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Featured Paleontologist: Rebecca Hunt-Foster

This issue, we spotlight Rebecca Hunt-Foster, District Paleontologist for Bureau of Land Management Canyon Country District in southeastern Utah. Her district covers 3.5 million acres and includes sites that hold exciting new dinosaur discoveries.

Your current research focuses on dinosaurs. Were you a huge fan of dinosaurs as a child?

I was not a huge fan of dinosaurs as a young child, but was always into animals, particularly reptiles and amphibians. I seemed to skip the "dinosaur phase" that many younger children go through, or at least had a delayed response to it. I did enjoy dinosaurs, but I came to find them through books when I was around 13 years old. My mom is a librarian and the first book on paleontology I read was Jack Horner's "Digging Dinosaurs." That book opened the door on paleontology to me and made it very appealing. After that I devoured every book in my mom's library, and then got as many things on Inter Library Loan as I could at the time. I also had the opportunity to spend time in college libraries where I had more access to additional books and journals. I started to write to 'local' paleontologists (there was only one vertebrate paleontologist in Arkansas when I was growing up, so I wrote to many others in surrounding states) and asking questions and if I could participate on excavations. Our local Arkansas paleontologist, Dr. Leo Carson Davis, took me on my first excavation in northern Arkansas where I had a chance to work at Pleistocene vertebrate site inside a cave. In the stream beds outside of the cave were the common Paleozoic invertebrate fossils, such as crinoids, brachiopods, and bryozoans.



I read that you are the sole field paleontologist in the Bureau of Land Management. Do you think aspiring paleontologists might see that as a viable career path?

I am currently the first and only district paleontologist in the BLM. Grand Staircase-Escalante National Monument has had a field paleontologist on staff since 2000, and the BLM also currently employs 2 state paleontologists, 3 regional paleontologists, and 1 national program lead. The National Park Service also employs about 10 professional paleontologists at at least 7 parks and monuments, and also has a national program lead. The USDA Forest Service currently employees three professional paleontologists. Federal land management is a viable career path in paleontology. The jobs are few, but they do exist and we are always looking for qualified people who are experienced with museum collections, federal land management, and professional paleontology (i.e. paleocrats). With the signing of the



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Paleontology Resources Preservation Act in 2009, requiring that the agency manage paleontological resources using scientific principles and expertise, the bureau will likely hire more state and district paleontologists in the future, although I am unaware how or when they will be adding these positions.

I chose to pursue a position with the federal land management agency over working in a museum or academic positions for a few reasons. I like working with a variety of people, and my job allows for me to interact with a variety of spectrums, from the public to higher level researchers. The type of work I get to do with my job appeals to me - the days are seldom the same and I have a variety of things I am responsible for accomplishing. I really enjoy being able to be outside and experience this great area, and to encourage other to get out and enjoy it as well. I see new things and meet new people all the time, and that since of discovery and helping to educate and excite people about paleontology really drives me to do my job.

What is a typical work day like for you?

I do not have a typical work day - it is often something new, and greatly depends on the season and activities going on in our area. One day I might be working with a paleontologist to help them in obtaining an excavation permit, and the next day I could be in a classroom speaking with children or giving a public lecture to interested members of our community. I also get to work with other members within our BLM team to assist with their projects - everything from recreation and wildlife to mineral extraction and range land issues - we have actually had cows find dinosaur tracks!

I give advice on paleontological field work taking place in my area, and assist researchers and consultants with obtaining the appropriate permits they need to do work in my district. I have been developing a paleontology education program that includes public outreach, to help our community and visitors gain a better appreciation for our paleontological resources, while also helping to educate about the need for protection of these fossils.

I work with my other natural resource specialist through the NEPA process, and develop stipulations for actions needed to protect fossils.

I maintain databases, and work in GIS for various projects that I give input on. For instance, if a new hiking trail or oil pad were to be constructed, I would give advice about what the potential would be for finding fossils in that area. If the potential is high or likely I would suggest a surface survey or monitoring for the area before, and sometimes during, construction. Fossils are often found before the work occurs, and these can be safely removed or the project can be moved around them so they are not damaged. When the potential to find fossils is very high, a paleontologist is on site while the work is taking place, to help safely remove any fossils discovered before any damage or additional damage is done. This type of work is often called consulting or mitigation paleontology, and is a growing field that many may want to consider as a possible career path.

Given that the goal of FOSSIL is to link amateur groups with professionals, what are your thoughts about the role of amateurs in the science?

I believe that amateurs are vital for the progression of science. In my job I work closely with the [Utah Friends of Paleontology \(UFOP\)](#), which is a statewide non-profit volunteer organization dedicated to preserving Utah's fossil resources through public education and volunteer support of sponsoring institutions. Our local chapter (the Gastonia Chapter) was started in February of 2013 and we have a great group of local community members who help me to preserve and protect the fossils in southeastern Utah. Our volunteers actively participate in monitoring sites with our new paleontology site stewardship program, assist in local paleontology projects such as helping researchers uncover tracksites or excavate fossil sites, trail and locality maintenance, community education activities, and with finding fossils themselves. On almost a weekly basis I will get an email from our



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Local UFOP chapter members, other community members, and visitors to the area who have discovered a new tracks or bones in the field, or who want to know more about our area and how they can make discoveries themselves. I love begin able to interact with them and visit these discoveries with them and their families.

I think it is important to work with your local community, as they are often the ones out on the ground finding the fossils. Being able to include them in the scientific process and help further their appreciation and education about why these sites are important is a wonderful experience. I find that amateurs ask some great questions about the HOWS and WHYS, and really make me think about it from different angles, which I find very beneficial and helps me to be a better educator and communicator.

