



fossil@flmnh.ufl.edu www.myfossil.org [@projectfossil](https://twitter.com/projectfossil) [TheFossilProject](http://TheFossilProject.com)

Club Corner: Dinosaur Research Institute -Discovering the Past With Funds for Future Scholars



DRI has contributed multi-year funding to excavation of the important *Albertosaurus* bonebed at Dry Island Buffalo Jump Provincial Park where 22 individual *Albertosaurus* have been identified.

By Guy McLaughlin

Following the retreat of the last Ice Age 12,000 years ago the meltwater gouged deep, steep-sloped river courses and threaded the Canadian west with coulees, ravines and gullies. Over the millennia their eroding slopes have unveiled a treasure of marine fossils and dinosaur bones revealing the life that flourished in a humid lush climate many millions of years ago. Alberta has an exceptional variety of dinosaur remains and a special responsibility in the study and preservation of this unique resource. Significant funding is required to prospect, excavate, prepare and study this resource before the fossils are exposed to weathering and destruction. Young scientists embarking on this fascinating profession need financial support for their research.

The Dinosaur Research Institute (DRI) <http://www.dinosaurresearch.com/> was established in 1996 by several keen amateur and professional paleontologists as a non-profit society. Its purpose is to raise and provide financial support for dinosaur research by graduate students and scientists. The Institute funds high-quality scientific dinosaur research on western Canadian dinosaurs; including exploration and recovery, preparation, presentation, and any related research. The DRI will also

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fund international dinosaur fieldwork provided the project relates to dinosaurs found in western Canada.

The 13-member Board is made up of world renowned scientists Dr. Jason Anderson, Dr. Philip Currie, Dr. David Eberth, Dr. David Evans, Dr. Eva Koppelhus, Dr. Michael Ryan, Dr. Darla Zelenitsky and Darren Tanke in addition to several amateur paleo enthusiasts.

Since 2004 the DRI has supported 121 projects in Canada and around the world and provided \$420,000 CAD in financial assistance. In addition the DRI has provided financial assistance of \$190,000 CAD for fieldwork and fossil preparation.



Dinosaur Research Institute president Al Rasmuson coaches Christian Kiss in jacketing skills.

DRI Gala Dinner, Nov. 3, 2018

The DRI raises funds in several ways from direct appeals to corporations and individuals to the sale of dinosaur-themed products. The Institute holds special annual events in Calgary to showcase the work and successes of the students and scientists it supports. The Institute will host its 14th annual Fundraising Gala on November 3, 2018 which features palaeontologists speaking on recent dinosaur initiatives in western Canada, as well as posters, displays and presentations by University of Alberta and University of Calgary paleo students.

These dinners are enthusiastically supported by Calgary's dinosaur community and have raised almost \$200,000 CAD over the years.

Dinotour, Aug. 3-6, 2018

This year the DRI is conducting its 5th [Dinotour](#) – a four-day guided exploration of southern Alberta's dinosaur quarries. This once-in-a-lifetime journey is guided by six of the scientists on the DRI Board and provides a unique opportunity to explore and learn about Alberta's palaeontological treasures. For more information, email info@dinosaurresearch.com

Examples of recently funded fieldwork include:

Southern Alberta Dinosaur Project

The vertebrate resources of the Milk River region of extreme southern Alberta have received little attention in the past yet the area contains some of the oldest dinosaur-bearing sediments in Alberta (Milk River, Foremost and

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Oldman formations). Since 2008 the DRI has provided funding to the Southern Alberta Dinosaur Project, a multi-year paleontological survey of the area with the goal of compiling a detailed biostratigraphic framework of the region. Project leaders also plan to document the dinosaur fauna of the lower half of the Belly River Group and the Milk River formation and compare dinosaur faunas and their associated environments through time. The fieldwork has been a collaborative project between Dr. David Evans of the Royal Ontario Museum, Dr. Michael Ryan of the Cleveland Museum of Natural History and colleagues at Alberta's Royal Tyrrell Museum.

Morrin Bridge Fieldwork, Albert

For two years the DRI has been funding University of Alberta fieldwork on the Red Deer River with 2017 having been a most successful season. Fieldwork led by University of Alberta postgraduate students focused on extensive sampling of two microsites containing an abundance of the rare theropod dinosaur *Troodon*. Nearly 500 kg of sediment were collected for bulk sampling, and surface collection recovered dozens of *Troodon* teeth, embryonic material from hadrosaur dinosaurs, dozens of frog bones, and the first recorded eggshell. A partial skeleton of a *Thescelosaurus* (a small herbivorous dinosaur) was recovered along with more material from a champsosaur discovered in 2016, and a well preserved hadrosaur trackway which will contribute to understanding of both the depositional settings in the formation and the behavior of the animals that lived here. Together, the sites produced 24 accessioned specimens comprising hundreds of individual fossils.



Southern Alberta Dinosaur Project fieldwork; *Wendiceratops pinhornensis* quarry on the Pinhorn Grazing Reserve of southern Alberta.

Mongolia

While the DRI concentrates on funding projects related to western Canadian dinosaurs not all funding is awarded to work in this region. Occasionally the Institute will support overseas initiatives such as a 2015 Mongolia fieldwork trip to gather raw data on the anatomy of Mongolian oviraptorids, to understand variation in the skeleton of oviraptorosaurs (the group to which Albertan caenagnathids belong). Fieldwork and museum visits allowed University of Alberta PhD candidate Gregory Funston to observe 21 oviraptorosaur skeletons first-hand, each of which provided excellent anatomical data. Much of this data was incorporated into a phylogeny that was recently published in the Journal of Vertebrate Paleontology, as part of the attached article "A new caenagnathid (Dinosauria: Oviraptorosauria) from the Horseshoe Canyon Formation of Alberta, Canada, and a reevaluation of the relationships of Caenagnathidae" (Funston and Currie 2016). <http://www.tandfonline.com/doi/abs/10.1080/02724634.2016.1160910>. In addition to describing a new species of Albertan caenagnathid, the paper also discusses sexual display structures in oviraptorosaurs and their bearing on phylogenetic testing.

The 2015 trip also provided data for a review of Mongolian oviraptorosaurs, entitled "Oviraptorosaur anatomy, diversity, and ecology in the Nemegt Basin".

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<https://www.sciencedirect.com/science/article/pii/S0031018217306065>

This study examines the ecological relationships of oviraptorosaurs and helps to explain why caenagnathids are present across Asia and North America, but oviraptorids are not.

Danek Bonebed, Edmonton Alberta

The DRI has been supporting fieldwork south of Edmonton at the Danek Bonebed, a recent find that since 2006 has been offering up hundreds of specimens. Most of the bones at Danek are from *Edmontosaurus regalis*, a classic hadrosaur with a long snout tipped with a shovel-shaped beak and one of the most abundant dinosaurs from the Late Cretaceous.

The *Edmontosaurus* are offering palaeontologists new details about the well-known hadrosaur. The occurrence of *Edmontosaurus* in central Alberta links these dinosaurs with contemporary members of the same species found in southern Alberta and even older specimens found in the northwestern part of the province. Plotting out these finds will help palaeontologists better understand what sort of habitat *Edmontosaurus* preferred and how populations of the dinosaur spread through North America.



