



NARG NEWSLETTER

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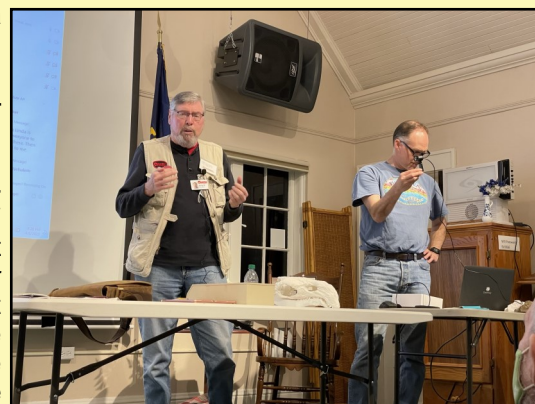
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Reunited and It Feels So Good!

After two years of on-line Zoom meetings, NARG met in-person for the first time in April 2022! On April 6, 41 members attended the meeting either in-person or via the Zoom link. It was wonderful to see each other again and we had a lot to share. The show-and-tell segment of the meeting went very long in the very best way as many people shared finds from the previous years. It was exciting to see current and new members show fossils from their COVID travels.

After show-and-tell, Jerry Dodson continued a previous talk about the information we can learn about vertebrate animals by looking closely at their skulls. He has provided a summary of that talk on the following page.

We were also able to explore our new location, Tualatin Heritage Center (8700 SW Sweek Dr, Tualatin, OR 97062), for the first time. This space should meet our needs for meetings as well as our scheduled Fossil Fest in August. We should feel at home here as the landscaping outside includes several large glacier erratics from the Missoula Floods. We hope to see you at our meetings on the first Wednesdays of every month starting at 7PM.



Jerry Dodson presents on skulls while Aaron Currier monitors technology.



NARG's new home at the Tualatin Heritage Center



One of several glacier erratics in the landscaping around the Tualatin Heritage Center.

Skulls, A Preview for Fossil ID

By Jerold Dodson

(Editor's note: The following is a summary of Jerold Dodson's NARG presentation given on April 6, 2022.)

I volunteer at the Oregon Museum of Science and Industry (OMSI) paleo lab and have been a volunteer since 2002. I never quite realize the idea of time flying. But it does.

We (OMSI) have many skulls in the lab, both actual bone as well as resin, and other cast copies. For many visitors the time in the lab talking and learning of fossils is a highlight. Folks particularly enjoy the highly fractured and desiccated *Triceratops prorsus* skull that we have been working on for nearly two decades. But my dissertation is not limited to the *Triceratops* skull of which only 25% or so was saved from erosion in the Hells Creek hills East of Casper, WY, home of Casper College and the Tate Geological Museum at Casper College.

OMSI allowed me to set-up display tables in a classroom area adjacent to the lab. Of course I had access to the lab and to fossil displays in the lab inclusive of fossil prep by fellow volunteer and NARG member Greg Carr.

The purpose of the presentation was to help NARG members identify and use skull anatomy in their fossil toolkit. Comparative anatomy of vertebrates is a useful tool to understand how the animals lived in specific environments. Researchers use modern or near-modern bones and fossil bones, whether reptilian or mammalian, to ID and understand very old fossils.

Looking at skulls with known features of known animals, and studying those features, provide an investigator with information that will facilitate ID of unknown animals. For instance tooth structure and animal utility – what did it eat thus how did it earn a living when it was alive. Tooth structure inclusive of differing morphological structure that is evident in the dentary and the maxilla of most mammals is specific to species.

