaking, and visible dehydration.

The results of this study indicate Novec performed best in all categories, followed by nPB. D-lim performed poorly with the greatest degree of post-solvent degradation and, with BC and Ecolink, will not be used at RLB. nPB will be phased out in the RLB Preparation Lab and replaced with Novec. Only manual surface cleaning will be considered for fossil preparation at RLB.

PALEOTOOLS VS. STONE TOOLS: AN UNOFFICIAL MAINTENANCE GUIDE

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After the recent acquisition of new air scribes in the preparation laboratory at The Western Science Center, both staff and volunteers have voiced inquiries regarding their identification and maintenance. Despite hands-on training as well as labels applied to drawers and tools, our preparators have sometimes confused tools made by PaleoTools and The Stone Company. This proposed graphical guide is meant to help with identification of the various types of air scribes available from PaleoTools and The Stone Company, as well as to address inquiries regarding the operation of the air compressors. PaleoTools and Stone air scribes have the same application, and thus their appearances can be similar except for some important differences: PaleoTools scribes have no regulator attached to the hose and no on/off lever; while, Stone air scribes have both of these features. While these two main brands of air scribes used in paleontological preparation are similar in appearance, they have different maintenance requirements. For example, PaleoTools requires oil be placed into the tool to inhibit rust and prevent seizure of the tool; in contrast, The Stone Company requires the o-rings on the needle to be lubricated and then excess lubrication to be removed before reinsertion of the needle. If these two maintenance requirements inadvertently get confused it could result in costly repairs or replacement of the tool. Additionally, there are PSI differences between the various tools to address, as well as the various applications for the different sizes of the air scribes. For instance, a Micro Jack (PaleoTools) or HW-322 (The Stone Company) is used for fine detail work, versus an ME-91 (PaleoTools) or HW-65 (The Stone Company) that would be applied when removing large amounts of matrix. This guide will be made available online to all institutions in the hope that it will supplement essential hands-on training on the proper identification and maintenance of these important tools and the air compressors that power them.

EFFICIENCY OF PHOTOGRAMMETRY THROUGH MESHROOM FOR OUTREACH AND EDUCATION 3D MODEL RECONSTRUCTION

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The goal of this project is to determine the minimum number of photographs needed to generate an outreach-quality printable 3D model through photogrammetry. Photogrammetry is becoming an increasingly important method in fossil replication. The ability to rapidly produce digital models for outreach and education cannot be understated, as 3D printing allows for a more tactile experience without the need to visit an institution or remove fossils from collections. An outreach-quality model for this experiment is defined as being recognizable as the original specimen and complete with no voids or defects. These models are not research-grade and lack the accuracy for detailed morphological analysis. A *Protostega* humerus, oreodont jaw, and a mosasaur vertebra were chosen for modeling to give a range of size and shape. Photographs were taken using a Canon Rebel T6S DSLR. Photography was standardized using a turntable with notched degrees. A photograph was taken every degree for two rotations. The first rotation was at zero degrees from horizontal and the second was at forty-five degrees from horizontal. The resulting seven hundred and twenty photographs were subdivided every forty, thirty, twenty, fifteen, ten, five, and two degree to compare the quality of resulting meshes. Photograph groupings were processed in Meshroom and evaluated for defects in MeshMixer. Both programs are open access and have user-friendly simple, intuitive workflows. 3D models were generated with the ten, five, and two-degree groupings, and were printed using a Creality Ender 3 Pro. The forty, thirty, twenty, and fifteen-degree grouping did not produce usable models. The ten, five, and two-degree models all produced outreach quality models with a minimal increase in quality. The ten-degree model needed ~8 hours to process, the five-degree model ~16 hours, and the two-degree model over 30 hours. Given the ten-degree model's quality to time ratio, it is the preferred method in quickly generating outreach quality models. The use of Meshroom as a photogrammetry software is best used for quickly processing educational 3D models.

THE USE OF THE TEAS TRIANGLE TO REMOVE AGED MATERIALS APPLIED TO FOSSILS: AGED HYDROGENATED POLYMER (BLUE-TACK®) ON *HYPSILOPHODON FOXII* IN IGEA (LA RIOJA, SPAIN)

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Igea, a locality of La Rioja (Spain), contains fossil remains attributed to *Hypsilophodon foxii*. These remains were found, and prepared, put on display in 1994. The specimen was adhered on methacrylate sheets using a hydrogenated polymer (synthetic rubber) commonly known as Blue-Tack and displayed in a glass case.

Due to the need for further studies on the fossils, it was necessary to extract the specimen from the showcase and remove the aged Blue-Tack. Blue-Tack is composed of a hydrogenated polymer (synthetic rubber), which contains a particulate-shaped mineral filler, mixed with a blue pigment and a mineral oil, which is not specified, but presumably a paraffin, naphthenes or aromatic hydrocarbons. The product also indicates that under optimal conditions of preservation (temperature, humidity and low light incidence), it can last up to 4 years.

Knowing the physical-chemical characteristics, we can place the Blue-Tack inside the Teas Triangle. In this way, we can superimpose two Teas Triangles (solvents and product), with the information of the organic solvents and, thus, be able to determine which mixture of organic solvents is better and safer for the removal of the material. The organic solvents selected for the solubility tests are acetone and white spirit, given the nonpolar nature of the material we want to dissolve. Finally, solubility tests are carried out by different applications of the solvents separately and together in the selected quantity, by swab in three methods: applied, rolled and rubbed. Thanks to these tests and the comparison between the swabs, we can determine how solvents work on the material. With this comparison, we can see how the removal of both solvents works without having to use the rolled and rubbed swab, and the fossil suffers less mechanical stress. Therefore, the use of the Teas Triangle for the removal of applied materials can determine the necessary quantity of solvent and mode of removal to safely restore fossils for research.

WHAT SHALE WE DO? CREATING A PANEL MOUNT FOR A *PLATECARPUS* EMBEDDED IN SHALE USING UPDATED MATERIALS

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A specimen of *Platecarpus* came to Triebold Paleontology Inc. (TPI) as a part of an exhibit renovation project for the Burke Museum in Seattle, Washington. This specimen was removed from the existing exhibit in eight plaster jackets that contained some legacy matrix reconstruction in poor condition. Various methods were used to create the original false shale-like texture including pieces of newspaper glued together and covered with plaster. These methods, while marginally effective in presentation, were flaking off. The fossil itself was in good condition and 10% Paraloid B-72 dissolved in acetone was used to stabilize the original matrix. The end goal for this specimen was to create a stable panel mount with newly reconstructed margins of faux-shale surrounding the authentic matrix. TPI staff consolidated the plaster field jackets containing the *Platecarpus* into four sections that slid together to form a single panel mount. The following materials were used to build the base of the area around the jackets: plywood, square steel tubing, nuts, bolts, and polystyrene foam board. With experimentation we created a faux-shale texture to lay atop the foam base to blend aesthetically with the natural shale. A combination of Hydrocal FGR-95, fiberglass cloth, aluminum foil, Apoxie Putty, acrylic paint, and a cutting wheel attached to a Dremel completed this goal. The four interlocking sections were transported via crate and assembled onsite. The end result is a 17-foot long *Platecarpus* panel mount with seamless reconstructed shale that is on display at the Burke Museum.