University of Toronto post-graduate students head to McPheeters bonebed for a day's work.

Researchers also found some skull bones from an *Albertosaurus* that died close in time to the hadrosaurs. These bones represent the northernmost occurrence of *Albertosaurus* yet found and add to the picture that as the herbivorous dinosaurs of Cretaceous Alberta came and went, *Albertosaurus* remained a top predator for a longer span of time than any individual prey species.

To learn more about the Danek Bonebed, check out the special issue of the [Canadian Journal of Earth Sciences](#).

Graduate Student Support

- DRI Student Project
- Rene Vandervelde Travel Grant for the SVP Annual Meeting
- Scholarship Supporting Neoceratopsian Research
- Travel Grant for the CSVP Annual Meeting

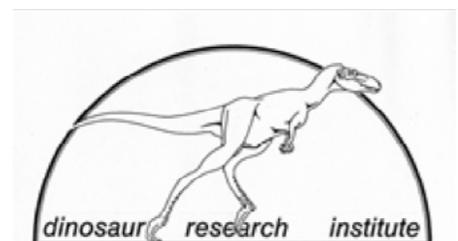
Grant details and application forms available at www.dinosaurresearch.com

Contact information:

Website: www.dinosaurresearch.com

Email: info@dinosaurresearch.com

Mail: Dinosaur Research Institute; P.O. Box 6353 Stn. "D", Calgary, AB. Canada, T2P 2C9



FEATURED PROFESSIONAL: DAVID BOHASKA

Editor's note: This issue we feature David Bohaska, a collections manager of Vertebrate Paleontology and research assistant at the Smithsonian National Museum of Natural History.

Can you describe your path to becoming a paleontologist? Were you into fossils as a child? Did you begin college thinking you would become a paleontologist?

I've had an interest in nature for as long as I can remember, and dinosaurs in about 5th grade, but it was a field trip (April 1964) to Calvert Cliffs, Maryland (marine Miocene) in a 7th grade nature club that really got me interested. I went to college planning to be a paleontologist.

It must be amazing to work at the Smithsonian! What was your route to finding your current position?

Since the Smithsonian was relatively nearby, I dreamed of working here from grade school on. I checked that goal off my bucket list after I was a summer intern here in 1975. After receiving my Masters, I worked as Registrar at the Calvert Marine Museum from 1979-1989. I was mostly accessioning and cataloguing maritime history and fisheries artifacts (which I enjoyed, particularly after reading "Beautiful Swimmers", but that's another story) but kept my hand in paleontology, mostly collecting on weekends. (Paleontology of Calvert Cliffs is one of the major themes of the CMM). I eventually decided I wanted to get back into paleo full time, and asked Clayton E. Ray (formerly of University of Florida) to let me know if openings came up, and became his research assistant in 1989.



David Bohaska. Photo credit George N. Bohaska

As a collections manager, what is a typical work day like for you? What are some of your favorite parts of your job? Your least favorite?

Lot of paperwork, which can be frustrating when worrying about legal issues (Did the collector/donor have permission to collect?). [Do it right when collecting yourself, document as if writing for someone who doesn't know what you're thinking (field notes) both for legal possession and scientific data value]. Often the historical research in old collecting records is interesting however.

I'm still here at 67 (yikes!) partly because of my colleagues, many in other departments. I'm still learning, often at lunch or over coffee. I've done and had help with fossil and modern bone IDs, and had conservation questions (what consolidants, storage containers, archival papers okay to use?) over coffee. And it's not just the job; in the last week I've attended a retirement party (51 years service), birthday of emeritus curator (90), and grad student wedding. They're the best, and it's been an honor and privilege to work with them.

Least favorite: There's a certain president of the US who instituted performance appraisals, and I curse him every year when I have to spend days tabulating what I did for a year.

I understand that you have been involved with the Aurora Fossil Festival and the amateurs who participate for quite some time. How did you become involved and why do you find the experience rewarding?

Do you think I ever find any decent fossils? (Just joking, on rare occasions I have). I get down to North Carolina for example maybe three times a year. It's by developing local contacts, who can hit an outcrop frequently, or can head out when they see the conditions are right, who are going to make the finds.



David at Belgrade Summer 2018

In my years at the Calvert Marine Museum, it was Norm Riker (boat builder) who would wake me up early Saturday mornings when he saw the tide had blown out. (Why he continued to drag me out after all the times I cursed him over the phone at sunrise I don't know). Another amateur, Wally Ashby (retired FAA) lived at Scientists Cliffs, and I was often up just north of there salvaging specimens he had seen in the cliff.

I actually began attending fossil fairs and festivals with Smithsonian crews before I was hired in 1989, so I've known some people for decades. See above about wonderful colleagues at work, and substitute "amateurs".

Admittedly, we add to "our" (really your) collection through donations at fossil fairs, and get into localities while there. But I have the best job in the world, am paid with tax money, so I feel I owe something back.

Often you hear about three aspects of museums: research, outreach/education, and collections. I don't think they should be separated, all benefit the others.

What is one of your most memorable field experiences? Do you have a favorite locality or site?

Got started, grew up visiting Calvert Cliffs (about a two hour drive from Baltimore area where I grew up, and now I live there).

Of course, Lee Creek Mine in Aurora, North Carolina was always the highlight of our North Carolina-South Carolina fossil fair/collecting trips. You knew you would always find something on the Lee Creek spoil piles.

I was a volunteer field assistant to Eugene Gaffney at the American Museum of Natural History the summer of my freshman year in college (1970). He had just been hired, and was sent out west to see many of the classic fossil reptile localities.

Do you have a favorite fossil discovery (can be your own, or a famous historical discovery)?

Hard to pick, sort of an apples or oranges or which of your children is your favorite kind of question.

Early in my Calvert Marine Museum days, went out to field check several specimens Wally Ashby had found. One was a partial true (or earless) seal (Phocidae) skeleton; up to that time, that animal had been found only one bone at a time, and those were rare. That species was also the earliest record of the family at the time (still among the earliest). The origin of seals is a major evolutionary land to marine transition, and there were questions about monophyly versus diphly of the true seals, sea lions, and walruses.

I did find (I actually saw it first!) a partial auk skeleton at Calvert Cliffs, where finding single bird bones is a major event. Norm Riker also involved with this one; real challenge for the two of us to collect it from a fallen block in freezing water. Eventually named after me, and was one of many fossil birds used to calibrate a molecular clock [see bit below about getting broad background in college].

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What advice would you give to a student thinking about pursuing paleontology as a career?

Major in geology; smaller department, and you'll get to know your professors and other students more easily. But take lots of biology, particularly whole animal. (I eventually ended up in a biology department in grad school, and had to make up in organic chemistry and physiology, so maybe better to get those out of the way as an undergraduate. Glad I took physiology, rather not talk about organic chemistry). You'll use the chemistry in collections care and fossil preparation. These days we worry about what our preservatives and storage materials will do to our specimens in 200 years and more. Naturally you'll be required to get a broad background in math and the other sciences (chemistry, physics). Of course learn to write well. Sometimes I found it hard to keep the long term goal in sight, while taking all the required courses. I was advised to think how I might use some of what I thought less interesting to be able to do something original in the future. Having a mentor helps, and you should keep doing something rewarding (field work, visiting colleagues in museums) to keep your morale up.