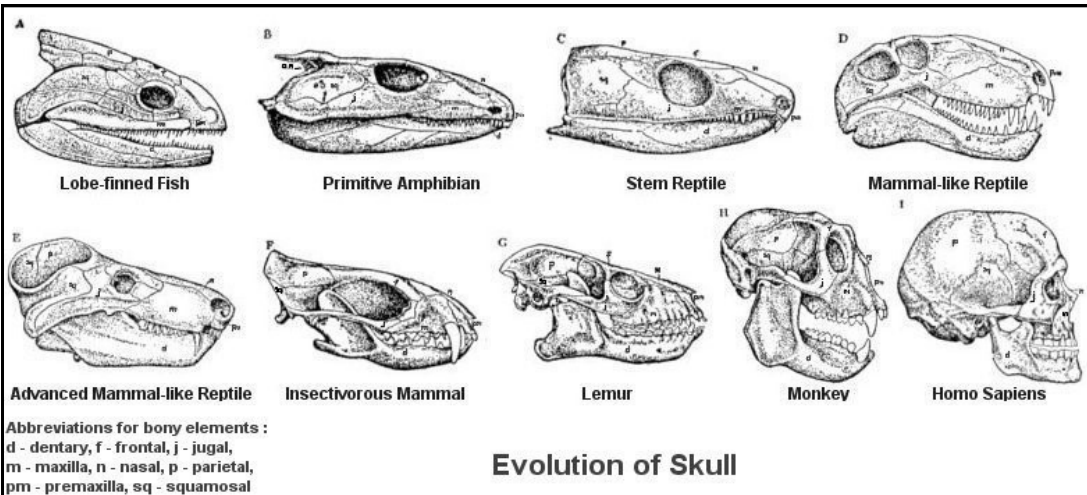
Consider the differences among primates, Canidae and Felidae. The number, shape and count of incisors, canines, pre molars and molars differ. The differences are due to evolutionary change and speciation.

Consider the positioning of skull bones as juxtaposed with the mandibles (in different species). The quadrate always articulates (hinges) with the articular of the mandible. Sometimes the articular is part of the bone structure the surangular/angular.

The NARG April meeting included the videos and discussion intended for the March meeting, with some updates and editing.



Jerold Dodson working in the OMSI Paleo Lab (picture by Greg Carr)



<https://universe-review.ca/R10-19-animals10.htm>

Field Trip Report: Izee-Suplee Area, May 2022

Quite a few of us -about 12 people- went on this field trip. We started out in the what-once-was Suplee, Oregon, now just a location on the map. Attendees were Andree & Scott Kraker, Curtis & Pennie Huggins, Tara & Anthony Baker, Kent Gibson, Tabitha Basye, Nathaniel Woodward, Brian Ravh and Dave Ellingson. We visited three localities on Saturday and three localities on Sunday May 21st and 22nd. On Saturday May 20th we started out at 10:00 AM at the intersection of the Suplee-Paulina road and the Weberg Rd. We then preceded a few hundred yards north on the road to where Bernie the Thalattosaur was found in 2011 and excavated in 2012. We combed through the various rocks on the side of the road-cut. There are lots of Permian limestone rocks there even though the shale is generally Triassic. The formation is the Brisbois formation which has been dated to the Carnian age of the Triassic 225 to 235 million years old. The best fossil found was a large plate of sandstone that contained belemnites on the side of it. These are small cigar-shaped rods that were the internal stiffening inside a squid-like animal. Nathaniel was the finder of this fine specimen.



After several hours at this spot we moved to a second location, the Weberg ammonite site. It's about 8 miles down the road. At this location we hunted for ammonites but found mostly belemnites and clam fossils. It's very apparent that this area has now been picked over rather well by our group in past field trips and is not as productive as it used to be.

Our last stop of the day was in the Cretaceous Bernard formation. This is also the same location where many of us camped on Friday night. At this location there are an interesting juxtaposition of rocks. We have an outcropping of Permian limestone about 280 million years old. We have outcroppings of Triassic conglomerate known as the Begg formation which is 230 million years old. In addition we have the Bernard formation which is Cretaceous at roughly 100 million years old. All these formations are literally within steps of each other. In

the Bernard formation the site of interest is a Cretaceous plant deposit which contains leaves from Cretaceous plants. In a series of specimens that the NARG group collected a number of years ago Dr Retallak at the University of Oregon identified 22 different species of plants. This included two types of ginkgoes, four types of ferns, and several conifers. The majority of plants were actually flowering plants which we call angiosperms. This is an unusually high variety of Angiosperms since they had only recently evolved. These plant fossils are collected by walking over the sandstone flipping over the rocks and looking with a slanted diagonal light to look for the impressions of the plant leaves on the surface of the rocks.



Continued from previous page, Izee-Suplee Area Field Trip

Saturday evening it rained a little but it wasn't bad enough to prevent road travel. It also cleared up after midnight and got very cold – below freezing. We all woke up to ice on our windshields!