I find that amateurs ask some great questions about the HOWS and WHYS, and really make me think about it from different angles, which I find very beneficial and helps me to be a better educator and communicator.

I understand a site in southern Utah that includes amazing dinosaur tracks is going to be open for the public?

Southeastern Utah is a great area for tracks! We have the right age and type of rocks exposed over great distances. In the Moab area we currently have four publicly interpreted sites that you can hike to and visit. In 2015 we are planning on adding more hiking trails to visit tracksites—one in the Moab area and one near Blanding. One of the tracksites in Moab is special due to the abundance of tracks available to view at the site - a minimum diversity of at least 10 named ichnotaxa representing dinosaurian and crocodylian trackmakers. Several of these tracks are either new to North America, or from animals not currently known to science from body fossils in this area, making this the most significant Early Cretaceous tracksite in the world. This site is a short distance from the highway, and from the parking lot there will be an information kiosk with information about the short hike (less than a quarter of a mile). A trail that leads to a series of boardwalks will guide you around the site, with interpretative panels explaining about the various tracks and how they were made. A shade structure will also be on site to keep visitors out of the elements and give them a nice overview location for viewing the tracks. We hope to have the site opened in the spring of 2015, with a public celebration planned for the future as well. Stay tuned for future details and announcements!



Do you have any advice to share about effective ways to get children and teens interested in paleontology and collections?

I think giving youth the opportunity to join you in the field or the museum can really help spark their interest. It is one thing to visit their schools and tell them about what it is like, but having the opportunity to actually go out and do the real work, even for a few hours, can be priceless and change lives. Showing all aspects of the work, from the fun and amazing moments, like finding a fossil in situ or doing prep work, to the mundane everyday task, such as data management, labeling or inventorying, can give a better understanding of what the job as a whole is like.

Further reading:

Read about how amateur and professional paleontologists are working to excavate dinosaur tracks in southern Utah. [Moab Times Independent](#).

2014 scientific paper on the excavation of the Mill Canyon Dinosaur Track Site. [pdf](#).

A description of John Foster and Rebecca Hunt-Foster's research involving dinosaur skin fossils is [here](#).

An [interesting story](#) about the only dinosaur remains found in Arkansas, and the focus of Rebecca's graduate research.

More on Rebecca Hunt-Foster on the [National Fossil Day website](#).

STONE ROSE INTERPRETIVE CENTER



By Michael Sternberg, President, Friends of Stonerose



What's cheaper, and more entertaining, than taking the family to a movie? It's visiting Stonerose Interpretive Center to dig for fossils! Nestled in the mountains of northeastern Washington state, Stonerose attracts 5,000-9,000 visitors (that's more than the entire county population) each year including foreign visitors from more than 25 countries.



Stonerose is celebrating its 25th year as a 501(c)3 educational nonprofit that provides public access to Eocene age lake bed fossils. We also offer educational outreach to schools and interested organizations, and have active research of our collections.



Wes Wehr

Stonerose began as the result of a serendipitous trip in the mid 1970's undertaken by Wes Wehr and a teenager by the name of Kirk Johnson. Wesley C. Wehr was Affiliate Curator of Paleobotany at the Burke Museum who relied on others to drive him around the state looking for fossils. He enlisted the newly licensed Kirk (now Director of the Smithsonian's National Museum of Natural History) to check out fossil localities in Eastern Washington State. Republic fossils had been previously studied by J. Umpleby in 1910, E. W. Berry in 1929 and Wolfe and Barghoorn in



Kirk Johnson

1960, but were considered relatively insignificant.

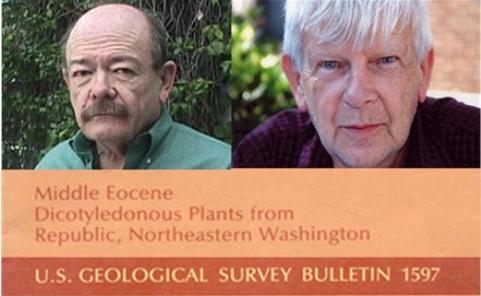
Kirk returned home to later continue professionally as a paleobotanist, but Wes returned to Republic convinced that the Republic fossils were much more abundant and diverse than previous researchers reported. As a result of his persistence, Dr. Jack Wolfe and Wes later published a groundbreaking USGS Bulletin on the fossil flora in Republic.

Wes and City leaders created Stonerose, first as part of City Parks, but in 1989 Stonerose incorporated as a nonprofit and became an autonomous entity.

What makes Stonerose unique?

- Public access to dig fossils in our quarry
- Retention of scientifically significant fossils for research
- Association of the finder with each specimen in the collections.
- Active collaboration with researchers
- K-12 education and outreach programs
- High diversity of flora (particularly the Rose family, Rosaceae) and insects.

Stonerose owns a fossil quarry located in the city of Republic, WA just a short walk from our Interpretive Center. Visitors register at the Center and are given an introductory orientation describing the geology of the site and how to best collect fossils. After successfully finding fossils, the diggers return to the Center to have the specimens examined and identified. Any specimen of



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by Stonerose, but diggers are allowed to keep three fossils per day. Whether our visitors dig or not, our interpretive displays provide a glimpse of life long past.

If a specimen is retained, the finder's name and contact information is recorded on an accession card and kept with the fossil. If the specimen is determined to not be significant by our scientist team, the fossil is returned to the finder. We encourage

researchers to acknowledge the finder in any publications and in many cases that acknowledgement has been by naming the new taxon after the finder! Follow-up letters inform the finder if their specimen has been referenced in a scientific paper, and when possible we include a copy of the paper for them to enjoy.