For vertebrate paleontologists, a medical school human anatomy course is a great idea. (I didn't). Human anatomy is the most detailed known, you develop coordination doing dissections, and teaching anatomy in med school is a good way to get a job. (You teach anatomy, but your research and field work can be paleo. A number of med school anatomy departments have multiple vertebrate paleontologists on staff. I was lucky; museum jobs are rare).



David and his son Alex wet screening matrix from the recent Belgrade dig. Photo credit Paula Bohaska

AMATEUR SPOTLIGHT: NATHAN NEWELL

Editor's note: Nathan Newell has been an active member of myFOSSIL since joining the community in April 2017. He is an amateur paleontologist who has contributed more than 50 amazing specimens to the myFOSSIL gallery. Nathan has helped promote FOSSIL by sharing some of these great fossils on his Instagram page, which also includes fun paleontology memorabilia from the past. We interviewed Nathan to learn more about his passion for fossils and paleontology.

What first got you interested in collecting fossils? How long have you been involved in paleontology?

I've loved prehistoric life ever since I was a kid. I used to love watching old monster movies with dinosaurian creatures like Godzilla, taking trips to the Smithsonian National Museum of Natural History, and visiting Dinosaur Land in White Post, VA (which is still my happiest place on Earth). These all infused in me a passion for all sorts of prehistoric creatures, which I enjoyed exploring in books like Ranger Rick's Dinosaur Book. As an adult I continued to go dinosaur hunting in museums and read books on paleontology and evolutionary theory, but living in Virginia, I just didn't think that fossil hunting was feasible.

Eventually I found Fossilguy.com, which featured, to my surprise, a few fossil hunting sites within driving distance! This led me down a rabbit hole of research as I tried to find other cool sites and understand the complicated geography of Virginia and West Virginia. I've only been fossil hunting for about two years, but it's been a blast!

Where are some of your favorite places to collect? What do you most enjoy about fossil hunting?



Nathan Newell



"Smoke Hole" - one of Nathan's favorite places to hunt fossils

Fossil collecting in Virginia is tricky. The rocks throughout much of the state are igneous and metamorphic, but west of the Blue Ridge Mountains, the Appalachians are composed of Paleozoic sedimentary rocks. Vegetation is everywhere, covering up outcrops and resisting erosion, so the only fossil sites I've been able to find are roadcuts.

I enjoy collecting in the Appalachian Mountains; the scenery is just beautiful. Smoke Hole Road leading up to the Big Bend Campground near Upper Tract, West Virginia is particularly breathtaking, with fascinating geology juxtaposed with the beautiful South Branch Potomac River.

What I enjoy most is finding something completely unexpected. I almost discarded one fossil because I thought it was just porous rock, but upon further inspection, I discovered that it was a tiny coral colony with all sorts of little critters. I was holding a whole miniature fossilized ecosystem in my hands!

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You have contributed more than 40 beautiful specimens to myFOSSIL! What motivates you to keep a digital catalog? What are your goals for your collection (digital or otherwise)?

Thank you! I like keeping a digital catalog on myFOSSIL because it's the best way to organize and visualize my fossil data all in one place. I keep separate spreadsheets and photos on Google Drive for my own purposes, but the data is fragmentary: the photos are in one folder, the descriptive data is in a spreadsheet in another folder, and the site locations are on a custom Google map completely separate from everything else. But with myFOSSIL, I'm able to view the data, photos, and map for a fossil all in one place.

Also, it's great for publishing my fossils so others can check out what I've been up to. I like sharing the exact location of my fossil sites so others can discover cool sites that they might not have known about before. Publishing my collection on myFOSSIL also helps me get in contact with paleontologists, both professional and amateur, that could help me with identification.

My goal for my digital collection is to accurately record the information and bring it all together so that I can see patterns that would help me find new sites and anticipate the fossils that I might find. My goal for my collection is to hopefully contribute in some small way to the understanding of paleontology in Virginia and West Virginia.

We have been loving your fossil photos on Instagram! You do a great job of capturing even the smallest fossilized details in your photos- how do you put together such great images? Do you have a background in photography?

I'm glad you've been enjoying the photos! I don't have any professional background in photography, but I've been publishing photos of small collectibles on the Internet for about the past 20 years, so that experience helped me take pictures of fossils. Fossil photography is a lot more challenging because many important details are so much smaller than anything I've ever tried photographing before.

I use a Samsung Galaxy S8+ smartphone with a macro lens attachment for my photos.

You also incorporate fun nostalgia pieces into some of your fossil photos, such as the Fruity Pebbles dinosaur coins. Is paleontology memorabilia another interest of yours?

Yes, I love paleontology memorabilia! I mainly collect stuff from my childhood, which is hopelessly scientifically inaccurate nowadays but still maintains a certain charm for me. Some of my favorites are Marx Toys dinosaurs, British Museum of Natural History dinosaurs from Invicta, and old books featuring classic paleo artists like Rudolph Zallinger and Charles R. Knight.

Looking to the future, what are your paleontology dreams? Are there any fossils you've been wanting to collect, but haven't gotten the chance to yet (or haven't been able to find)?

I'd like to get more involved with education, especially teaching kids of elementary or preschool age about fossils. I recently gave a fossil presentation to my son's preschool class and the kids absolutely loved being able to handle real fossils. One said, "Gee, I wish you had dinosaur bones!" and I lamented, "Yeah, you and me too, kid."

As for fossils I've been wanting to find (and taking dinosaurs out of the question since the rocks in Virginia and West Virginia aren't particularly cooperative in regards to the Mesozoic), I'd just like to find a complete trilobite. Cephalons are maddeningly elusive around here for some reason, so if I found a complete trilobite, I'd be very happy. After that, I'll set more lofty goals for myself!

To learn more:

Read more about Jayson Kowinsky aka "The Fossil Guy" and his website in this [previous newsletter article](#).

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Some of Nathan's favorite fossils:



Brachiopod: Spirifer keyserensis



Trilobite: Phacops rana



Brachiopod



Brachiopods and Branching Corals

RESEARCH: CALAVERAS DAM CONSTRUCTION: SALVAGE PALEONTOLOGY

By Cristina Robins

California, in addition to being a geologists' paradise, has strong environmental laws that protect fossils found during construction on state-owned lands. These fossils must be evaluated by professionals, and, if deemed significant, collected, prepared, and curated into an official repository. This can consist of a few fossils (isolated mammoth or mastodon remains) to large-scale discoveries. Construction projects include estimates for the environmental and paleontological mitigation costs.

The excavation for the new, more seismically stable Calaveras Dam east of San Jose, CA has led to the discovery of the most significant San Francisco area fossil find in decades. The size of the find, variety of fossils, age, and, in some cases, great preservation all make it a scientifically significant fossil site. Over the course of the project, nearly 10 million cubic yards of sediment was excavated. Over 2,000 blocks containing fossils were discovered. I say "blocks" because some of the samples contain multiple fossils, but in the official count are listed as "1." These fossils are being prepared and curated at the University of California Museum of Paleontology, located at UC Berkeley.