RESTORATION OF THE ARTICULAR DISK AND CANINE TOOTH ALVEOLUS REPOSITIONING INCREASES THE ACCURACY OF BITE MECHANICS ANALYSES IN *SMILODON FATALIS*

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Reconstructions of extinct taxa are usually based on skeletons and dentitions. It is impossible to restore the structure and function of these animals accurately without considering the soft tissues that overlie teeth and bones. *Smilodon fatalis* with its bladelike upper canine teeth, required precise occlusion to avoid tooth breakage. Most mammals have an articular disk that cushions and aligns the mandible during biting; such tissues are rarely preserved in fossils.

We devised a simple method in this study to predict the size, shape, placement, and thickness of the articular disk, experimenting with paper, leather, felt, plastic and silicone. Paper proved too variable in thickness and was not compliant for shaping an articular disk. Leather is a natural, variable material, lacking in uniformity. There are too many kinds of plastic to make this a replicable material. Silicone was difficult to control to produce repeatable results. We found the most accessible and replicable material was felt. Felt is ubiquitously available and consistent in size, thickness, texture, pliability and density and comes in standardized 12" squares. We used layers of felt built up to achieve correct dental alignment. After adding each layer, we tested dental alignment and concluded that four layers represented an appropriate articular disk thickness and the teeth aligned correctly. When we had achieved an accurate disk reconstruction, canine occlusion permitted the most effective neck bite on *Smilodon's* large prey.

Our work included a second change in *S. fatalis* bite reconstruction by inserting the upper canines to their full alveolar depth. The teeth are less securely anchored when the upper canine alveoli are not maximally filled. *S. fatalis* would experience a decreased likelihood of tooth breakage with properly seated canines.

Our method refines the manner in which fossils are reconstructed. When this process is completed with accuracy, the resulting exhibit more correctly depicts the animal as it was in life and will aid in teaching future students and the public who visit natural history museums.

GEOLOGY 3264—AN UNDERGRADUATE COURSE IS PALEONTOLOGICAL LABORATORY TECHNIQUES—WHAT HAPPENS WHEN THOSE THAT DO NOT PREPARE FOSSILS TEACH PREPARATION?

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Many undergraduate students have limited experience with paleontological preparation and conservation techniques, especially if they cannot afford to volunteer at a museum. I developed a two credit-hour 3000-level course, GLY 3264, Paleontological Lab and Analytical Techniques for our paleontology concentration, aiming to have students bolster their skill sets as they apply for internships or graduate school. The course is structured much like a studio art class—weekly two-hour meetings to introduce techniques, with students expected to spend out-of-class time (60+ hours total over the semester) practicing and developing those skills. Topics covered include fossil identification, data recording, screenwashing, cleaning, matrix removal (tooth brushes, pin vises, air scribes), molding, casting, painting, consolidants and adhesives, slab saws and sectioning, microscopy (light and scanning), photogrammetry, 3-D printing, poster construction, and others. I rely extensively on guest lecturers to demonstrate most techniques and myriad websites for readings, videos, and other resources. Student grades are based on attendance/participation, a lab notebook, a "digital portfolio," an end-of-class project, and an end-of-the-semester check-in of all fossils and equipment and lab cleanup. The lab notebook records all out-of-class preparation activities, including hours logged, materials and methods used, specimens involved, etc. The portfolio is usually in presentation software and photographically documents the "before and after" of all methods touched upon in class. The museum project encourages students to focus on a particular skill, usually with an eye toward improving our exhibits. We are not a repository, and have limited collections/lab space, but do have access to many teaching specimens and field collections from summer course trips. Thus, students develop skills with low risk (common) fossils, including invertebrates, and we use the resulting casts and prints for classroom, outreach, and recruiting materials. By sharing this strategy, I hope to explore further avenues for formalizing best practices for teaching paleontological techniques in an academic setting.

VERTEBRATE FOSSIL CASTING METHODS USING A SIMPLE ROTATIONAL CASTING MACHINE: A PRIMER FOR THE BEGINNER

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Rotational casting machines (RCMs) are valuable time saving devices used to construct hollow casts as the machine does the work while allowing the lab tech to perform other duties. These machines typically have an inner and outer framework that rotate at varying speeds around different axes. RCMs also provide cost savings as hollow casts require less casting resin. However, the most favored reason for hollow casting is to decrease the fossil replica weight for easier installation by exhibit technicians. There are guides for those wanting to mass produce specimens; however, this presentation is for the generalist working at natural history museums.

The purchase of RCMs can be expensive but will provide decades of use when properly maintained. There are “make your own” guides available, which could be a route for those handy with tools and on a tight budget. Size and weight limitations should be considered when purchasing or constructing such machines. Considerations should also be given for methods required to properly mount a rubber mold/mother molds on RCMs, particularly when balancing the mold properly. Unbalanced molds can add wear and tear to the machine and can even overheat the motors running the rotation frames.

Testing casting resins is recommended. Resins with short pot lives can set before rotating the mold adequately. Resins with a pot life of 10-20 minutes tend to work best. Overfilling molds can produce irregular buildup of plastics inside the cast. Exothermic casting resins may require multiple pours of the plastic, followed by rotation, in order to develop a consistent cast thickness. Continual rotation during heating AND cooling of any casting resin prevents deformation or overly thin areas. RCM casts using plaster is not recommended due to trapped air that produces a pitted surface. Filling thin-walled resin casts with foam or plaster provides extra strength to the structure. Pour spouts integrated into the mold design are highly recommended when using RCMs.

Safety when using RCMs is paramount, particularly if there are no cages around the rotating frames. Proper maintenance and general clean-up will ensure a long life for your machine.

PRELIMINARY ASSESSMENT OF THE USE OF HYDROGEN PEROXIDE TO MANAGE PYRITE DECAY IN FOSSIL SPECIMENS AT NORTH CAROLINA MUSEUM OF NATURAL SCIENCES (NCSM)

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Pyrite decay refers to the process of pyrite crystals (FeS_2) reacting with oxygen and moisture in the air producing ferrous sulfate ($FeSO_4$), sulfuric acid (H_2SO_4) and sulfur dioxide (SO2). Waste water treatment and mining industries have a history of using hydrogen peroxide (H_2O_2) to manage oxidation of unwanted sulfur and pyrite. These industries have contributed to the literature on treatment protocols that helped shape our methodology. We experimented with a novel approach to managing pyrite decay in fossils by intentionally activating the oxidation reaction through the application of hydrogen peroxide (H_2O_2) to assist in removing oxidation byproduct, and isolating pyrite to produce a more stable specimen.

Experimentation was carried out on two pyrite affected bone fragments of NCSM 14345, *Acrocanthosaurus atokensis*. A10cm long section of rib exhibiting pyrite and redox byproducts was submerged in 3% H_2O_2 solution and observed for 15 minutes, then rinsed with water. During treatment a strong sulfur odor was noted rising from the effervescing solution. After treatment, pyrite crystals remained on the specimen, while visible evidence of the redox byproducts disappeared, as well as the odor of sulfur. The bone was slightly bleached, but overall remained unchanged. Second, a thin section slide produced from a 5cm section of gastral rib with pyrite but no byproduct was covered with the same 3% H_2O_2 solution. The sample was monitored for the same duration with little noticeable reaction, then rinsed with tap water. Before and after images taken under 50x magnification were compared. No degradation of the bone resulted, and no change was noted in the pyrite. This treatment is experimental, can affect future chemical analysis, and is not recommended for widespread implementation until longer-term results can be established. Specimens continue to be observed in conjunction with control specimens to assess whether they are more resistant to future pyrite decay following the treatment. Preliminary experimentation supports the hypothesis that hydrogen peroxide is an effective ‘scrubber’ to remove pyrite oxidation byproducts without altering non-pyritic bone structure.