On Sunday the 21st we visited three more collecting localities. All three of these were located along 4 service road 6370 which starts at the South fork of the John Day river goes up by Graylock Butte and ends up going back to County Road 380. The first stop was at a Triassic methane seep site. At the at this site methane came up through the mud which is now in hardened into shale. When the methane mixes with oxygen-containing seawater, microbes (bacteria) can grow by consuming the methane as food. The same process occurs today at deep sea methane seeps and where methane is escaping the permafrost in the Arctic areas. As the bacteria eat the methane they grow and reproduce in turn they are eaten by invertebrates particularly brought brachiopods. These three reefs identified in this area are all made out of one species of brachiopods called Halorella. Methane seeps nowadays are mostly populated by

clams of various species and tubeworms. Methane seeps have been located as old as the Silurian and Devonian, including both clam-based seep and brachiopod seeps. See this reference: <https://www.nature.com/articles/s41598-017-14732-y>.

Here is a link to Oregon's seeps:

<https://www.journals.uchicago.edu/doi/10.1086/658199>.

It does not include the seep we went to as I discovered it after the article was written.

The second stop on Sunday was an area of Jurassic sediments that had some blocks of Permian limestone and what looks like Begg formation conglomerate. We collected invertebrates from the Permian or maybe Triassic and also conglomerate material that looked like the Begg formation though the maps don't call it that. the conglomerate was rather attractive and some people collected that as well.



The third stop was a Jurassic invertebrate shell location known as the Suplee formation we spent a lot of time. We found the best specimens in the road fill rather than in the actual outcropping - a lot of clams, brachiopods, some ammonites and various other unknowns were all collected.

Half of the people on this trip had never been on a NARG field trip before. All collected something, and went away happy.

Sincerely, Greg Carr

Continued from previous page, Izee-Suplee Area Field Trip



230 MYA brachiopod from a newly discovered methane seep

NARG caravan on Forest Service dirt roads

Upcoming NARG Field Trips

Greg Carr is organizing a series of weekend field trips for NARG members. All these Summer adventures will be to Central Oregon. When choosing sites and times, Greg attempted to meet the following goals:

- 1) Multiple trips mean that most people get to go on some, no matter what their schedule
- 2) Trips will be confined to weekends (Friday evening-Sunday afternoon) so people with work constraints can still come.
- 3) Central Oregon is close (relatively) to minimize gas usage.
- 4) People are encouraged to do carpooling to (again) minimize gas cost and fossil fuel usage.
- 5) Trips will not be scheduled on holiday weekends.
- 6) Collecting locations will be preferred.

Here is his proposed schedule. Suggestions are welcomed:

June 18-19	Madras— excavating recently discovered giant spike-toothed salmon skeletons
July 23-24	Arbuckle Mountain — fern, leaf and palm fossils
August 20	Mist Bluff—crinoids and other invertebrates
September 17-18	Mitchell—leaf fossils and ammonites
October 8-9	Post —petrified wood, agates, calcite crystals

Camping and lodging locations will be sent out a few weeks before each trip.

For more information, contact Greg Carr (greg.fossil.hunter@gmail.com).

Field Trip Opportunities with Prehistoric Field Museum in Utah

To go along with the theme of summer field trips, here are some field trips available in conjunction with the Price Utah Prehistoric Field Museum. These are to one of the fossil heavens on earth: Utah!

Contact Jerry Dodson (sirthomasdee01@gmail.com) or Josh Lively (josh.lively@usu.edu) for more information.

Colleagues and volunteers,

Are you feeling cabin fever? Are you excited about getting back outside and finding fossils with your favorite museum in eastern Utah? The wait is over - we have finalized our schedule of remote paleo expeditions for 2022! Attached you'll find the TLDR version of the schedule. As always, our trips are FREE to our students, volunteers, and colleagues, with food, water, and all the necessities provided. We do appreciate any donations to the museum to help cover food costs, but only if you are able to chip in. Because we shifted around dates a bit, please respond to confirm what dates you'll be able to attend a given trip, even if you have already signed up for one. Let me know if you have any questions. Looking forward to seeing you all out in the field with us again in 2022!

Below are details for each of our trips:

June 21-30: Cretaceous - Paleocene North Horn Formation, Wasatch Plateau, Utah

When it's getting hot at lower elevations, let's work up high! This trip will be based out of Joe's Valley (+7000'), with most of our work being at over 8300' in elevation with big daily elevation changes. The North Horn Formation spans the Cretaceous-Paleocene boundary, meaning we will find the last of the non-avian dinosaurs in Utah on this trip! A portion of our crew will continue excavating our Rabbit Foot Torosaurus locality, while the rest prospect for new sites. Last year we found abundant egg shell, invertebrates, turtles, crocs, and even Tyrannosaurus teeth! Camping will be at Joe's Valley Reservoir, which is easily accessed by car on blacktop.