Cristina Robins

This fossil site contains plant, vertebrate, and invertebrate remains. This allows for a better reconstruction of the paleoenvironment of the site. We are still finalizing a date for the site, but Miocene age, about 20-15Ma, is our current estimate. Most of the fossils we find are quite large, as is typical for a construction site – the fossils that can be seen from the cab of an excavator are more likely to be collected. Additionally, there seems to be some preferential sorting for size, as smaller fossils have been winnowed away.

The fossils show the scars of California's active tectonic history. Located along the Calaveras Fault, a branch of the Hayward Fault, numerous fossils are fractured, offset, and bear slicken-sides, or polished areas of broken bone that have been shredded and altered by previous earthquakes. The fossils have been extensively remineralized, with large crystals of calcite filling in voids. The sediment varies, but typically contains silica, iron, and sulfur, which makes for difficult (and aromatic) preparation. Our chisels and pin vices are quickly dulled by the matrix, and the bone is usually softer than the rock, which makes preparation more painstaking than usual.



Slicken sides on bone (shiny bits, central left in photo). This whale skull has seen better days.

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Thus far, we have found well over 20 whale skulls. We have four types of baleen whale, and two types of toothed whale. One of our baleen whales is a new species – luckily, it is also our best-preserved whale! The skulls can be a range of sizes, from dolphin-sized to skulls four or more feet long (whale length estimated at 20 feet). One of our skulls is too large to fit inside the preparation lab at UC Berkeley. We also have at least 6 individuals of one species, which will allow for researchers to compare interspecific variation.



A baleen whale skull with the braincase exposed. The void where the brain was now contains a calcite geode. Whale is on it's right side; spine would attach at the center left of the photo.



Underside of a baleen whale skull. The brown is bone, black is organic material (including driftwood!) and yellow is sulfur-rich sediment.



Mandible of a baleen whale. This mandible is 4 ft long (missing 3" from distal tip on right and 9" from proximal base at left). The mandible would have belonged to a whale ~20 ft long.



Removal of the largest skull – this one is too big to fit inside the prep lab and will be prepared off-site. It weighs between 1 and 2 tons. Photo courtesy of JP Walker.

In addition to whales, we have some remains of *Desmostylus*, which was an elephant relative (picture a small hippo) that lived in estuarine environments. We also have seal and sea lion remains. Fish were plentiful and large, as we have some fish vertebra that are 4 cm in diameter! We've also identified 13 genera of sharks, including the infamous *C. megalodon*.



One *Desmostylus* tooth. Molar cusps featured; roots in back.

Although vertebrates are what capture most people's interest in fossils, the invertebrates and plants are what yield the most information. Many larger animals migrate and live in multiple habitats. The plants and invertebrates often stay close to home base. We have hundreds of molluscs, including scallops 20 cm across. Predatory snails (naticids) are common, but their characteristic drillhole left behind on other molluscs is very rare. The clam fauna indicate both deep and shallow water. We have numerous barnacles, but none are attached to their hosts. Sea urchins and crabs are rarely found.

Plant fossils are present on every whale prepared thus far. Mostly the fossils consist of charcoal and hash, but some plants have defined structure and are identifiable. We have pinecones large (15 cm) and small (1 cm), twigs and branches, driftwood, and large pieces (30 cm³) of pine tree and palm tree wood. The pine has been extensively burrowed into by what we interpret to be *Teredo* clams (*Teredolites* ichnofossil), also known as shipworms, or "the termite of the sea." In some cases, the wood is solid burrows. The palm tree escaped burrowing – possibly the wood was unappetizing to the clams.

Given the presence of large sized plant remains, invertebrates from multiple depths, and a size bias against small organisms, it seems like these fossils were deposited as part of a landslide/debris flow. The bones are almost all isolated elements (one whale was found partially articulated), possibly indicating remobilization by the debris flow.

We just passed the halfway point on our two-year funding from the San Francisco Public Utilities Commission, but we are nowhere near halfway through processing the fossils! This project ended up much larger than anticipated. We received a new whale skull over spring break in March 2018, just in time for many undergraduate student employees in the prep lab to work out their final exam stress by chiseling the rock, revealing the skull beneath. Stay tuned for more updates – there's something new everyday.

To learn more (and see more of Cristina and images of fossils and fossil prep): (Note: the CBS and NBC footage have ads).

[Calaveras Dam Project Fossils Providing Glimpse of Prehistoric Bay Area](#) (CBS)

[Fossils 15-Million-Years-Old Found at Calaveras Dam Rebuild](#) (NBC)

Time lapse video of the dam construction can be viewed at <https://www.youtube.com/watch?v=apfyYTXI4rE>

FEATURED FOSSIL : *Triceratops* vs *Tyrannosaurus*

By Alex Hastings, Assistant Curator of Paleontology, Virginia Museum of Natural History

Movies, television, and comic books have all depicted dinosaurs fighting each other many times. However, scientific evidence of live interactions between dinosaurs are exceptionally rare. Even in most cases of tooth marks on bone, it is impossible to tell whether or not the fossil represents predation or scavenging. These fossils become rarer still for the uncommon large predators of the dinosaur era. Feeding traces that can be attributed to *Tyrannosaurus* are incredibly uncommon. However, fossilization sometimes gives tantalizing clues of live interaction.



Figure 1. Left brow horn of a *Triceratops* (VMNH 120763). Arrows indicate tooth marks made by a *Tyrannosaurus*. Photo by A. Hastings.

Above is the brow horn of an adult *Triceratops* (Fig. 1) from the Hell Creek Formation of Montana, from the end of the Age of the Dinosaurs (about 68 million years ago). The end of the horn is missing, and we may have a good clue as to why. Two very deep and large round depressions are featured at the remaining end, which match up perfectly with those of an adult *Tyrannosaurus* (Fig. 2). An associated fragment of the frill from the same individual also bears several tooth marks (Fig. 3), although these are admittedly harder to see in photographs. A series of tooth marks form a line across the frill. In X-ray, the location of these tooth marks is revealed to be denser than the bone around it, which indicates healing and bone regrowth. This is critical to understanding this interaction because it means the *Triceratops* lived through the encounter, and was therefore alive when the marks were made.

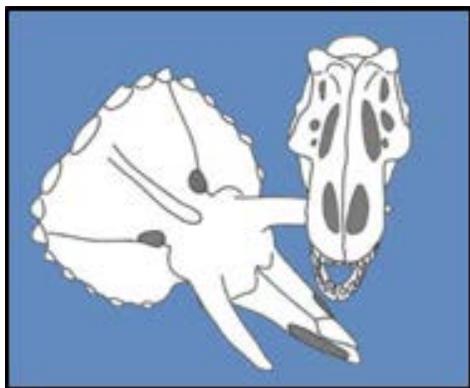


Figure 2. Diagram showing the likely scenario that created the tooth marks in the *Triceratops* horn. Modified from Happ (2008).