PREPARATION OF A COMPLETE SKULL OF THE LATE CRETACEOUS TURTLE *DENAZINEMYS NODOSA* FROM THE KAIPAROWITS FORMATION OF SOUTHERN UTAH

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For nearly 15 years, the Raymond M. Alf Museum of Paleontology has worked a multi-taxon bone bed (RAM locality V2005022) from the Kaiparowits Formation in Grand Staircase-Escalante National Monument, Utah. This locality has produced a variety of Late Cretaceous vertebrate taxa, including hadrosaurids, azhdarchids, tyrannosaurids, and turtles. A large block containing hadrosaur postcrania was opened for preparation in January 2019. Intricate bone was exposed through mechanical preparation and identified as the complete and virtually uncrushed cranium and mandible of the baenid turtle *Denazinemys nodosa*, the only associated skull of such completeness for this species.

Due to the intense hardness of the heavily indurated matrix and the skull's delicate nature, preparation for this specimen involved several methods. First, bulk matrix was removed with a PaleoTools ME-9100 airscribe, and the skull was stabilized with 10/90 w/w Paraloid B-72 in acetone. When it was determined the fragile skull would not withstand heavy vibration, a Microjack 6 was used. Unfortunately, the vibration of the Microjack was easily transmitted through the well-cemented matrix and could damage the specimen. In addition, the stylus was not precise enough to navigate around the skull. It was decided that acid preparation was the best method moving forward.

Exposed bone was coated with 25/75 w/w Paraloid B-72 in acetone, and the skull was soaked in a 5% glacial acetic acid solution. After soaking, the skull was placed in gentle running water for at least four times the length of the soak. The specimen was allowed to dry, and preparation continued underneath a microscope with a carbide needle. Minute bone fragments that separated from the skull during mechanical preparation were reattached with cyanoacrylate glue, which was observed to withstand the acid baths better Paraloid and allowed excess layers of Paraloid to be removed with acetone and without concern that the smaller fragments would be lost. The full process of preparation involved multiple methods and adhesives, resulting in the most complete *Denazinemys* skull and jaw, which includes diagnostic palatal features and thin bone that would not have been preserved otherwise.

MARINE FOSSILS FROM THE COALEDO FORMATION: A CASE STUDY ILLUSTRATING THE WORKFLOW TO PREPARE AND SHIP AN UNCURATED COLLECTION

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As stewards of paleontological materials at the Natural History Museum of Los Angeles County, collections staff are relied upon to preserve collections and their accessory material. However, a lack of resources has contributed to collections remaining in various curation states once returned from the field such as the marine fossils from the Coaledo Formation. These vertebrate fossils were collected decades prior by a former paleoicthyology curator. The collection consists of teeth, vertebrae, tail stings, and placoid scales of sharks, rays, and teleosts. Using the Coaledo Formation collection as a case study, the following workflow establishes the materials and methods employed to inventory, track, pack, and ship an uncurated marine collection to its original collector for identification, publication, and completion of curation.

Photographs of the material were taken with a DSLR camera to document their original condition and location. Over 100 specimen trays containing 249 glass vials and 279 elements were inventoried with associated field numbers and tags. Once all trays were assigned a unique number for tracking, each was photographed alongside a printed label using an iPhone or a Nikon point and shoot camera. Custom specimen housings, similar to cavity mounts, were created using a combination of Ethafoam planking, tri-rod, and 1/4” and 1/8” liners affixed using a hot glue gun inside polystyrene containers and pre-made cardboard boxes. Using a Dremel tool, cylindrical holes were drilled into Ethafoam planking to house vials. The specimen housings were packed inside cardboard shipping boxes internally lined with 1/4” Ethafoam with styrofoam peanuts or air-filled bags to fill empty space. A copy of the images and inventory were sent in the packages and electronically to the collector to aid in the unpacking, identification, and cataloging of the material. This method allowed for over 500 trackable yet uncataloged elements to be shipped to the original collector with approval from the Museum Registrar, resulting in diminished museum backlog and material identification which aids in the completion of curation and publication of research.

REINVIGORATING THE VOLUNTEER PROGRAM AT THE MUSEUM OF GEOLOGY DURING THE COVID-19 PANDEMIC

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The Museum of Geology's (MoG) volunteer program at South Dakota Mines (SD Mines) lacked cohesive structure, protocol, and policies prior to 2020. Much of its volunteer base consisted of college students (high turnover per semester) and a small group of dedicated community members (low turnover) that primarily worked in the fossil preparation laboratory. Other spheres of the museum including collections and exhibits lacked a dedicated volunteer base. Inconsistencies in volunteer management and effort throughout the museum, coupled with high volunteer turnover, resulted in many incomplete projects. During the museum's 3.5 month closure due to COVID-19, staff and faculty discussed updating the volunteer program and began to research other institutions' methods and policies. A SurveyMonkey poll was sent to 13 past and 6 present volunteers and several external institutions were contacted for feedback on how to improve the MoG volunteer program. Those considerations were implemented in fall 2020 through a revised program designed to foster higher retention rates, optimize staff time, strengthen relationships with volunteers, and spread resources evenly throughout the museum's facilities. The new program's volunteer manual contains a structured onboarding process, code of conduct, museum policies, and campus information to welcome and guide new volunteers. A questionnaire was also designed for prospective volunteers using short answer questions, semantic differential scales, and checkbox self-assessments, allowing staff to screen participants objectively. The MoG is currently implementing this new program and plans to send out evaluation surveys at the end of the academic year. Initial observations indicate a higher retention rate among student volunteers between fall and spring semesters and an increase in productivity in the fossil preparation laboratory and collections. Staff also reduced volunteer training time by conducting group trainings and workshops rather than one-on-one sessions. By maintaining and updating this structured program, we expect the MoG volunteer base to grow and increase in productivity across all spheres.

COLLECTION AND PREPARATION OF A NEARLY COMPLETE *TRICERATOPS PRORSUS* SKULL PROVIDES OPPORTUNITY FOR PUBLIC EDUCATION IN MATERIALS AND METHODS IN PALEONTOLOGY

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The opportunity to engage and educate the public regarding the comprehensive process of readying a fossil specimen for research and museum exhibition rarely occurs concurrent with the work. However, the discovery (2016), excavation (2017–2018), recovery (2018) and initial preparation (2019) of an articulated, nearly complete skull of *Triceratops prorsus* from the Upper Cretaceous Hell Creek Formation of Montana afforded such an opportunity. Paleontology field expeditions undertaken by the North Carolina Museum of Natural Sciences (NCMNS), are blogged, tweeted and recorded on NCMNS social media platforms directly from the field. Moreover, live-stream interviews by field team members are broadcast directly into the Daily Planet theater in the museum's research wing and are free and open to the public. Once the specimen arrived at the museum, it was placed prominently within the publicly viewable Paleontology Research Lab allowing museum visitors to watch the preparation process. The opening of the field jacket in September 2019 was live streamed by NCMNS to local news agencies and this event, open to the public, drew curious museum visitors eager to see the specimen emerge from under its protective casing. Paleontology staff working with the Audio/Visual department, set up a time-lapse camera system which snaps a still photo every five minutes to document the progress of preparation from start to finish. Current preparation status is routinely reported via Twitter and other museum social media platforms and highlights preparation progress of the skull and the discovery and preservation of ancillary fossil specimens (e.g., other taxa, and plant fossils) in the surrounding matrix. Preparation is ongoing and projected to continue for more than a year. This project and the discovery of such an iconic dinosaur species has allowed us to more broadly engage and educate the public regarding the materials and methods of paleontology generally and fossil preparation and conservation specifically.