August 10-17: Cretaceous - Paleocene North Horn Formation, Wasatch Plateau, Utah

See above! We may camp at a different locality to access some new outcrops, depending on the results of our June trip.

August 31-September 7: Eocene Uinta Formation, Roosevelt, Utah

This trip will be based out of the Uinta Basin near Roosevelt, Utah. The museum has a number of sites, including a bonebed producing a weird, poorly known mammal called Achaenodon. If you're tired of dinosaurs or just more interested in mammals and turtles, this is the trip for you! Because this trip spans Labor Day, we expect this one to fill up quickly! More details to follow this summer.

September 27-October 4: Upper Cretaceous Neslen and Lower Cretaceous Cedar Mountain formations, Green River, Utah See above! Depending on what we scare up in May, the focus may lean more toward excavation at our Cedar Mountain quarry, which has so much bone we will probably be working it until I retire...

If you live in the Price/Helper area (or want to come hang out in a hotel in town), we will also have abundant day trips out into local areas to excavate a new mosasaur, plesiosaur, and sauropod, particularly in July and other times between our remote expeditions.

Joshua Lively, Ph.D.

Curator of Paleontology

Prehistoric Museum

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**Editor's note: These field trips are organized by the Prehistoric Museum and not sponsored by NARG.*

“Cretaceous Gulch” Invertebrates and Shark Teeth Near Price Utah

By Nathaniel Woodward



Google satellite map of “Cretaceous Gulch” location

During July 2021 I had the opportunity to return to my hometown of Price, Utah for a two week visit with my Father. Much of that time was spent on the strikingly stunning geological uplift known as the San Rafael Swell, just a short 20 minutes drive south. Most of my collecting was done in an area slightly north of the Swell and just south of Highway 6, also known as the Grand Army of the Republic Highway (shoutout to any Clone Wars fans) near East Carbon. Here is a wide swath of exposed fossiliferous rock known as the Emery and Ferron Sandstone member of the Mancos Shale. This sandstone layer is comprised of a few subsidiary layers which each contain unique and spectacular varieties of ancient marine life from the Western Interior Seaway of the late Cretaceous. In my searching I found a large number of concretions containing incredible ammonite, turritella, and other bivalve and gastropod specimens as well as a few interesting but yet to be conclusively identified rock formations.

While I am quite familiar with finding most of these species in this location, which I have dubbed “Cretaceous Gulch,” I was happy to find a wide exposure of the Juana Lopez member of the Ferron Sandstone. This layer is known to contain a large number of shark and fish teeth both in quantity and diversity and did not disappoint.

Having an acquaintance with a local alfalfa farmer who provided permission to collect on his property, I looked for accessible exposures of this sandstone layer among book cliffs. Once located, I set-out to find an extinct anthill to draw some samples from, which proved to be not much of a challenge. From my first sample several teeth were immediately visible from an incredible range of species as well as hundreds of other types of marine life and even a tiny meteorite. The extinct anthill was then relocated to a five gallon bucket (the scientific way of saying I got a shovel and scooped up dirt) and I spent the subsequent months sifting and sorting through each granule. The contents of this anthill produced identifiable specimens mostly of the chondrichthyan species of about half-a-dozen taxa were found including *Ptychodus*, *Leptostyrax*, *Pseudohupolophus*, *Squalicorax*, and *Protoplatyrhina*. Also found among these teeth was a single forearm bone from some marine reptile which measured approximately 1 cm. (See photos on next page.)



If you have access to a similar area and want to collect fossil teeth, I suggest combing the mid-level sections of book cliffs and sifting small samples from anthills as you go. I recommend bringing a small trowel and sifting screen or simply a gold panning plate which is my preferred method. Academic papers such as those written by Becker, Wellner, Mallery, and Chamberlain go into great detail regarding these species near this location and are worth the read.