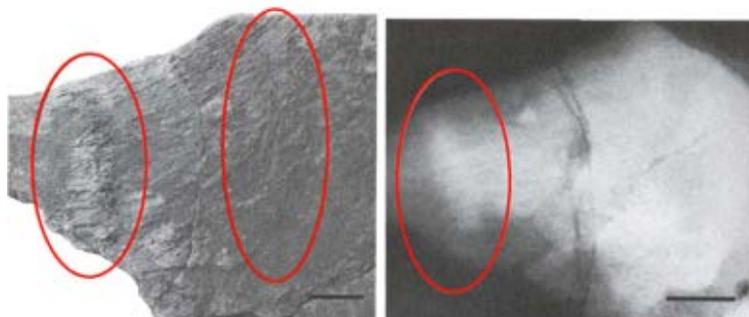


Figure 3. Frill section from the same *Triceratops* skull (photo: left; x-ray: right). The red circles indicate scoring marks made by the teeth of a large predatory dinosaur. The x-ray shows the thinner section of bone has greatly thickened at the location of the series of tooth marks. Scale bars equal 2 cm. Modified from Happ (2008).

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This fossil is the only evidence in the world for live interaction between *Tyrannosaurus* and *Triceratops*. Tooth marks have been found in other *Triceratops* bones, but these have never shown signs of healing. This fossil and only a handful of others are the best evidence out there that *Tyrannosaurus* was likely an active predator, and not an obligatory scavenger.

This fossil is part of a Hell Creek collection that was orphaned when the Shenandoah Valley Discovery Museum decided to no longer maintain scientific collections. This collection (including this *Triceratops*) is now part of the fossil collection at the Virginia Museum of Natural History in Martinsville, Virginia. Recent funds acquired from the Bureau of Land Management have allowed for the entire Hell Creek collection to be digitized. To see photos of these specimens check out the Virginia Museum of Natural History's account at [FLICKR.com](https://www.flickr.com/photos/vmnh/)

“This fossil is the only evidence in the world for live interaction between *Tyrannosaurus* and *Triceratops*.”

For more about this amazing fossil, please see the original publication by Dr. John Happ:

Happ, J. 2008. An analysis of predator-prey behavior in a head-to-head encounter between *Tyrannosaurus rex* and *Triceratops*, in P. Larson & K. Carpenter (eds.), *Tyrannosaurus rex the Tyrant King*, Indiana University Press, pp. 355–370.

EDUCATION: THE WENAS MAMMOTH FOUNDATION'S EDUCATIONAL PROGRAM

By Bronwyn Mayo

In 2005, while constructing a road on a hillside overlooking the Wenas Valley, north of Selah, in Central Washington State, the left front leg (Humerus) bone of a mammoth was uncovered. The Wenas Mammoth find is on private property owned by Douglas and Bronwyn Mayo. Finds of isolated mammoth elements are common on the Columbia Plateau; however, these remains have been found in the Missoula Flood deposits. The Wenas Mammoth is unusual because it is well preserved, at an elevation 300' above the Missoula Flood deposits.

During the summers from 2005 – 2010, Central WA University (CWU) conducted field schools for scientific investigation of the mammoth bones, called the *Wenas Creek Mammoth Project*. The interdisciplinary project used methods from paleontology, archaeology, and geology. The project's goal was the careful scientific recovery of bones and associated artifacts, while placing the finds into an appropriate context of physical geography. Each year's project included the field school, public tours, presentations, and volunteer opportunities, averaging over 2,000 visitors each four-week period. During that time, a *Bison antiquus* and a man-made flake were also discovered, and the finds were found to date back 17,000 years.



Wenas Field School 2010

In 2012, with the driving force of the land owners, a group of local educators and supporters began the process of forming the Wenas Mammoth Foundation (WMF), a non-profit 501c3 corporation. The mission of the WMF is to promote, preserve and utilize the Central WA Dig Site and its natural science and history, and to inspire the pursuit of educational opportunities throughout WA State. The WMF was aware that there is a need to improve mathematics, science, and critical thinking skills for K-16 students, and prepare them for careers. The 2016-17 Science Assessment Scores for WA State (OSPI) for the 8th grade Science Exam demonstrated only 65% proficiency, and in South Central Washington region, those scores were at 47% and below, depending on the district.

Over the years the WMF has created fun and interactive learning activities for students to explore and be inspired about earth science by utilizing our local natural environments and history. The WMF's goal includes offering exciting avenues for educators, professionals, scientists, and students. This is delivered through innovative hands-on curriculum that meets the Next Generation Science Standards (Disciplinary Core Ideas and Crosscutting Concepts). The WMF's Educational Program also supports STEAM (Science, Technology, Engineering, Art, and Math), and CTE (Career and Technical Education).

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Educational Program includes:

WMF's Mobile Educational Exhibit and Program: This exhibit and program visits schools and community events throughout the year. The Mobile Educational Exhibit is a small museum that brings Ice Age history to the schools. The exhibit has displays that support the variety of lesson topics that are offered in a classroom or assembly setting. The lesson topics include:

1. What are mammoths and mastodons?
2. Identifying Mammoth Skeletons and Other Ice Age Specimens
3. Habitat and Biological Evolution of the Proboscidean Family
4. The Teeth and Tusks Can Tell A Story (Grazers and Browsers)
5. Analyzing the Soil for Clues (Evaluating 17,000-Year-Old Soil Samples)
6. The Evolution of the Wenas Bison Antiquus
7. The History of the Wenas Creek Mammoth Project
8. Mysteries of Wenas Mammoth Mountain
9. Volcanoes of Central WA State



WMF's Mobile Educational Exhibit

Hands-on Activities: The WMF is developing fun hands-on activities to engage students' curiosity. This may include exposing bones using brushes, and then identifying what was discovered. It may also be sifting for artifacts in a dig box or exposing large full-size mammoth bones (casts) in a large dig area. Whatever the activity, all ages want to join in.



Sifting for clues



Inspiring curiosity

2018 Paleontology Youth Summer Day Camp: The WMF will be introducing 4-12th grade students to the methods of paleontology and archaeology at their first youth summer day camp. This year's focus will be on the methods of setting up the digging unit, and why. Students will have dig site hands-on activities, as well as classroom lessons and activities.

STEAM and CTE Projects: Whatever the project may be, STEAM and CTE students to have the opportunity to take the skills they are learning in the classroom out into the field.



Photo © Leann Jones

WMF Signage: In May 2012, the mountain on which the Wenas Mammoth was discovered was officially named Wenas Mammoth Mountain by the WA State Board on Geographic Names and the U. S. Board on Geographic Names. In celebration of this, the YV-Tech Welding Program students (CTE) fabricated a sign “Wenas Mammoth Mountain”, that sits at the foot of the hillside.

Mobile Educational Exhibit: When the WMF began planning the mobile exhibit the need for display cabinets was critical. Wood Shop class (CTE) students from West Valley High School stepped up to the task and constructed display cabinets on both sides of the trailer.