DEVELOPMENT OF HANDLING AND STORAGE PROCEDURES FOR RADIOACTIVE AND RADON GAS BEARING PALEONTOLOGY COLLECTIONS

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The Museum of Northern Arizona, working with an industrial hygienist, created a standard operating procedure to test for radioactive fossils and minerals in our collection as part of an Institute of Museum and Library Services (IMLS) grant. The procedure outlines protocols to safely store these specimens, and minimize staff, volunteer, and researcher exposure. Several formations in the American West have fossil vertebrates and petrified wood known to be radioactive. These include the Chinle, Kayenta, and Morrison formations, all present in our collections. While many fossils from these formations are at or below background radiation level, others are above background and need proper handling and storage. Radioactive fossils can be harmful to human health in a couple ways. Gamma and beta radiation can penetrate the skin, internal organs, and bone marrow; dense lead shielding is needed for protection. Alpha radiation is not hazardous externally, but if inhaled in a gaseous form like radon, it can be deposited in the lungs and damage tissues. Radon daughters in particulate form are most harmful in dusty environments as they adhere to dust. This is especially of concern to preparators, and local dust extraction and N100 respirator masks should be used whenever preparing radioactive fossils. In our collections, Mesozoic fossils were tested with a Ludlum Geiger counter, and radon gas formation was measured using canisters and a Corentium radon detector. When working with radioactive specimens, protective equipment consisting of a lead apron and disposable nitrile gloves are worn, as well as dosimetry chest and ring badges to measure exposure. Our most radioactive specimens are stored in a modified Delta Designs, Ltd. case. It is engineered with a local exhaust ventilation fan with 100% discharge outdoors, preventing buildup of radon within the case. Because gamma radiation can penetrate through cabinet doors, a radiation area was designated around the cabinet and only authorized individuals are allowed in this area. Creating these procedures will help to decrease exposure to radiation in our collections, and we hope they can be helpful to other institutions as well.

CHANGE IN ASPHALTIC LATE PLEISTOCENE FOSSILS IN RESPONSE TO ASPHALT-REMOVAL WITH A VARIETY OF SOLVENTS: A CONTINUING INVESTIGATION

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A study at Rancho La Brea (RLB) included 6 solvents and 48 fossils from Deposit 14 of 'Project 23' – an excavation of Late Pleistocene asphaltic deposits. This follow-up study explored the effects of the solvents: Aerotron, Butyl cellosolve (BC), D-limonene (D-lim), Ecolink 1171 (Ecolink), Novec 73DE (Novec), and n-Propyl Bromide (nPB). Methods involved ambient temperature soaking and manual cleaning of bird femora, canid metapodials and vertebrae. Soaked fossils were submerged for 24 hours. nPB proved most efficient for matrix removal in soaking trials and Novec for manual cleaning trials.

Assessments over a 9-month period determined the effects of solvents on changes in odor, color, mass, and integrity. This period was sufficient to discern changes in the specimens. Assessment will recur annually to observe continued changes. All Cal/OSHA and institutional H&S procedures were followed for both this follow-up study and the original study, including PPE use.

Aerotron and Novec had no solvent odor after nine months. BC, nPB, and Ecolink had only mild odors. D-lim retained the strongest odors. Odors were assessed qualitatively by a single observer. Changes in fossil color were monitored using a Canon 6D camera, Canon MP-E 65mm 1-5x macro zoom full frame lens and compared using Munsell soil color charts. An insignificant number of specimens displayed color change. Mass fluctuations stayed within +/-1g, suggesting that these solvents do not affect fossil mass over time.

Humidity levels were highest in winter, when fossil deterioration rose across all groups. Specimens treated with Novec and Aerotron had the least change. nPB and D-lim specimens changed moderately in bone integrity. Fossils prepared with BC and Ecolink had the highest frequency of cracking, flaking, and visible dehydration.

The results of this study indicate Novec performed best in all categories, followed by nPB. D-lim performed poorly with the greatest degree of post-solvent degradation and, with BC and Ecolink, will not be used at RLB. nPB will be phased out in the RLB Preparation Lab and replaced with Novec. Only manual surface cleaning will be considered for fossil preparation at RLB.

COMPACTED FIBERGLASS ARMATURE FOR SUPPORTING SMALL FOSSIL SPECIMENS

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Armatures to support fossil specimens are commonly constructed with metals such as steel or brass. Metallic armatures can present risks for small and delicate fossil specimens, as repeated fit tests, abrasion, and metal corrosion can damage the fossil. An alternate armature material is here presented, made using stacked layers of fiberglass cloth which are saturated with solutions of Butvar B-76 adhesive liquefied in acetone (approx. 30% solution by weight and approx. 7.5% solution by weight), and compressed between sheets of Tyvek polyethylene cloth until set. The result is a stiff sheet of archival material which can be cut to size, adjusted in shape with the use of a liquid solvent, and adhered directly to the specimen if desired. The reversible properties of the adhesive provide a means to remove the armature in the future. This method is an adaptation of preexisting related techniques: using temporarily adhered string to maintain the alignment of pieces of a fractured specimen, and using paper or fiberglass adhered to thin specimens as a supporting backing material. A drawback of this technique is the reduced function of the fiberglass support under heavy weights or when spanning large surface areas. This method can be used in exhibit environments, in creating storage supports which can be CT scanned along with the specimen, and for the reinforcement of select fragile specimen features.

A case study is presented using this method and materials to alter a historical display mount of the small mammal *Leptomeryx evansi* (USNM V16754) to provide support for fragile freestanding articulated limbs. The use of this method reduced overall time needed to accomplish the stabilization task versus the fabrication of a metal armature, avoided the use of equipment and hazards associated with welding or brazing, and avoided risk to the specimen associated with altering the original mount structure to properly anchor metal armature. Results of work include the greatly reduced likelihood of fracture and loss of limb elements, preserving the integrity of the specimen as both a display and research object.