Martin A. Becker, Robert W. Wellner, Christopher S. Mallery, John A. Chamberlain. Chondrichthyan from the lower Ferron Sandstone member of the Manco Shale (Upper Cretaceous: Middle Turonian) of Emery and Carbon Counties, Utah, USA.. *Journal of Paleontology*. 2010. 84(2):248–266. doi: <https://doi.org/10.1666/09-053R.1>

Continued from previous page, "Cretaceous Gulch"



Separated anthill components (teeth in lower left-hand corner)

Editor's note: It is illegal to collect vertebrate material, including shark teeth, from public lands (BLM, NSFS). Collecting from private land (as Nathaniel did) is legal with the landowner's permission.



Variety of shark teeth found after sifting sands of anthills

Cartoon Corner



A single forearm bone from some marine reptile which measured approximately 1 cm.

Mammoths in Corvallis

In 2016 during the construction of a section of Reser Stadium at Oregon State University a partial skeleton of a Columbian Mammoth were uncovered. Several bones were recovered, including a femur, pelvis, scapula, and ribs. Unfortunately, there was not enough time to complete the excavation before construction had to resume so a large section of soil was removed and eventually loaded into over a hundred 5 gallon buckets. These buckets sat in a warehouse at Oregon State until about 20 were removed to Woodburn High School earlier this month. On May 14, eight brave NARG members screened through these buckets and found more of the Reser Mammoth. Most of the bones were fragments, but a handful were larger pieces of rib. While the process was muddy and wet, it was rewarding as all buckets contained bone and all screeners went home with a bag full of the Reser Mammoth.



There are still plenty of buckets to screen through so this adventure will happen again in the future.



Also, during the month of April, a construction crew doing gas line work on 9th street in Corvallis uncovered a mammoth tusk. The Reser crew were brought back in to excavate and managed to plaster jacket the tusk and remove it intact. There were other bones that were uncovered and it appeared that the rest of the skeleton was under the road.

So, the next time you are driving down 9th street in Corvallis to catch a bite to eat before the big Beavers Football game know that you are walking on skeletons of mammoths that are still waiting to be excavated.

Submitted by Dave Ellingson

Jim Goedert's (NARG Advisor) Plant Fossil Discoveries Part of Evolutionary Research Study

Dear Jim,

It's been a while since we last corresponded about Sucia Island and its Cretaceous plants. Attached is a paper that my lab published that describes exceptionally well preserved fruits with interesting evolutionary and biogeographic implications. I believe you and David actually collected these specimens and we acknowledged you two in the paper.

Hope all is well.

Sincerely,
Brian

Brian A. Atkinson, PhD
Assistant Professor, Department of Ecology and Evolutionary Biology
Curator, Division of Paleobotany, Biodiversity Institute
University of Kansas

Extending beyond Gondwana: Cretaceous Cunoniaceae from western North America. Keana K. Tang, Selena Y. Smith and Brian A. Atkinson

Received: 19 October 2021 Accepted: 16 December 2021

New Phytologist (2022) doi: 10.1111/nph.17976

Summary

- Cunoniaceae are important elements of rainforests across the Southern Hemisphere. Many of these flowering plants are considered Paleo-Antarctic Rainforest Lineages that had a Gondwanan distribution since the Paleocene. Fossils of several modern genera within the family, such as *Ceratopetalum*, have indicated biogeographical connections between South America and Australia in the Cenozoic.
- Here, we report a dramatic geographical range extension for *Ceratopetalum*, and Cunoniaceae as a whole, based on two exceptionally preserved fossil winged fruits from Campanian (c. 82–80 Ma old) deposits on Sucia Island, Washington, USA. The fossils were studied using physical sectioning, light microscopy, micro-computed tomography scanning and multiple phylogenetic analyses.
- The fossil fruits share diagnostic characters with *Ceratopetalum* such as the presence of four to five persistent calyx lobes, a prominent nectary disk, persistent stamens, a semi-inferior ovary and two persistent styles. Based on morphological comparisons with fruits of extant species and support from phylogenetic analyses, the fossils are assigned to a new species *Ceratopetalum suciensis*.
- These fossils are the first unequivocal evidence of crown Cunoniaceae from the Cretaceous of North America, indicating a more complicated biogeographical history for this important Gondwanan family.

Acknowledgements We thank David W. Starr and **Jim Goedert (Washington, USA)** for the collection of fossils as well as Steven R. Manchester, Florida Museum of Natural History, University of Florida, for bringing the study material to our attention. Fossil material is credited to Washington State Parks and Recreation Commission.