Silhouette Projects (CTE): In 2015, the YV-Tech Skill Center Construction Program and the Perry Technical Institute’s Welding Program answered the question “How big was the Mammoth?” by fabricating and erecting a life-size mammoth. The construction students prepared the foundation and the welding students fabricated and erected the mammoth. Several local photographers have taken many breathtaking photos of the silhouette. Perry Technical Institute’s Welding program is currently fabricating and will be erecting the Wenas *Bison antiquus* silhouette soon.



Installing cabinets



Photo © Lonny Smart

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Mural Projects (STEAM): In 2017 and 2018, art class students from La Salle High School painted murals on 40' cargo boxes. During the school year students, under the guidance of their art instructor Mrs. Jones-Campbell, had to research, plan and practice their artwork. The goal is to visualize what the Wenas Valley looked like 17,000 years ago.



2017 mural



2018 mural

It Takes A Community: The discovery of the Wenas Mammoth has changed how folks look at the Wenas Valley. Many people ask, “How did you find the mammoth?” We simply reply, “We didn’t find the mammoth, it found us... and boy has that changed our lives!” However, it takes more than finding a mammoth and having a dream to make it into an educational opportunity. It also takes the dedication of people within our community and organizations to be successful. You can keep up on our story, and view photos and videos at www.WenasMammoth.com or on www.facebook.com/WenasMammoth.



Wenas Creek Mammoth Project Group in 2007

NEWS FROM THE PALEONTOLOGICAL SOCIETY

By Bruce MacFadden



Jack Kallmeyer receives the Strimple Award

Each year the PS presents the Strimple Award to recognize outstanding achievement in paleontology by amateurs (someone who does not make a living full-time from paleontology).

This year we are pleased to report that the Strimple Award recipient is Jack Kallmeyer. Jack is the President of the Dry Dredgers Fossil Club in Cincinnati, Ohio. In addition to working with professionals and coauthoring papers in professional journals, Jack has been instrumental in the continued success of the oldest fossil club in the United States. Jack will be presented the Strimple Award during the PS Awards Banquet to be held at the Geological Society of America Annual meeting in Indianapolis, 4-7 November 2018. The Strimple Award could not have been given to a more deserving person. We congratulate Jack on this accomplishment.



Jack Kallmeyer

Read more about the Strimple Award in this earlier [article](#).



National Center for Science Education Recognizes Tiffany Adrain



Tiffany Adrain

The National Center for Science Education announced that Tiffany Adrain, the collections manager at the University of Iowa’s Paleontology Repository, is one of the 2018 recipients of the Friend of Darwin award. The award is given to individuals who have made outstanding efforts to support NCSE and advance its goal of defending the teaching of evolution and climate science. Tiffany was honored for her involvement in the NCSE’s expansion of its Science Booster Club into Iowa.

You can read more about Tiffany’s award in this NCSE [blog post](#).

CITIZEN SCIENCE AT BELGRADE

By Hunter Thurmond

I don't often complete surveys, but when completion means the chance to participate in a citizen science dig with The FOSSIL Project looking for extinct rare land mammals, I'm a little more eager. Ok very eager to fill out this survey. And I was selected! The FOSSIL Project was going to bring me out to New Bern, North Carolina for a citizen science project and the Aurora Fossil Festival. Up until this point I knew no one else who collected fossils or had any interest in paleontology, but they told me there would be thousands of fossil lovers in the tiny town of Aurora for the festival.



Belgrade webinar

A few weeks before the big weekend, Dr. Bruce MacFadden, Florida Museum paleontologist, gave a webinar outlining the dig site information and what we would be looking for, rare land mammals! I had only recently become interested in sharks teeth, but the webinar had examples of shiny mammal teeth of which I had never seen. Dr. MacFadden explained that the Martin Marietta quarry at Belgrade had created 5 special piles of sediment taken specifically from a dark portion called the Belgrade Formation. He referenced a free paper by Lauck Ward who was also participating in the dig. Dr. MacFadden explained the early Miocene fossils at Belgrade were closely related to fossils found in Nebraska and by himself recently in Panama. The ultimate goal was to acquire enough fossils to determine whether Belgrade was a habitat more similar to the tropical example in Panama or the dry example in Nebraska. That's where citizen science comes in to play; by allowing everyday citizens like myself to participate in the joy of discovery, fossils can be found more rapidly.

In the webinar Dr. MacFadden showed us renditions of the early Miocene, or Arikarean Land Mammal age as he referred to it. The giant *Daeodon* really caught my imagination, how cool would it be to hold a tooth of this Arikarean 20 million year old beast. He had been referring to them as rare fossils for a reason. The true sparsity I could not comprehend at the time, although other fossils being very plentiful. When we got to the quarry they gave us a safety lesson and waivers to sign, and we were off to collect. Bruce reminded us what we were looking for and for the next few hours FOSSIL Project participants and the Special Friends of the Aurora Fossil Museum (SFAFM) dug through the piles and sifted our hearts out. The SFAFM helped The FOSSIL Project setup the Belgrade formation dig with the Martin Marietta quarry. Many variety of teeth were found from sharks, cetaceans, fish, crocodylians, but only a few were found from the desired rare land mammals. Dr. MacFadden said one may have been a camel tooth but they are still going through the many fossils we produced that day. All the fossils we found were bagged, labeled, and donated to the Florida Museum of Natural History as part of our citizen science project. The FOSSIL Project later had the fossils sorted by other citizen science participants, increasing the level and spread of citizen involvement.

What might it mean for the habitat argument if camel teeth are present at Belgrade? Does that mean Belgrade was a more dry climate like that of similar age in Nebraska? Maybe camels of this age didn't live in dry climates, or maybe it is not a camel tooth at all! I love letting my imagination chase an answer; there are so many scenarios to explore, each one a possible picture of the past.

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Piles of Belgrade sediment ready to be explored



Citizen scientists search for rare extinct land mammals in the Belgrade Formation

After we wrapped up our project at Belgrade, we were off to the festival opening ceremony. The more experienced collectors on the trip had been here before and introduced me to the museum and spoil piles. Yes, right there at the museum were more piles of fossils to hunt through. I sat in the piles next to Victor Perez, a grad student at the University of Florida and part of the FOSSIL Project, who was able to identify almost all the shark teeth I pulled out of the piles. The next day the Festival really kicked off with many organizations including The FOSSIL Project having educational booths. Dana Ehret gave a talk on shark paleontology which was like being a student for a day for many amateurs, an opportunity they all valued. I personally left this wonderful opportunity The FOSSIL Project offered to me with just as much excitement as I had arrived with, and with many more opportunities to participate in paleontology in the future.



Digging in the spoil piles at the Aurora Fossil Festival

To learn more:

You can access the Belgrade webinar [here](#).



A tooth from a *Megalodon* ancestor found by Eric, a member of the Special Friends of the Aurora Fossil Museum

FOSSIL PROJECT UPDATES

By Sadie Mills, FOSSIL Project Coordinator

FOSSIL Team Changes

In April, FOSSIL Co-Principal Investigator Betty Dunckel retired from her role as Director of the Center for Science Learning at the Florida Museum. As a founding member of the FOSSIL Project team, Betty helped the project grow from an idea to our current online community of almost 1,000 social paleontologists. We will miss her on the project, but wish her a happy and relaxing retirement!