The Stonerose fossil site is a lacustrine (lake) deposit in the Tom Thumb Tuff member of the Klondike Mountain



Formation dated to about 48-49 MY. The flora (300+ taxa) is an upland temperate forest with many extant families represented, such as birch, alder, elm, and many members of the Rose family. Several plant families, that are now only found in Eastern Asia and Southeastern United States, show up in our fossil record. Metasequoia is the predominant conifer, but several dozen other genera are also present. Vertebrate fossils consist mainly of fish including Eosalmo (earliest known

salmonid), and birds (feathers and 2 partial skeletons). Over 60 insect families are present and aquatic invertebrates are also found.



Because of the depositional setting, the fossil preservation is remarkable, which is of great value to our digging visitors as well as to our researchers.

We house more than 8,000 specimens in our collections, which are documented in our proprietary database STRATA©. The database is extensive in scope. It is used to collect visitor information, track memberships and donations, catalog the collection with finder, taxonomy, and other specimen data and more. Drs. Kathleen Pigg (ASU), Melanie DeVore (GCSU), Bruce Archibald (SFU) and Conrad Labandeira

(NMNH) have current research projects involving Stonerose specimens.

Stonerose Interpretive Center and Eocene Fossil site is, to our knowledge unique in the world of paleontology. We offer family friendly opportunities to collect beautiful fossils while preserving the scientifically important record of this diverse paleo-environment. Our education outreach includes giving kids a chance to find a fossil at the Burke Museum annual Dino Day, visiting K-12 schools and hosting National Fossil Day events.

The Republic fossil sites are recognized as a world-class paleontological resource of the early appearance of many genera and a diverse ecological community.



We invite you to visit us and share in the experience of discovery of ancient fossil life. More at www.stonerosefossil.org.

By Megan Higbee Hendrickson, Teacher, Academy of Holy Names

Editor's note: Megan teaches earth science and biology to sixth and seventh graders at the Academy of Holy Names in Tampa, Florida. She is a participant in the 2014 cohort of the GABI RET (Great American Biotic Interchange Research Experience for Teachers). Megan has been a classroom teacher for 10 years. Prior to GABI, she was a research assistant in the Bahamas for a coastal ecology and near shore reef research project. Geology and paleontology are new interests for her.



Megan Higbee Hendrickson

After looking for fossils in Panama this summer with the GABI RET team, I was excited to get out into the field again, which we did on our wrap-up trip to New Mexico. (It was only on our last day of fielding in Panama that I felt like I finally had the hang of looking for fossils.) As we arrived to our location north of Santa Fe, Dr. Bruce MacFadden looked around the area and quickly realized that the quarry we were looking for was a short hike over the next ridge. The landscape of our field locality was beautiful; I happily trotted alongside Bruce and the other teachers stopping to snap pictures of the landforms I had recently been studying with my students in Tampa, Florida. (I was thrilled to have my picture taken while sitting on a hoodoo after having to convince my students that they did, in fact, exist despite the silly name.)

Little did I know that inspecting this hoodoo would lead to an exciting discovery. While walking near the base of the formation I noticed that there was part of a bone exposed in the dirt. I began to clear away the loose sand and quickly realized that I had found a fossil of some size. Upon closer inspection of the bone, I realized that the end of the bone was split in half, what appeared to be a softball size piece was missing. I glanced down the steep side of the hill I was working on and something caught my eye. Leaving the bone for a few minutes, I went down the hill and retrieved what turned out to be the end of the bone I had uncovered at the top of the hill. Placing the two pieces together and realizing I had a complete fossil was an indescribable feeling.



Megan's find: fossilized metatarsal of a *Megatylopus matthewi*

Very excited, I called Bruce over to identify what I had found. Almost immediately Gary Morgan (our other field leader both in NM and Panama) identified the bone as the metatarsal of a *Megatylopus matthewi*, or giant giraffe camel.

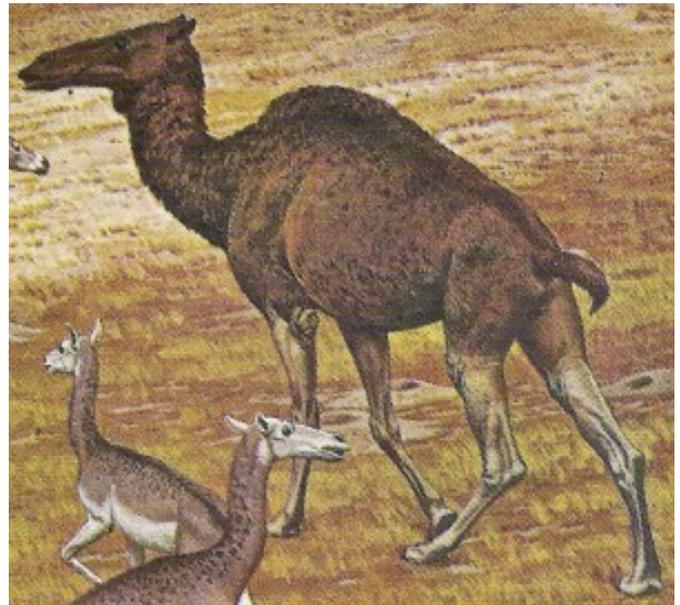
Hearing the excitement over the fossil made me realize that I had found something very special. I worked to clear the area around the bone carefully and with Bruce's help successfully made a plaster jacket. Working on excavating this fossil from beginning to end was a great learning experience. Although it was a simple excavation, understanding the process of collecting and protecting a fossil for transport is a topic my students ask about frequently, and one that I more fully understand now. I was happy to make the hike back to the vehicles with my find and eager to find out exactly what a giant giraffe camel looked like.