Figure from Tang, Smith, and Atkinson. Extending beyond Gondwana: Cretaceous Cunoniaceae from western North America featuring fossils collected by NARG advisor, Jim Goedert.

New
Phytologist

Research 3

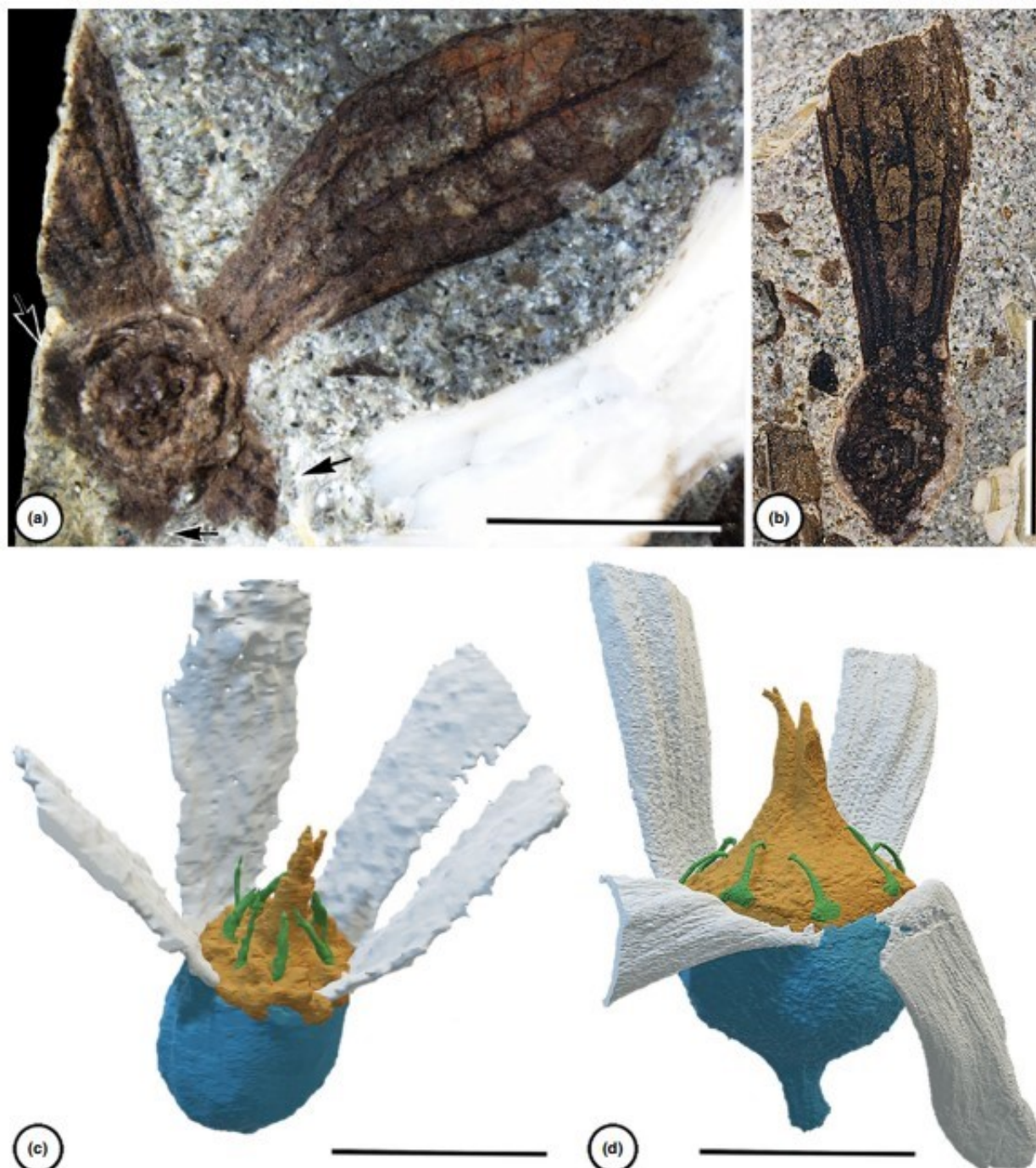


Fig. 1 Structure of *Ceratopetalum sutschensis* Tang & Atkinson sp. nov. (a–c) and extant *Ceratopetalum succirubrum* (in d). (a) Exposed rock showing top-down view of fruit with an annular nectary, one entire wing, a partial wing and three abraded wings (arrows). Note that the upper (superior) portion of the ovary is abraded. KUPB 19168, Bar, 5 mm. (b) Exposed specimen in oblique longitudinal view of fruit body and a wing. KUPB 19169, Bar, 5 mm (image courtesy S.R. Manchester, University of Florida). (c) Three-dimensional reconstruction of specimen in (b) showing general morphology of the fruit including two styles, diplostemonous stamens and four wings are present. KUPB 19169, Bar, 5 mm. (d) Three-dimensional reconstruction of extant fruit of *C. succirubrum* showing general morphology including two styles, diplostemonous stamens and four wings (apices are cropped). BH 95696, Bar, 5 mm. Colors: white, calyx/wings; orange, styles and nectary disk; green, stamen; blue, hypanthium.

Bob Manley's 14 Newport Crabs Go to Kent State for Clarification (and Lisa Schenk's Related Find)

An original description of five small Astoria Formation crabs, found near Moolak beach in Newport, OR, was done in 2001, by Drs. Schweitzer & Feldmann, at Kent State University. The assigned genus also covered similar but different species of small crabs found in the Coaledo Fm. on the SW Oregon coast. Recently Bob Manley collected and prepared 14 additional examples of these Newport crabs—some with ventral sides showing—and sent them to the original describing authors for identification and clarification. Drs. Schweitzer & Feldmann gave the project to their PhD student, Raelyn Eckert to study, measure, evaluate and to further complete the species description and its place in the family and subfamily of small crabs. She measured the crabs, charted them and clarified the Genus and species descriptions, with the results published in an open-access paper in the Bulletin of the Mizunami Fossil Museum,(cited below). The crabs were also photographed with a scanning electron microscope, showing additional details with extreme closeups of the small bumps or cuticles and the honeycomb structure on the surface showing a hexagonal prismatic structure of their surface arrangement. To make them available to everyone for future study, Bob donated the 14 crabs to the Condon Collection at the University of Oregon.