CAPTURING CURIOSITY: VISITOR ENGAGEMENT AT THE STERNBERG MUSEUM FOSSIL PREP LAB

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A working fossil preparation laboratory, or 'fish bowl' lab, is a publicly accessible space within a museum where visitors can view and speak with the staff and volunteers actively preparing fossils. These labs provide a unique behind-the-scenes experience where visitors can observe and engage with science in action. The Oceans of Kansas Fossil Prep Lab at Fort Hays State University's Sternberg Museum of Natural History completed renovations to become a modern, operational fossil prep lab in 2019. Currently, the lab relies solely on university student workers and volunteers and is only in use on average ten hours per week during normal museum hours. While the possibility of incorporating media such as videos, illustrations, and signage into the visitor's experience at the lab exists, there has been little focus on creating these forms of media. Previous research indicates that positive visitor experience is largely dependent on interaction with a preparator while visiting a working lab. The purpose of this study was to determine the best ways to encourage engagement and enhance adult visitor experiences while visiting the prep lab when unstaffed. A total of 35 visitors between the ages of 18-65 were surveyed using iPads and the online survey platform Qualtrics in front of the Oceans of Kansas Fossil Prep Lab. To encourage visitor participation, the survey consisted of only 11 questions and was designed to require less than 5 minutes to complete. Survey results indicate the majority of visitors prefer to be engaged through interactive activities, videos, and social media with the topics of field work, paleoecology of Kansas, and geographic origin of fossils. These findings provide a framework in understanding visitor experience at a working fossil prep lab while the lab is not in use.

A METHOD FOR PRODUCING ARCHIVAL FOAM INSERTS QUICKLY AND ECONOMICALLY USING PRE-MADE TEMPLATES

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Safe fossil specimen storage is one of the most critical components of maintaining paleontological collections. This means not only ensuring materials used in collections are archival, but that the efficacy of these materials is maximized. Polyethylene foam is one of the most common materials used in paleontology collections, with Ethafoam being among the most recognizable brand names. This material is frequently used in paleontology collections to line archival boxes, buffering specimens from minor jostling and ensuring they do not contact hard surfaces. Woefully, many collections are plagued with uneven and poorly-fitting foam inserts—often cut manually using scissors. Ill-fitting foam inserts can slide in their boxes and allow small specimens and fragments to make their way off of the foam and underneath it, potentially damaging them. In this project I demonstrate a technique for cutting form-fitting foam inserts for archival boxes using pre-made templates. These templates are stiff and can be used alongside a sharp blade such as a craft knife to ensure quick and consistent production of foam inserts.

Templates are made first from paper, then foam to ensure fit, then finally a hard material such as Sande hardwood or particle board. Only one template is made for each box size, so accurate measurements are taken to ensure a long-lasting fit. These foam inserts protect specimens from contact with the box sides through the inclusion of lateral foam wings cut from 0.5 in-1.0 in depending on the box height. These provide additional protection by maintaining tension in the foam insert, preventing it from moving and shifting under specimens. This archival method requires minimal initial input of time and money to produce the templates and master the cutting technique. However, the use of templates ensures maximum economy of Ethafoam of any thickness with less scrap waste by producing consistently-sized foam inserts. It is an invaluable technique for paleontology collections of all sizes, but particularly those with rapidly growing collections.

OLD DINOSAUR DIGS WITH POOR SITE DATA RECORDING + PRIOR SAMPLING OF ARTICULATED/ASSOCIATED SKELETONS + TIME TO ERODE AWAY ALL TRACES OF PRIOR DIGGING = A RESEARCH AND COLLECTIONS CONUNDRUM FOR MODERN VERTEBRATE PALEONTOLOGISTS

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Improper locality documentation for dinosaur skeletons collected in the early 20th Century in Canada has been a long-recognized problem. Much effort has been made to relocate lost quarries or identifying found but unidentified “mystery quarries” based mainly on surface bone scrap and dateable garbage. Since the late 1980’s, close to 100 sites in Alberta have been relocated this way. Some newly recognized problems add a wrinkle to these efforts and affect fieldworkers and researchers globally. One was the deliberate sampling of specific bones from skeletons. In fast-eroding sites, evidence of this sampling may be lost, and the modern worker fails to realize this. For example, a headless hadrosaur may have been “head-hunted”. Another is the accidental incomplete collecting of disarticulated skeletons. A 1913-1914 ankylosaur quarry, traces of which had been completely eroded away, was rediscovered in 2018. More bones were just being exposed after 104 years of erosion. 2018-2019 work revealed a disarticulated femur, tibia/astragalus, metatarsal, ossicles, several large osteoderms, ischium, two parallel rows of caudal tendons and a perfect 1.7- metre-long tail club. The author matched a labelled 1913 AMNH field photo to the 2018 site from which *Euoplocephalus* AMNH 5337 was collected. This situation exposed an unrecognized problem. On finding a partial dinosaur skeleton, how would you know if the specimen was once sampled, long ago? After curation, parts of one skeleton are in two museums with two catalogue numbers; in our case AMNH 5337 and TMP 2018.012.0151. Fortuitously, the photo match, and non-duplication of bones in the AMNH and TMP samples allowed for a successful resolution. In other cases, knowing who worked the site first, when, and where the missing bones are now may prove problematic. It behooves us to record accurate site information, take numerous site photos, some with skyline and in the case of disarticulated skeletons, digging at least one metre beyond the last bone. If the AMNH had dug another ~50 cm in 1914, they would have found what we did in 2018-2019. COVID-19 has delayed finishing the reopened quarry and fully resolving this dilemma. Trading of casts of AMNH and TMP original material, sharing precise locality data with the AMNH, and revised specimen description are possible outcomes.

FLIPPING GIANT DINOSAURS: A HOW-TO GUIDE FOR ROTATING MASSIVE, DELICATE FOSSILS

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The Denver Museum of Nature & Science (DMNS) has a rigorous field paleontology program that supports national and international curatorial research. Over 80% of the fossils collected and prepared by DMNS are dinosaurs, and often include body blocks or nearly complete skulls from taxa such as *Pentaceratops*, late Jurassic sauropods, and *Edmontosaurus*—some of the largest fauna to ever walk the Earth. Traditional preparation techniques and methods are applied to these fossils (some weighing in at 3,000+ lbs.), but challenges arise when the time comes to rotate and prepare the remainder of the fossil encased in the field jacket. Flipping a specimen from prepared to un-prepared surface may appear straightforward; however, the convoluted shapes of immense dinosaur skulls and skeletons consistently pose significant challenges. The Earth Sciences lab at DMNS has experimented with different materials and methods for successfully re-orienting large dinosaur fossils while maintaining the structural integrity of the specimen. Using large plaster support structures, ratchet straps, and cushion foam, oversized fossils with complex morphologies can be effectively flipped and stabilized for further preparation. Case studies of projects requiring construction of specialized structures for flipping include: a *Triceratops* skull, *Majungasaurus* caudal series, *Pentaceratops* skull, an unnamed ceratopsid body and skull from southern Utah, an *Ophthalmosaurus* skull, and mammoth and mastodon pelves and skulls. By sharing the materials and processes required for manipulating large fossils, the DMNS lab aims to instill confidence in the ability of other organizations to tackle large-scale prep projects, too.

THE SILT BUCKET CHALLENGE: LESSONS LEARNED FROM PROLONGED SCREEN TIME

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In 2019, mitigation efforts associated with highway construction revealed a new late Pleistocene site in Valley County, Nebraska. A disarticulated bison skeleton was dispersed over an 8 m x 3 m area. The subsequent discovery of lithics suggested human interaction with the skeleton prior to burial. High resolution sampling was needed to determine the stratigraphic context between the lithics and fossil horizon. Large quantities (~18,770 kg) of excavated sediment collected in stratigraphically-controlled 10 cm intervals were bagged for wet-screening. The amount of accumulated sediment was too great for transport to the Museum and environmental concerns prevented processing in a nearby river or body of water. Nebraska Department of Transportation offered their facility and use of a front-end loader as a washing basin. The loader served two key roles: 1) a quick cleanup of unwanted processed sediment and 2) creation of an ergonomic work space by adjusting the bucket height to eliminate prolonged bending and back strain.