In May, FOSSIL social media intern Michael Le graduated from the University of Florida with a degree in Marketing. During his time with FOSSIL, Michael was responsible for starting and maintaining the project's Instagram account, which has grown to have over 500 followers. We wish Michael the best as he starts the next chapter of his career!

This summer, two new interns have joined the FOSSIL team:

Mary Jane Hughes is a rising senior at the University of Florida. As one of the FOSSIL Project's Social Media Interns, Mary Jane enjoys creating engaging content for Facebook, Twitter and Instagram audiences. She uses her design background and creative writing style to craft captivating content with the hope to inspire paleontologists around the globe. As she continues to develop her passion for communication and science, Mary Jane is completing her undergraduate degree in Public Relations with a concentration in Business. From a young age, Jurassic Park became one of her favorite movies because of the exciting nature of understanding the creatures of the past. Her interest in fossils has continued to grow with this internship. After graduation, Mary Jane has the goal of becoming a consultant for government-funded programs with an emphasis on the opioid crisis and to be a force for positive change in society.



Mary Jane Hughes

Samantha (Sam) Ocon helps create content for the FOSSIL Project's social media accounts while also lending a hand wherever she may be needed. As an aspiring professional paleontologist, FOSSIL's mission to "bring paleontology to the people" resonates deeply with her desire to work in paleontological outreach. Sam has been following her passion for paleontology since the early age of two - leading her to pursue a B.S. in Geology at the University of Florida. She also plans on a graduate career in paleontology - hopefully working on Cambrian arthropods! Currently, she also assists with research in the micropaleontology division of the Florida Museum of Natural History's invertebrate paleontology lab.



Sam Ocon

In August, we will welcome Jennifer Bauer to the team as a postdoctoral associate. Jen recently completed her PhD at the University of Tennessee, where she studied the evolution of blastoids, an extinct group of echinoderms. During her time with FOSSIL, Jen will serve as curator for the myFOSSIL gallery. We look forward to having her expertise and enthusiasm for paleontology outreach on the project!

Citizen Science at Belgrade

In late May, FOSSIL collaborated with the Special Friends of the Aurora Fossil Museum (SFAFM) to host a citizen science dig at the Belgrade Mine in North Carolina. FOSSIL was joined by 10 individuals from around the US, who were selected to participate based on their completion of the FOSSIL Community Survey.

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At the mine, participants searched through sediment piles from the Belgrade formation, which had been graciously set aside by the mine manager and staff. The goal was to find rare extinct land mammals from the Belgrade layer, a Miocene deposit from 5- 20 million years ago. After three hours of diligent sifting, participants collected bags of specimens and buckets of matrix for further analysis at the Florida Museum. The research on this material is ongoing, and we're excited to keep the community updated on what we find. So far, the matrix has revealed an assemblage of marine fishes, including pufferfish, gar, barracuda, and drum fish. A surprising find has been a colubrid snake vertebra, the first of its kind documented at Belgrade! You can see a 3D scan of that specimen, created by Jeanette Pirlo, here: <https://www.myfossil.org/ac-media/39806/>.



The team at Belgrade

We'd like to thank Martin Marietta, Mine Manager Doug Fetsko, and the staff of the Belgrade Mine for making this research opportunity possible, and for showing us such wonderful hospitality while at the mine. We also appreciate the efforts of SFAFM president Lee Cone for helping coordinate this citizen science project. To learn about the trip from a participant's perspective, read Hunter Thurmond's article about his experience beginning on page 21.

Presentations & Publications

In June, FOSSIL graduate student Jeanette Pirlo attended the Southwest Florida Fossil Society meeting in Punta Gorda, FL. There, she presented about her work on the Fossils4Teachers! professional development workshop. Jeanette, along with FOSSIL members Bruce MacFadden, Eleanor Gardner, Victor Perez, and Denise Porcello, recently published on this workshop in the May issue of *Connected Science Learning*. You can read their article here: http://csl.nsta.org/2018/05/connecting-fossil-clubs/?sf_action=get_data&sf_data=results&sf_issue=issue-6.

Congratulations to FOSSIL team members Lisa Lundgren, Kent Crippen, and Victor Perez, as well as former members Eleanor Gardner and Austin Hendy, for their recent publication in the *International Journal of Social Media and Interactive Learning Environments*. Their article, "Mental models and social media personas: a case of amateur palaeontologists," explores how amateur paleontologists perceive and engage with social media. You can read the abstract here: <http://www.inderscience.com/offer.php?id=92374>.

FOSSIL graduate student Rich Bex traveled to Limerick, Ireland to participate in the European Conference on Social Media. He presented a poster on the development of the myFOSSIL mobile app, and was awarded Runner Up for Best Poster. Congrats to Rich, and his co-authors Lisa Lundgren and Kent Crippen!



Richard Bex and his award winning poster

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myFOSSIL Mobile App

By Sadie Mills

We began development of the myFOSSIL mobile app last spring, and have moved into the testing phase this summer. We tested the first beta version during our citizen science dig at Belgrade. It was exciting to get a first look at how the app works, and we even sent our first tweet directly from the app!

We next tested a beta version with teachers participating in the iDigFossils professional development workshop (www.idigfossils.org). Teachers used the app during field trips to three different fossil collecting sites: Thomas Farm, Montbrook, and Rattlesnake Creek. You can see the uploads made by teachers at the Rattlesnake Creek site here:

<https://www.myfossil.org/groups/idigfossils-rattlesnake-creek-dig/>.

We got great feedback from participating teachers and look forward to the public release of the app later this year!

YouTube “50 States of Fossils” Update

By MacKenzie Smith

My PhD research focuses on plants from a particular formation that is found only in Oregon. Thus, in order to do field work this summer (which for me included collecting specimens and doing ecological surveys) I drove out to Oregon from Florida. This was a perfect opportunity to reconnect in-person with fossil clubs and to continue my YouTube series “50 States of Fossils.” In Iowa, fellow University of Florida paleobotany graduate student Bob and I met up with MAPS, the Mid America Paleontological Society. We were met with excellent hospitality as we discussed the next day’s dig at the Rockford Fossil Quarry over pizza at University of Iowa Museum of Natural History Collection Manager’s house, Tiffany Adrain. We were joined by fellow MAPS members Dale (president), Marvin, and Jim. Following pizza, we had a tour of the collection. The next morning we went out collecting in Rockford with Dale, Marvin, and Glen. We also filmed the dig for the YouTube series. The dig was fun and a new experience for me since I had never found Devonian aged fossils before and have never dug in an old limestone quarry. The bountifulness and durability of the fossils was also a surprise to me. Everyone was a great help in showing us where and how to collect.



A teacher’s post from Rattlesnake Creek



MAPS members and MacKenzie collecting in Rockford, Iowa

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Once I got to Oregon in June, I presented some of my current research on fossil fruits belonging to the Ericales, a plant order that includes kiwis, tea, rhododendron, and blueberries, at the North America Research Group (NARG).