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Finding the *Megatylopus* fossil was exhilarating and I was thrilled to have such an amazing experience to share with my students when I returned to the classroom. I have only been learning about paleontology since May. This find has me excited to learn more about what I found and continue to work in the field when I can. Bruce and Gary are have been wonderful mentors and the field experience I had in New Mexico brought a new level of motivation and excitement into the classroom when I returned.

The Paleontologist's Perspective by Bruce MacFadden

Megatylopus matthewi belonged to a group of camels that evolved in North America during the Miocene. Standing at least 12 feet tall, this giant "giraffe-camel" evolved characteristics that made them look like the giraffes of the Old World, despite the fact that the camels (*Camelidae*) and giraffes (*Giraffidae*) are different families of plant-eating, even-toed hoofed mammals (*Artiodactyla*). This dual similarity is an example of parallel evolution of similar characteristics in different groups. *Megatylopus* was widespread in North America, and its occurrence in New Mexico about 6 million years ago, although not unexpected, is nevertheless interesting. I was so excited that Megan made this discovery and the GABI RET teachers had the opportunity to share in the excitement. I am also glad that we were able to add important fossils to the research collections at the New Mexico Museum of Natural History.



Megatylopus matthewi or "giant giraffe-camel"

“Although it was a simple excavation, understanding the process of collecting and protecting a fossil for transport is a topic my students ask about frequently, and one that I more fully understand now.”



Megan on the hoodoo

By Bruce J. MacFadden, Florida Museum of Natural History, University of Florida

Two major professional societies are devoted to paleontology in the U.S. These are the Paleontological Society, founded in 1908, and the Society of Vertebrate Paleontology, founded in 1940. It is widely appreciated by professionals that the contributions of amateurs enrich the disciplines through activities such as field collecting and the donation of important fossils to research collections in natural history museums. In so doing the amateurs contribute to, and advance the science of paleontology and collaborate with professionals. Both of these societies have annual awards that recognize the contributions of amateurs. The awards are presented at the Annual Meetings of each society held in the Fall, at which time the recipient typically attends the meeting to receive the award and be recognized at an awards ceremony.

Strimple Award of the Paleontological Society

The Strimple Award recognizes outstanding achievement in paleontology by amateurs (someone who does not make a living full-time from paleontology). Contributions may be an outstanding record of research and publication, making outstanding collections, safeguarding unique paleontological materials through public service, teaching activities in the area of paleontology, and collaborations with others working in paleontology.

Harrell Strimple was a self-trained paleontologist and from 1962 to 1980, curator of the Paleontological repository at the University of Iowa. His collecting and research emphasis was primarily crinoids. He published more than 300 scientific papers and was a major contributor to the *Treatise of Invertebrate Paleontology*. He frequently named new species of crinoids after local fossil collectors (Adrain, 2009).

Strimple Award Chair: Arnie Miller millerai@ucmail.uc.edu

[For more information](#) about the Strimple Award.

Skinner Award of the Society of Vertebrate Paleontology

The Morris F. Skinner Award honors outstanding and sustained contributions to scientific knowledge through the making of important collections of fossil vertebrates. It shall also be made to those persons who encourage, train or teach others toward the same pursuits.

Morris Skinner was from the Sand Hills of Nebraska in the 20th century. He worked for the Frick Laboratory, primarily as a field collector of fossils, but he also curated fossils. He amassed an extraordinary stratigraphically well documented collection of fossil vertebrates from North America that is one of the largest of its kind in the world. When the Frick Collection became part of the American Museum of Natural History in the 1960s (Galusha 1975), Morris became a curator of that institution. Morris was an expert on fossil horses, and freely shared his love of paleontology and



FOSSIL Project Announcements

The FOSSIL Project is developing a lineup of distinguished speakers who are available to visit fossil clubs and paleontological societies across the country. Topics will vary. Contact fossil@flmnh.ufl.edu if you are interested in hosting a speaker.



Catalina Pimiento

The FOSSIL Project will be participating in the 2015 Aurora Fossil Festival held in Aurora, NC in May. Hope you can join us!



The Aurora Fossil

Continued from page 8

fossil horses, and freely shared his love of paleontology and fossils with amateur and professionals alike. This author was mentored by Morris and owes a debt of gratitude to him for his encouragement and guidance during my early professional career.

Skinner Award Chair: Daniel Goujet goujet@mnhn.fr

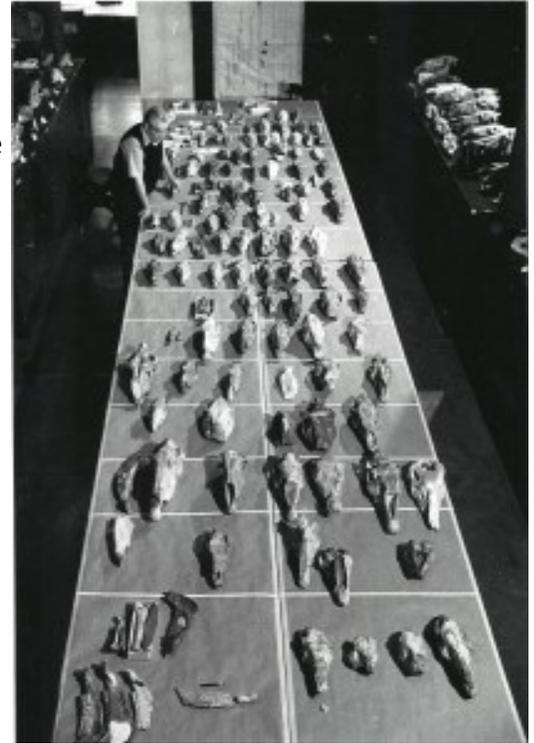
[For more information](#) about the Skinner Award.