Traditional methods of placing small quantities of sediment in a sieve and submerging with slight agitation would have been time prohibitive. The most efficient setup involved using a set of four five-gallon buckets per bag. Each bucket was filled approximately one-third full with water and each bag was equally distributed among the four buckets in the set. The bucket contents were stirred lightly by hand to mix the sediment and water. Contents soaked as subsequent bags were distributed into their respective bucket sets. After soaking for roughly 6 minutes, the slurry was swiftly swirled by hand until a vortex formed getting the silt into suspension. While in suspension, the slurry was poured through a Vollrath 5270 16” aluminum sieve using 20 mesh screen (0.841 mm openings). The sieve was submerged and lightly agitated as needed before repeating the process with remaining three buckets in the set. This “stir and pour” method reduced processing time nearly 4.5 minutes per 23 kilograms of sediment over traditional dipping techniques. The processing time could be decreased further by allowing the sediment to dry prior to wet-screening. Dry sediment reduced better than damp sediment. Longer soak times did not result in greater overall sediment reduction. No perceivable damage was caused to specimens using either screening technique.

A NEW WAY TO MUSEUM: EDUCATIONAL PROGRAMMING BORN FROM COVID

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When museums around the world closed in response to the COVID-19 pandemic, they were left scrambling for ways to contribute, stay relevant, help families with children at home, and not crumble financially. The Sternberg Museum of Natural History's first response was a "Dome From Home" series of periodic, informal Facebook live events. This stop-gap allowed us to reflect on how to make our current educational programming more effective, sustainable, and profitable. Thanks to a CARES grant, the Museum has developed a professionally produced YouTube series called "A New Way to Museum" that spans a wide range of natural history topics and targets specific audiences from pre-K to adults. With the versatility of video, we can provide educational content beyond what we did pre-COVID by highlighting collection practices, specimen preparation techniques, live animal footage, and specimens not on display to a wider audience.

Within the first month of publishing videos to YouTube, subscribers to our channel increased by 45% and the number of views increased by 59%. By tracking the number of views, watch time, target audience, and subject matter, we are able to identify key demographics to target our videos. This helps us grow our product in the most beneficial (and profitable) way. Media production also necessitated the expansion of the Museum's database capabilities. By employing the same software developers who designed our paleontology database, we could utilize our database experience and modify existing workflows. Additionally, this YouTube series is linked to a monthly membership subscription (via Patreon) as a source of revenue to sustain video production and financially benefit the museum.

A New Way to Museum is a success story highlighting the importance of museum-wide collaboration. Collections and exhibits form the basis of content, museum personnel provide on-air talent, multiple departments collect and analyze data, and collection staff assists with media archiving. This project has proved to be an effective way to get staff, volunteers, students, and the general public re-engaged with the museum while also expanding our impact and revenue streams.

A METHOD FOR EFFICIENT AND SAFE MOLDING OF LARGE, COMPLEX FOSSILS AND SUBSEQUENT GENERATION OF INEXPENSIVE, HIGH-FIDELITY CASTS

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In scientific institutions, casts of fossils are made for research, teaching, display and public education, archiving, and exchange. Archiving casts is particularly important if original specimens are returned to remote institutions or if their long-term conservation cannot be guaranteed. Large and/or complex fossils pose special problems for molding and casting relating to demolding, expense, and concealing parting lines. An approach that addresses these issues is construction of thin, multi-part rubber molds supported by fiberglass and resin mother-molds, use of plugs in mold parts to occupy deep morphological spaces, and hollow-casting using polyester resin and fiberglass matte. We adopted this approach to cast three titanosaur vertebrae from the Upper Cretaceous Lameta Formation of western and central India. Sections of each vertebra were isolated, using Klean Klay to block off the section, supported by insulation board pieces hot-glued to form scaffolding where necessary. Three layers of RTV silicone rubber (GI-1100) were thinly painted or sculpted onto the section (the third layer was thickened with a thixotropic agent). Plaster plugs were filled into mold segments covering deep pneumatic fossae typical of titanosaur vertebrae. Two layers of fiberglass mat and polyester laminating resin were applied over the mold pieces to form the mother-mold, with a flat extension all around beyond the mold line to provide a surface for bolt holes to be drilled at the end of the process to hold the mold pieces together. Parting lines were placed along edges of vertebral laminae or along natural inflections of the morphology, where they are least noticeable. The number of mold subdivisions was based on ease of removal of each section from the original, protecting thin vertebral laminae from breakage. The casts were made by thinly applying multiple layers of talced, pigmented polyester resin into each mold section, finishing with un-talced resin and fiberglass mat, and then bolting the parts together. Resulting casts are inexpensive, strong, accurate, lightweight, and have negligible parting lines.

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Wally's Critter Tacos

1 lb. Ground *critter* (I prefer venison, bear, or groundhog but any meat will do)
½ Tbsp Chili powder
½ tsp Red or cayenne pepper
½ tsp Cumin
1 tsp Chopped (dried) onions
Pinch of Oregano
Pinch of Paprika
Pinch of Thyme
Pinch of Garlic
½ Tbsp Flour
Salt and black pepper to taste

- Brown meat and drain (if fatty) – not needed for well-trimmed meat.
- Once browned, mix all ingredients (with meat) and about 1 cup of water. Simmer until desired consistency (less for people who like sloppy joe style, longer for those who like it crumbly).

Wallace Garden Chili

This recipe doubles and/or triples well if you have big pots and want to can or freeze some.

1 lb. Ground meat (I prefer venison, bear, or groundhog but any meat will do)
1-28 oz. can of crushed tomatoes
1-15 oz. can of tomato sauce
1-12 oz. can of tomato paste
3-16 oz. cans of pinto beans*
1-16 oz. can of black beans
1-16 oz. can of whole kernel corn
1-16 oz. can of kidney beans
2 Chopped/diced green peppers
1 Chopped/diced sweet onion
1 cup of water
1 Tbsp Chili powder
½ tsp Red or cayenne pepper
1 tsp Cumin
** Obviously, beans can be "mixed and matched" depending on personal preference.*

- Brown (and drain if needed) meat separately. Sauté peppers and onions lightly = until soft.
- Combine all in a large stockpot and simmer (on low heat) for several hours (sometimes I let it go all afternoon when I do a double or triple batch). Leave uncovered while cooking to reduce the water content and stir regularly to keep it from sticking/burning to the bottom.
- Best reheated the next day so flavors have time to combine, but just fine on day one.
- Good stand alone, but also awesome served over spaghetti noodles with cheddar cheese on top!

Chocolate Gravy (serve with biscuits)

1/4 cup cocoa
3 Tbsp all-purpose flour
3/4 cup sugar
1/4 tsp salt
2 cups milk
1 Tbsp butter softened
2 tsp vanilla

In a medium mixing bowl mix the cocoa, flour, sugar, and salt together. Add the milk and mix until well combined. Pour the mixture into a medium saucepan. Cook over medium heat, stirring constantly, until the texture is similar to gravy. About 7-10 minutes. Remove from the heat and add the butter and vanilla. Stir.