Two weeks later I met up with members Aaron (president), Guy, and my parents to collect fossil mollusks from the approximately 15 million year old Astoria Formation and film the Oregon episode. Nothing unusual was found but we managed to recover a part of a *Trophon kernensis* (snail) and several *Patinopecten prepatulata* (scallop). While a major goal for FOSSIL is to foster an online community for sharing knowledge and experiences with paleontology, it was great to have in-person interactions with paleontology club members while on my trip. Stay tuned for our Iowa and Oregon episodes!



NARG members collecting at Beverly Beach in Oregon

FOSSIL Project Spends a Day at Camp...Three to be Exact

by Jeanette Pirlo

Summer is a time for fun and relaxation, except when you're a grad student! It is a time to catch up on work you had every intention to get done during the school year, plus, get a chance to do some fun outreach activities with the next generation of fossil enthusiasts. This summer, I've had the opportunity to guest speak and participate at three camps at or near the Florida Museum of Natural History: Sharks and Minnows Summer Camp at the Florida Museum, the Firewise Nature Camp in Ocala, Florida, and the Fort White Elementary School Summer STEM Camp in Fort White, Florida. FOSSIL supported my travel to these camps, and provided some of the fossil materials for camp activities. All three camps had approximately 40 participants ranging in age from 5 to 14 years old. Below, is an account of each camp.

June 25, 2018: Sharks and Minnows, Florida Museum

The Sharks and Minnows camp is an annual themed camp that takes place at the Florida Museum of Natural History. It focuses on sharks and fishes, both extant and extinct species, and campers get the opportunity to learn about biology, ecology, behavior, and more. I was asked to speak to the campers about my experience as a marine biologist during the day focused on biology. In my thirty-minute presentation, I described my journey to my current position as a graduate student in vertebrate paleontology, my successes, struggles and frustrations while in college, but, most importantly, I highlighted my work history with marine environments. The campers were very enthusiastic throughout the presentation and asked many questions about my work. Granted, one of the highlights of my time with them was their discovery of shadow puppets that they could make on the screen, from the projector. I am grateful for the opportunity to have met with the Sharks and Minnows camp because I was reminded by the campers that all dreams are possible!



Presenting to Sharks and Minnows campers at the Florida Museum of Natural History. Photo Credit: Victor Perez

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June 27, 2018: Firewise Nature Camp, Ocala, Florida

I joined the Firewise Nature Camp in Ocala. Firewise focuses on providing outdoor experience for campers. They have a great indoor and outdoor location in Ocala, with a comfortable indoor camp center, as well as a large forested area where campers get a chance to go caving, build forts, and learn about Florida's native flora and fauna. My task was to inform the campers about Florida's past flora and fauna.

Using educational, giveaway fossils representative of Florida from 5 million years ago, I created a mock dig site on the camp grounds. I introduced the campers, ages 5-14, to paleontology and my role as a paleontologist. We then discussed the types of fossils they might find in Florida. After splitting the group in half, we went outside and dug in the pit.

June 28, 2018: Fort White Elementary School Summer STEM Camp, Ft. White, Florida

I joined the Ft. White STEM Camp for the day. The camp is focused on elementary school students interested in STEM careers. Unlike Ocala, we did not have an outdoor space from which students could dig fossils, but we improvised! The camp director, Janet Sweat, provided kiddie pools filled with sand, and quartered into separate spaces for students to spread out. Each section had various fossils local to Florida that they would be able to dig through. Both Janet and I were concerned that the campers would quickly find the fossils and that the activity would not take as long as we'd like, but we were pleasantly surprised! The campers were very careful uncovering their fossils. They took their time to gently remove the sand from around each specimen and made sure the fossil was intact before removing it from the sand box. As in Ocala, the campers at Ft. White were able to select two of the fossils that they found to take home.



Firewise Nature Campers dig in mock fossil pit to find buried fossils. Photo Credit: Jeanette Pirlo



Sorting matrix at Ft. White STEM camp

UPCOMING EVENTS

JULY 15 – JULY 22

[HELL CREEK FOSSIL DIG CHARTER \(SOUTH DAKOTA\)](#)

JULY 16 @ 8:00 AM - 5:00 PM

[MYGATT-MOORE ONE DAY DIG \(COLORADO\)](#) [RECURRING EVENT]

JULY 19 @ 8:00 AM - JULY 21 @ 5:00 PM

[NORTH DAKOTA BISMARCK AREA DIG \(NORTH DAKOTA\)](#)

JULY 21 @ 8:00 AM - JULY 22 @ 5:00 PM

[MORRISON PALEONTOLOGY FIELD PROGRAM \(WYOMING\)](#)

JULY 21 @ 9:30 AM - 5:00 PM

[CAST FROM THE PAST \(INDOOR PROGRAM\) \(ALASKA\)](#)

JULY 23 - JULY 27

[MONTANA JUNIOR PALEO FIELD EXPERIENCE \(MONTANA\)](#)

JULY 24 @ 8:00 AM - JULY 26 @ 5:00 PM

[RIVERS, TRACKS, AND DINOSAURS COLORADO \(COLORADO\)](#)

JULY 27 @11:00 AM – JULY 28 @3:00 PM

[DINO FESTIVAL \(VIRGINIA\)](#)

JULY 28 @ 8:00 AM - 5:00 PM

[PALEOJOE'S MICHIGAN FOSSIL DIG \(MICHIGAN\)](#)

JULY 29 @ 9:00 AM - 5:00 PM

[SUMMER PALEONTOLOGY SYMPOSIUM \(ITHACA, NY\)](#) RECURRING EVENT

JULY 30 - AUGUST 2

[DINO WEEK SCIENCE SUMMER CAMP \(BAKERSFIELD, CA\)](#)

AUGUST 2 @ 8:00 AM - 4:00 PM

[FOSSIL PROSPECTING HIKE \(COLORADO\)](#)

AUGUST 3 - AUGUST 6

[DINOTOUR 2018- DINOSAUR RESEARCH INSTITUTE \(ALBERTA, CANADA\)](#)

AUGUST 6 - AUGUST 9

[GEOLOGY, PALEONTOLOGY CAMP/DOCENTING A MUSEUM CAMP \(BAKERSFIELD, CALIFORNIA\)](#)

AUGUST 7 @ 8:00 AM - AUGUST 11 @ 5:00 PM

[NORTH DAKOTA PEMBINA AREA DIG \(NORTH DAKOTA\)](#)

AUGUST 11 @10:00 AM – 4:00 PM

[NORTHWEST FOSSIL FEST \(OREGON\)](#)

AUGUST 14

[GSA 2018 ABSTRACT DEADLINE](#)

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MORRISON PALEONTOLOGY FIELD PROGRAM KID'S DIG (WYOMING)

[SEPTEMBER 1 - SEPTEMBER 2 & SEPTEMBER 8 - SEPTEMBER 9 @ 8:00 AM - 5:00 PM](#)

SEPTEMBER 16 @ 1:00 PM - 3:00 PM

[DINOSAURS AND THE ARTIST- TALK BY DR. DAVID JARZEN \(OHIO\)](#)

SEPTEMBER 22

[EDELMAN FOSSIL PARK 7TH ANNUAL COMMUNITY DIG DAY \(NEW JERSEY\)](#)

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