In closing, these awards are important to link together amateurs and professionals and celebrate contributions to paleontology. In addition to the national and international awards described above, other paleontological societies and museums give similar awards on a more regional basis. Currently, there is no compilation of these kinds of awards, but that would be something that would further recognize the contributions of amateurs to the science of paleontology.

For further reading:

[Adrain, T. 2009. 150 Years of Collecting Crinoids at the University of Iowa Paleontology Repository. MAPS Digest, 32\(1\):19 – 28.](#)

[Galusha, T. 1975. Childs Frick and the Frick Collection of Fossil Mammals. Curator 18\(1\):5-15.](#)



Morris Skinner with Frick fossil horse collection, ca. 1970s

By Shari Ellis

David Kohls received the 2009 Harrell L. Strimple Award in recognition of his significant contributions to paleontology including the donation of over 72,000 of fossiliferous shale to the Smithsonian Institution and the University of Colorado Museum of Natural History. These pieces of shale contain over 200,000 individual Eocene insect/flora specimens from the Green River Formation in Colorado.

How did David managed to amass such a huge collection? Dr. Dena Smith, Curator of Invertebrate Paleontology at the University of Colorado Museum of Natural History, explains that it is because David—retired from Colorado Mountain College—approached collecting as a full-time job.



David Kohls, 2009 Strimple Award Winner

In the summer, as soon as the weather permits, David begins collecting. He treats this as his job, going to his field sites and working a full day, nearly every weekend-day available. In addition to collecting, he meets with local geologists and land owners and prospects for new collecting sites. He does this work all summer long. Then when the weather starts to turn, David begins to go through the material he has collected. He sorts and trims specimens, photographs and admires those that are extra special and begins the process of packing them for transport. All specimens are labeled with detailed locality data and the data of collection. In the spring, David and his wife Claudia come to the University of Colorado Museum to deliver the specimens and all associated data from the previous year. (Smith, 2011).

David's passion for paleontology was sparked by some fossil worm burrows and shells he discovered while on a field trip during a summer geology class that he arranged through Colorado Mountain College. Not long after, David discovered a locality rich with fossil insects and plant material and he began meticulously collecting fossil insects and plant material from that locality and from 12 other established collecting localities. He continued for 20 years.

Dena Smith aptly describes David as an "ambassador in the field." He formed strong relationships with local geologists, Bureau of Land Management personnel and several oil companies which ultimately granted him unprecedented, permitted access to parcels of their land in northwestern Colorado. David developed a deep appreciation for the value that museum collections offer scientists and kept many paleontologists around the world apprised of his most recent finds.

Scientists especially appreciate David's careful, unbiased collecting. Unlike many amateur collectors who tend to keep the prettiest fossils and discard the rest, David did not throw anything recognizable away. Rare taxa and faint specimens (spiders) that are often overlooked by other collectors regularly appear in David's material. David's specimens represent previously undescribed species and several have proved to be key in reconstructing the evolutionary histories of their groups. The fossils David collected and donated to museums will be studied by many generations of scientists. (Smith, 2011). Below are some of the more unusual and impressive specimens David collected and selected to share.

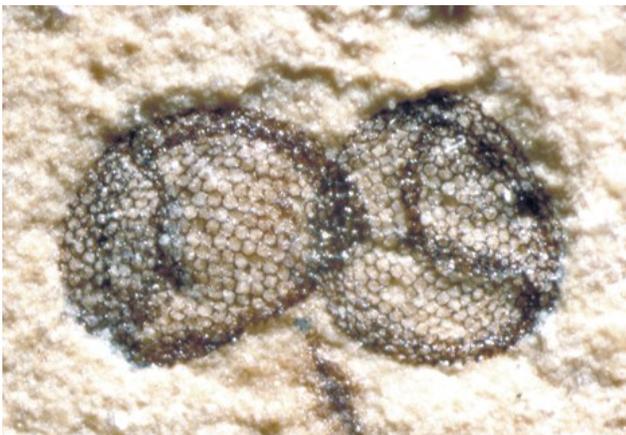
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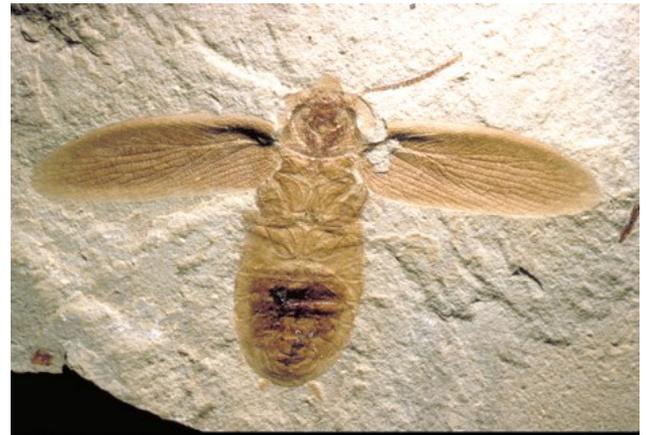
Staphylinidae (Rove Beetle)



Curculionidae (True Weevil)



Ommatidial Structure of Crane-Fly



Cockroach with Gut Contents

David retired from collecting following the 2011 collecting season, saying that it was time to leave that up to others. He now focuses his time on the art of macro-photography. Reflecting on what he has accomplished, David feels very proud that he has had the opportunity to prevail on others to help him make but a small contribution to the science of paleoentomology and is most content realizing that there will indeed be much for future study of the material in the collections. He strongly encourages those with similar interests to follow their heart, do the best that they can, and share their results with others by donating to a qualified museum.

To learn more:

Green River Fossil Collections <http://paleobiology.si.edu/greenriver/index.html>

[The Fossil Insect Collaborative at the University of Colorado](#)

Kohls, David. 2011. Response by David Kohls. *Journal of Paleontology* 85(3): 608 – 609.