Red Eye Gravy (usually served with country ham)

1/2 cup black coffee
1/4 cup water
1 tbsp butter
1 tsp honey (optional)
Cracked black pepper to taste

To the hot pan, add the black coffee, water, and extra butter. Bring to a boil and scrape the bottom of the pan to remove any flavorful browned bits. Simmer the Red Eye Gravy. Reduce the heat and simmer 8-10 minutes, to thicken and reduce the red eye gravy by half or more. Stir in honey and cracked black pepper to taste.

Name: _____

Just For Fun

P	E	T	A	R	B	E	T	R	E	V	T	L	A	V	I	H	C	R	A	C	Y	O
E	F	J	R	E	P	A	P	E	C	I	R	L	U	S	R	M	M	M	D	O	C	B
P	S	P	A	Y	E	S	I	V	N	I	P	A	A	G	U	A	U	A	M	L	R	C
P	D	A	I	P	M	M	A	G	V	L	M	A	B	P	A	G	E	M	Y	L	A	V
G	S	I	R	M	P	L	A	S	T	E	R	I	T	Y	S	N	S	M	P	E	C	E
C	O	N	S	E	R	V	A	T	I	O	N	R	N	G	O	I	U	A	G	C	K	N
T	Q	T	C	D	B	O	N	E	L	R	E	A	U	O	N	F	M	L	R	T	L	T
E	M	B	R	C	S	L	Q	K	O	X	P	B	O	L	I	I	G	S	O	I	A	I
N	A	R	I	C	D	I	A	C	N	A	O	R	M	O	D	C	N	P	T	O	C	L
O	O	U	B	Q	I	S	G	A	A	W	C	A	Y	T	H	A	I	E	A	N	O	A
T	F	S	E	E	O	S	N	J	H	O	S	S	T	N	R	T	T	C	R	S	R	T
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C	H	A	I	D	A	F	D	L	E	R	R	O	V	E	V	O	A	M	P	V	Y	O
A	T	E	C	A	R	A	L	E	F	A	C	N	A	L	T	N	C	E	E	X	H	N
J	E	O	A	R	A	N	O	I	E	C	I	P	C	A	U	Z	C	N	R	B	B	P
K	T	P	X	C	P	G	M	F	U	B	M	E	H	P	B	Z	H	L	P	X	V	V

Find the following words in the puzzle.
Words are hidden ↑ ↓ → ← and ↘ .

ACETONE	CARBOWAX	DINOSAUR	MICROSCOPE	PPE
ACID	CASTING	ETHAFOAM	MOLDING	PREPARATOR
AIR ABRASION	CAVITY MOUNT	ETHANOL	MUSEUM	RICE PAPER
AIRSCRIBE	CCD	FIELD JACKET	PAINT BRUSH	SDS
AMMP	COLLECTIONS	FOSSIL	PALEONTOLOGY	SPECIMEN
ARCHIVAL	CONSERVATION	HYDROCAL	PARALOID	VENTILATION
BONE	CRACK	MAGNIFICATION	PIN VISE	VERTEBRATE
BUTVAR	CRADLE	MAMMAL	PLASTER	

Created by Conni and Shane using Word Search Generator on
Super Teacher Worksheets (www.superteacherworksheets.com)

SAVE THE DATES!

APRIL 12-16, 2022

SEATTLE, WASHINGTON

THE BURKE IS BACK (FOR THE FIRST TIME SINCE 2012)!

The Association for Materials & Methods in Paleontology is currently seeking applicants for the 2023 meeting and beyond.

The Annual Meeting is vital to fulfilling AMMP's Mission: *education and advocacy to improve ethics, standards, and practices in paleontology.*

For inquiries, please email the Annual Meeting Committee: annualmeeting@paleomethods.org

We look forward to hearing from you!

Appendix A
AMMP Code of Conduct

The Association for Materials & Methods in Paleontology (AMMP) values the diversity of views, expertise, opinions, backgrounds, and experiences reflected within our community and is committed to providing a safe, productive, and welcoming environment for all participants. This Code of Conduct (COC) is important for promoting diversity and creating an inclusive, supportive, and collaborative environment for all people and cultures.

All event participants—including, but not limited to attendees, speakers, volunteers, exhibitors, personnel, members of the media, and service providers—are expected to abide by this COC.

We expect everyone to respect the following list of behaviors:

Expected Behavior

- Treat everyone with kindness, respect, and consideration, valuing a diversity of views and opinions (including those you may not share).
- Exhibit professional behavior at all times.
- Communicate openly, with respect for others, critiquing ideas rather than individuals.
- Be mindful of your surroundings and those of others. Alert event staff if you notice a dangerous situation or someone in distress.
- Make space for new people to join in your conversations.

Unacceptable Behavior

- Harassment, intimidation, or discrimination in any form including, but not limited to:
    - Written or verbal abuse
    - Exclusionary behavior and microaggressions related to age, physical appearance or body size, employment or military status, ethnicity, gender identity and expression, individual lifestyle, marital status, national origin, physical or cognitive ability, political affiliation, sexual orientation, race, or religion
    - Unwanted sexual attention
    - Use of sexual or discriminatory images or language
    - Deliberate intimidation, stalking, or following
    - Sustained disruption of talks, workshops, or other events o Bullying behavior, including intentional microaggressions o Retaliation for reporting unacceptable behavior
- Unacceptable behavior intended in a joking manner still constitutes unacceptable behavior.
    - Avoid jokes about a specific group (like “undergrads”).
    - Avoid making derogatory comments toward a specific individual.
- The recording or transmission of any sessions, presentations, demos, videos, or content in any format is strictly prohibited unless documented permission by AMMP is granted in advance.
- Disruption of presentations during sessions is strictly prohibited. All participants must comply with the instructions of the moderator(s) and any event staff.

- Participants should not copy or take screenshots of presentations if the author posts an icon prohibiting such action on the title page or other pages of the presentation, or if the author verbally announces such an action is prohibited during the course of their presentation.

Note About Differences of Opinion and Offense

The primary benefit of a collaborative professional event is the unhindered involvement and contribution of all participants. In order to achieve the objectives of an event within the limited time provided (with the universal benefit of all participants being fully engaged) discussions should be focused on the meeting topic at hand. All participants must be welcome and able to equitably and effectively participate.

Articulations

It is not a violation of the AMMP COC to express an opinion, raise research, or describe an experience (i.e. an "articulation") that is at odds with the opinions of or is found offensive by others. An articulation must be part of an on-point discussion of the AMMP event topic at hand and offered in a manner that does not interfere with others' reasonable ability and welcome to fully participate. Debate is an integral part of professional collaboration and it is important that differing positions be expressed with respect and consideration for all. Doing so in a manner that reflects intellectual rigor and is demonstrably mindful of minimizing, as reasonably possible, its potential adverse effect on others' ability to participate is considerate and professional. (Offering an advance warning of the potential for impact on others is one way to demonstrate such respect and consideration for all.) This includes avoiding dominating a discussion, expressing an articulation that is reasonably expected to cause offense gratuitously (i.e., unrelated to or unnecessary for the work on that topic), and voicing articulations as personal attacks (ad hominem) or put-downs of an individual.

It is important to show consideration for anyone who appears distressed by promptly halting the cause and demonstrating caring while still pursuing a way to share pertinent information with the event moderator's assistance if needed.

Reporting Incidents

If you feel that you are the subject of unacceptable behavior, have witnessed any such behavior, or have other concerns, **report the incident to the email address below as soon as possible**. AMMP will work with you to resolve the situation.