Smith, Dena M. 2011. Presentation of the 2009 Harrell L. Strimple Award of the Paleontological Society to David Kohls. *Journal of Paleontology* 85(3): 607.

By Randall B. Irmis, Jessica Seppi, Natalie Toth, and Matthew Whittaker, Natural History Museum of Utah, University of Utah

Through onsite initiatives like Junior Science Academy and K-12 field trips to the Museum, and offsite programs like Museum on the Move, Youth Teaching Youth, and Teaching Toolboxes, the Natural History Museum of Utah (NHMU) has statewide saturation reaching almost 70,000 students annually. All of these programs are designed to directly complement the Utah State Science Core Curriculum standards. In addition, our paleontological researchers have partnered with Grand Staircase-Escalante National Monument for the past fourteen years to bring world renowned paleontological discoveries to Museum visitors and K-12 students through engaging Museum exhibits and outreach materials. Nonetheless, despite the NHMU's extensive programming, many school districts statewide remain underserved, largely because they lack the financial resources for field trips to the Museum or field sites. These students are at a major disadvantage because they are not afforded the opportunities to interact with real objects (i.e., scientific specimens such as rocks, minerals, fossils, etc).

ROCKS, or Real Opportunities to Connect Kids with Scientists, aims to bring paleontology to life by bringing K-12 students into the field and behind the scenes at the Museum by providing them the opportunity to explore right alongside scientists through a digital experience, as well as the chance to interact with Museum educators and scientists while observing real fossils.

The first component of ROCKS is a suite of videos that encourage students to use the scientific process to explore the world of paleontology. By using paleontology as a lens we are able to provide an engaging venue for students to develop and hone their science process skills, while at the same time aligning with the Intended Learning Outcomes found within the 4th Grade Utah State Core Curriculum.

These videos provide the student with the opportunity to follow a fossil's journey from it's discovery at a field site, to preparing the fossil in the lab, and finally, cataloging it in collections; these videos also allow for background for a subsequent live Skype-interactive with a Museum paleontologist. After students have viewed the videos,

Museum educators will visit each classroom and facilitate various hands-on, inquiry-based activities with museum quality specimens that further support the exploration process, and provide fodder for further questions and inferences. Thereafter, students will have the opportunity to ask their questions and share their discoveries over Skype with a paleontologist from the Museum.

Once students have built a solid foundation of scientific process skills via the pre-recorded videos, hands-on experiences with the fossils, and interactive Skype conversations, the students will visit the Museum to have a first-hand look at paleontological specimens in collections, and interact in person with the paleontologist they previously conversed with virtually.



Filming excavation at Grand Staircase-Escalante National Monument

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For the first year of this project we are targeting all 4th grade teachers and students in an underserved school on the west side of Salt Lake City (approximately 100 students and 4 teachers), but plan on expanding the reach and scientific breadth of the program in future years. The pre-recorded videos will also be placed on the Museum website alongside additional resources and be made available to all K-12 teachers.

The education philosophy of the Natural History Museum of Utah has always been to encourage students to feel comfortable utilizing science process skills and, in turn, discovering their true abilities as scientists. We are guided by the emphasis that the scientific process is not a prescriptive method; instead, it is an array of tools that can be adapted for use in a variety of scientific settings. By the end of the experience students will be able to:

- 1) use science process and thinking skills;
- 2) manifest science interest and attitudes;
- 3) understand important paleontological concepts and principles;
- 4) communicate effectively using science language and reasoning; and
- 5) recognize why fossils are important and how they can help us make inferences about the prehistoric past.

These benchmarks are also the Intended Learning Outcomes (ILOs) for the Fourth Grade Science state curriculum in Utah.

Currently, we are in the process of completing filming and editing of the videos, with completion in early February 2015 and initial role-out to students soon after. The facilitated classroom visits and museum trip will be conducted in late spring of 2015 This project is supported by a [Paleontological Society Outreach and Education Grant](#).

To learn more:

More about the Natural History Museum of Utah's award winning [Youth Teaching Youth](#) program.

Randall Irmis' New York Times [Scientist at Work](#) blog.

Read more about Randall Irmis' research [here](#).

The first component of ROCKS is a suite of videos that encourage students to use the scientific process to explore the world of paleontology. These videos provide the student with the opportunity to follow a fossil's journey from it's discovery at a field site, to preparing the fossil in the lab, and finally, cataloging it in collections. The pre-recorded videos will also be placed on the Museum website alongside additional resources and be made available to all K-12 teachers.

By Catalina Pimiento, Doctoral Student, Florida Museum of Natural History, University of Florida

My most recent study on Megalodon, the largest shark that ever lived, was published in the open access journal PLoS ONE last month. This work was the result of a collaborative project with Chris Clements, an expert in mathematical methods that calculate times of extinction, and is part of a larger project where I intend to reconstruct the extinction of this giant shark.

Why do I study the extinction of Megalodon?

Megalodon is a very important species because it was an apex predator. Apex predators are animals that are at the top of the food chain, and have no threats from other predators. These animals maintain ecosystem stability as they control the populations of their prey. Therefore, their removal produces cascading effects (affecting all trophic levels) with catastrophic effects.

Given its importance, the extinction of apex predators has been extensively studied by modern ecology. However, the temporal and spatial scales of these studies are usually limited. Consequently, what we know about the extinction of apex predators is based on population declines or local extirpations, as opposed to actual extinctions. Hence, the study of the extinction of the Megalodon has the potential to offer a broader perspective, not just because it is a giant and cosmopolitan species, but because it has an extensive fossil record spanning for millions of years.

That is why I have been studying the extinction of Megalodon for the last several years. But in order to better understand the extinction of this animal, the first step is to know when it happened. The extinction of species is something we cannot observe directly. Although some scientists use the date of the most recent fossil as a proxy for their extinction time, the fact is that species can survive long after the last time they were recorded. To calculate the most likely extinction date, several methods based on their last records (or sightings) have been developed.



Catalina Pimiento photo © Jeff Gage



The benefits of scientific conferences

Last year, I had the privilege to attend an international ecology conference (INTECOL) in London. There, I attended a talk on an experimental study that tested the effectiveness of the methods that have been proposed to calculate dates of extinction. Given that I work with the largest shark that ever lived, it was a bit ironic that I found a talk about protists so interesting. In any case, I decided to invite the speaker (Chris Clements) to the talk I was giving the next day. In my talk, I mentioned my studies on the evolution of body size of Megalodon, and my intentions to do a meta-analysis of the fossil record to reconstruct its extinction. Chris and I met later that day and decided to study the extinction time of Megalodon combining the methods he works with, and my ideas and results of the meta-analysis.

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The study

We started by collecting the most recent records of the species. For that, we used the Paleobiology Database ([PaleoBioDB](#)) as a platform. As this database was incomplete (for Megalodon), we collected all articles reporting the occurrence of species, and added them to the [PaleoBioDB](#). All these data are available to the public.

Once we constructed the dataset (# 20 in the [PaleoBioDB](#)), we evaluated each record to make sure to include in the analysis only those with sufficient evidence on the age of the fossils. With this subset of data, we used the Optimal Linear Estimation model (OLE), which has been used before to calculate the extinction time of the Dodo. This method calculates the time of extinction based on the distribution of the most recent records. Given that in our case, the records do not have an absolute date, but instead, they span in a range of time, we re-sampled the age of each record 10,000 times from the highest to the lowest age.

The results suggest that the Megalodon became extinct around 2.6 million years ago. Since it has been suggested this species interacted with marine mammals, we proceeded to compare the results with the known evolution and diversification patterns of cetaceans.

What a surprise!

We noticed that our calculated extinction time for Megalodon coincides with the Pliocene and Pleistocene boundary. During the Pleistocene, modern baleen whales reached giant sizes. Therefore, in our study we suggest that the size, and therefore the ecological role of modern whales, was established once the world's largest shark, Megalodon, became extinct.

For now, our study only provides the time of the extinction and recognizes the coincidence with the evolution of gigantism in modern whales. Knowing if an event caused another is our next step.

Further reading:

The new paper on Megalodon extinction is available [here](#).

Read Catalina's paper on ancient Megalodon nurseries [here](#).



The Paleobiology Database
revealing the history of life

By Lisa Lundgren

Since the FOSSIL Project's Facebook page started in October 2013, we've steadily increased our readership, all the way up to—as of December 27, 2014—1,110 FOSSIL Project Facebook followers!

Over 1,000 likes on a Facebook page is a pretty good number, and we are grateful to all of our followers who like, comment and share our Facebook stories. If you have visited our Facebook page, perhaps you noticed that we often find research from open-access journals so our followers can see the new research that occurs in the paleontological world.

By the way, we measure the popularity of our stories by counting the number of people who click the like button on posts, comment on the posts or share them. So if you are on our page and find a post interesting, let us know by commenting, liking and sharing the post!

The story that generated the most interest recently was a discussion of the link between turtles and dinosaurs through genetic sequencing. The research showed that turtles are most closely related to birds, crocodiles and dinosaurs, creating a new group called *Archelosauria*.

Besides the open-access journals articles, we also post stories that we think will interest you, our FOSSIL Project collaborators. For instance, our followers showed interest in a post we created which detailed an iDigBio/ScNet webinar called “Small Fish in a Big Pond: Lessons Learned in Digitizing a Small Paleontology Collection.”

We are constantly searching for new content for the Facebook page, so if you have an event, story or research that you think should go on our page, please post on our [Facebook wall](#) or email us at fossil@flmnh.ufl.edu.

Thanks for helping us get to 1,000 followers! Please continue to like, comment and share with us.

Additional information:

[Turtles and dinosaurs: Scientists solve reptile mysteries with landmark study on the evolution of turtles](#)

The iDigBio/ScNet webinar was recorded and can be found on the Small Collections Network [website](#).



Not following us yet on Facebook? No worries. Below are some of our most popular stories from the last few months, so you can catch up.

Facebook Recap: our most popular stories



[Fossil Finders Documentary](#)

[Paleontologist Jack Horner is working hard trying to turn a chicken into a dinosaur](#)

[Small Fish in a Big Pond: Lessons Learned in Digitizing a Small Paleontology Collection](#)

The world’s dinosaur “Sue”-perstar returns to the Florida Museum of Natural History on Jan. 24, 2015, in the featured exhibition “A *T. rex* Named Sue.”

This bilingual exhibit presents the story of “Sue,” the largest, most complete and best-preserved *Tyrannosaurus rex* ever unearthed. It features a life-size, 42-foot-long cast of the dinosaur and family-friendly interactive components exploring the paleontology that has helped scientists reconstruct Sue’s life and legacy.

One of the largest flesh-eaters to have ever inhabited the Earth, Sue roamed North America about 67 million years ago. The *T. rex* is named for Sue Hendrickson, who discovered the dinosaur in 1990 near Faith, South Dakota.

The exhibit follows the dinosaur’s extraordinary journey from the Cretaceous period and sedimentary rocks of South Dakota to the U.S. courts and finally the world. The exhibit explores *T. rex*’s interactions with its Cretaceous environment, Sue’s instrumental role in unlocking many secrets of the species and the often creative methods of fossil preparation and study.