AMMP will treat all reports seriously and will work to understand the situation through prompt investigation, including conversations with relevant individuals and witnesses before determining an appropriate course of action. AMMP will exercise strict confidentiality with the identities of the reporting individual(s) and involved parties; however, if identification is necessary for resolution of incidents with higher authorities, AMMP will comply with information requests.

Contact information to report an incident: conduct@paleomethods.org

Consequences

- Anyone requested to stop a behavior by AMMP is expected to comply immediately.
- AMMP may take any action deemed necessary and appropriate, including immediate removal from the event without warning or refund.
- AMMP reserves the right to prohibit attendance at any future event, virtually or in person.
- Further action may be deemed necessary to address egregious acts.

Appendix B
Essential Competencies for the Professional Vertebrate Fossil Preparator

1. Critical Thinking

The judgments and actions of the qualified preparator are guided by a methodology that places a priority on enhancing, not diminishing the scientific value of the specimen. Critical thinking allows the application of the knowledge, skill, and experience of the preparator to assess the specimen, the task at hand and the desired end product before commencing preparation and during every stage of preparation. The preparator must be able to continually monitor the immediate physical impacts upon the specimen by treatments, handling, examination, and consider the long-term effects of the materials and techniques applied to the specimen. The qualified preparator has the ability to conceptualize, think creatively and evaluate information in a systematic, purposeful, efficient manner. The preparator also has an appreciation for their own limits and knows when and where to seek guidance.

2. Aptitude for Fossils as Materials

Competent preparation requires an intrinsic sensitivity and feel for fossils as physical, often fragile material. The preparator combines this innate aptitude with an understanding of the scientific value of fossils, and a lack of competency in this area cannot be offset by knowledge of preparation and conservation theory.

3. Understanding of Fossils as Biological Materials and Data

The qualified preparator has the ability to exercise good judgment when interpreting the distinction between biological remains and matrix, and is guided by a fundamental knowledge of vertebrate anatomy, physiology and evolution. The preparator can recognize that fossil specimens are the physical representations of primary paleontological data. A preparator has a basic understanding of fossils as an individual's remains and the biological data contained therein. A qualified preparator uses correct anatomical terminology to document preparation and communicate with researchers.

4. Understanding of Fossils as Geological Materials and Data

A qualified preparator should have an understanding of fossils and matrices as the products of geological processes and as geological data. This should include knowledge of taphonomy, basic geological principles, and different modes of preservation. Preparation usually requires removal of matrix from bone, and some fossil evidence such as trace fossils, root-casts, phytoliths and soil structure are contained within the matrix. Therefore, the preparator should have an awareness of data contained within the matrix and understands that any modification of matrix is a potential loss of data.

5. Participation in the Science of Paleontology
A qualified preparator is conversant in the specialized vocabulary, terminology, and research goals of paleontology, and can alert researchers to evidence and assist in its interpretation. The preparator understands the pertinent scientific references, and is able to share and receive relevant information with other subject matter experts.

6. Understanding of Conservation Principles and Ethics
The preparator is also a conservator and makes every effort to ensure that the prepared specimen will resist deterioration for as long as possible. The qualified preparator recognizes the agents of deterioration and understands the principles of preventive and remedial conservation. The preparator is familiar with the current literature, principles, ethics, and specialized vocabulary of conservation.

7. Documentation and Record Keeping
The qualified preparator understands that preparation is part of the scientific process and ensures that all data generated within the laboratory, including identifications, photographs, preparation records, and housing materials are documented and archived. The preparator keeps identifying numbers in association with specimens throughout the preparation process. The preparator keeps records of all tools, techniques, and materials used to prepare or house the specimen that might impact physical or chemical interpretation, or that might have to be removed in the future. The qualified preparator is able to create publishable documentation of materials and methods for inclusion in scientific descriptions of the specimen.

8. Understanding and Aptitude in the Use of Preparation Tools and Techniques
The qualified preparator can select the most appropriate tools and techniques to skillfully reveal scientific information, and safeguard the long-term well being of the specimen. The preparator should be proficient in the preparation of common modes of vertebrate fossil preservation and in challenging situations should be able to seek further guidance in the preparation and conservation literature. The preparator augments this knowledge through professional conferences and communication with colleagues.

9. Understanding and Use of Adhesives
The qualified preparator is familiar with the range of adhesives available and is able to select the most appropriate adhesive for a given task. The preparator has knowledge of the physical and chemical properties, uses of various adhesives, the setting mechanism and reversibility of adhesives, their solvents, and the advantages and disadvantages conveyed by each kind of adhesive. The preparator should also be familiar with the ethical implications of using adhesives on museum objects and the kinds of scientific data that may be obscured, lost or destroyed by the use of adhesives. A qualified preparator is conversant in adhesives terminology and

nomenclature and is able to justify decisions and correctly document adhesives used on specimens in preparation records and reports for publication. The preparator is able to mitigate and manage the potential health risks associated with the use of adhesives and solvents.

10. Understanding and Use of Molding and Casting Materials and Techniques

The qualified preparator is familiar with the ethical implications of using molding compounds on museum specimens and the kinds of scientific data that may be obscured, lost or destroyed during the molding process. The preparator is able to determine the suitability of the fossil for molding and type of mold produced based on its fragility, morphology, and other physical properties. The preparator is familiar with the physical properties and uses of various gap fillers, separators, molding and casting compounds commonly used in paleontology, is adept in their use and also trained in the management of potential health risks associated with molding and casting.

11. Use of Archival Labeling, Housings and Storage Environment

The preparator is aware that an essential step in the long-term conservation of fossil material is the use of archival labeling, housing, and proper storage environment. The qualified preparator incorporates specially designed archival housings into their preparation strategy, in collaboration with collection management staff. The preparator is knowledgeable about archival materials and proper storage environments and can recognize deterioration due to improper materials or storage conditions. As the understanding of storage materials evolves, the preparator is able to evaluate and modify storage materials and methods to ensure the long-term stability of the specimen.

12. Ethics of the Use of Specimens

The preparator is able to mitigate the risk of damage from research and education as much as possible without compromising the scientific value of a fossil specimen. The preparator is able to evaluate whether the specimen would be subject to undue or unnecessary risk by sampling, handling, loan, or display. A qualified preparator understands exhibition as a form of specialized specimen storage, and can evaluate exhibitions and their accompanying furniture, lighting, and other materials to ensure their compatibility with sound conservation practices.

13. Understanding Fieldwork

The preparator is aware that specimens should be collected with the goal of obtaining a stable specimen while ensuring that the greatest amount of geological and biological information is preserved, and understands that no fossil should be collected without comprehensive documentation. The preparator ensures that specimens are collected in a manner that facilitates preparation in the laboratory. The preparator knows and practices proper health and safety procedures while working out of doors in varying climatic conditions.

14. Health and Safety

The qualified preparator has the training to ensure their own safety and the safety of their coworkers and visitors by determining and mitigating physical and chemical hazards in the paleontology laboratory. The preparator should be able to comprehend Material Safety Data Sheets and select appropriate personal protective equipment and environmental controls, and have basic knowledge of emergency response and first aid.

2/23/2012 FINAL DRAFT by Matthew Brown, Amy Davidson, Marilyn Fox, Steve Jabo, Matt Smith

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