About 50 *T. rex* specimens have been discovered to date and only about one-quarter of these are considered more than 50% complete. At 90 percent complete and extremely well-preserved, Sue is the most celebrated representative of its species, allowing new detailed studies of the biology, growth and behavior of *T. rex*.

Sue received renewed attention this fall with the release of [Dinosaur 13](#), a film about Sue’s discovery and the legal troubles of the Black Hills Institute of Geological Research, the for-profit group who found and excavated the fossil. Film reviewers have described [Dinosaur 13](#) as “engrossing,” “awe-inspiring” and “a scientific soap opera.” Critics contend that the film ignores broader ethical issues of for-profit paleontology and potentially confuses the public by failing to make clear that the criminal convictions depicted in the film were unrelated to Sue.

For further reading:

[Society of Vertebrate Paleontology’s Statement on Dinosaur 13](#)

[Dinosaur 13 Broadcast on CNN Unearths Old Drama over a *T. rex* named Sue](#)

[Sue the *Tyrannosaurus rex* Stars in Dinosaur 13](#)

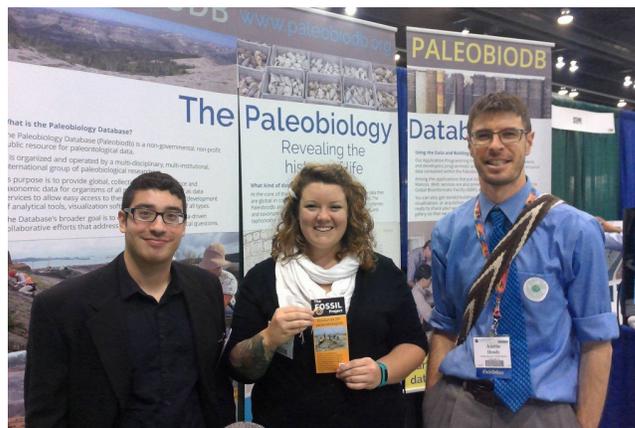


By Bruce MacFadden

The FOSSIL project has been busy on several fronts since our last newsletter. On October 4, the FOSSIL project participated in the National Fossil Day Celebration via a display table at the South Florida Museum in Bradenton. Later in October, Austin Hendy, Lisa Lundgren and Victor Perez promoted the FOSSIL project at the Geological Society of America Annual Meeting held in Vancouver, British Columbia, Canada.



Lisa Lundgren, Victor Perez, Kristen MacKenzie Shari Ellis (not pictured) and Kent Krippen (not pictured) participated in National Fossil Day at the South Florida Museum



Victor Perez, Lisa Lundgren and Austin Hendy represented FOSSIL at GSA

Representatives of the FOSSIL project including Kassie and Austin Hendy, Sharon Holte, and Adiel Klomp maker made presentations to fossil clubs throughout the fall. I presented on the Megalodon exhibit to the Florida Fossil Hunters in Orlando. During that trip, I toured the fossil exhibits at the Orlando Science Center and learned of the great activities sponsored by that club. In February 2015 Cristina Robins and Victor Perez are scheduled to present at fossil clubs in Florida.



Bonnie Cronin of the Florida Fossil Hunters with her horse evolution module

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Since the summer we have engaged the services of a local web development firm, Atmosphere Apps, to design and develop the next version of the myFOSSIL web site. The new and improved version will provide the opportunity for collaboration among members of fossil clubs and professional paleontologists throughout the U.S. We plan to launch this new version of the web site in early 2015, and we hope that all FOSSIL participants will feel at home on this web site as we develop a national learning community among amateur and professional paleontologists.

We are pleased to report that communication among our participants by social media is rapidly expanding. In fact in late 2014 we passed 1,000 likes on Facebook and 359 followers on Twitter. [See the article by Lisa Lundgren in this issue of the newsletter.](#)

In November, Austin and Kassie Hendy moved westward to California where Austin has taken a new job as the Collections Manager of Invertebrate Paleontology at the [Natural History Museum of Los Angeles County](#). We thank Austin and Kassie for their contributions to the FOSSIL project and wish them the best as they start a new phase in their lives, along with their two young daughters, Lucy and Josephine.

Looking forward to 2015, we expect that our new myFOSSIL web site will be the engine that drives the FOSSIL project, and coordinates club and professional participation in cyberspace. It will promote club activities, individuals' interests, and have a fossil photo gallery and e-library and K-12 educational resources, to name just a few of the major components of myFOSSIL.

FOSSIL-sponsored activities that are planned for 2015 include representation at the ever-popular Aurora Fossil Festival in North Carolina in May. Our participation will include a talk by UF PhD student Catalina Pimiento on Megalodon and a FOSSIL project display table. We are organizing a field conference to be held at the Calvert Marine Museum, in Solomons, Maryland immediately following the festival in North Carolina. We are in the process of developing a joint FOSSIL meeting with the Dallas Paleontological Society prior to the Society of Vertebrate Paleontology to be hosted at the Perot Museum of Nature and Science in October. As part of the goal of FOSSIL to expand our reach around the U.S. we are also in the initial stages of planning for other workshops, meetings and field trips during 2015. We are hoping that FOSSIL participants will plan to attend these events, as they represent special opportunities for partnerships involving active fossil clubs, the FOSSIL project and professional paleontologists and their societies.

We also are looking to expand our outreach to local fossil clubs throughout the U. S. during 2015. If your club has interest in having a speaker either representing, or supported by, the FOSSIL project to give a talk, please let us know and we will try to facilitate this on a first-come-first-serve basis. Depending upon travel costs, we should be able to support six talks to clubs. Preference will be given to clubs from regions outside of Florida and the southeast.

Contact us at fossil@flmnh.ufl.edu