While the journal article about Bob's 14 crabs was going to press, Lisa Schenk found, rescued and photographed one of the same crabs, (picture below) perfectly split, laying among the Newport, Oregon, beach rocks. Lisa put it in her scarf and cradled it in her lap during the ride home, to keep it from crumbling apart. Lisa plans to stabilize the surrounding rock fragments with an archival plastic Paraloid B72, dissolved in acetone, used by museums in fossil preparation, and perhaps superglue on the underside or between the fragmenting rock. Similar to the fossil crabs Bob found also at Newport, it also appears to be a *Globihexapus paxillus*—the only difference is that Bob's crabs were all inside concretions while Lisa's was found among the broken rocks on the beach.

The formal title of the article about Bob's crabs is below, followed by an online link to view or download:

Schweitzer, Carrie E., Rodney M. Feldmann & Raelyn P. Eckert. 2022. Evaluation of extinct members of Asthenognathinae (Decapoda: Brachyura: Varunidae) based on new specimens from the Astoria Formation (Miocene), Oregon, USA. *Bulletin of the Mizunami Fossil Museum*(49): 1-16.

<http://www2.city.mizunami.gifu.jp/bulletin/list/17/pdf/1/1/BMFM49-001Schweitzer%20et%20al.,%202022.pdf>



B-REX

By Arnold Williams

My cousin Bob Harmon was born and raised in Montana. Bob and his younger brother Pete would often search for dinosaur fossils in the canyons near their home. One day while out searching they discovered a bed of dinosaur eggs. They dug some up and put them in their backpack. On their way back home they came across a crew excavating an area. The crew was headed by Jack Horner from the Museum of the Rockies. Jack saw these two young kids watching them from the canyon rim. Jack was afraid they might come in at night and disturb the dig site, so he sent one of the workers up to see what they were up to. They told the worker they were out looking for fossils and had dug up some eggs. They showed the worker their finds in the backpack. He took my cousins down to show Jack the eggs. Jack hired them on the spot. Bob has traveled to China with Jack many times on digs and became the chief preparator at the Museum of the Rockies.

In 2000, Bob was out checking a canyon in the Charles M. Russell National Wildlife Refuge in Garfield County Montana, part of the Hell Creek formation looking for fossils. He stopped for lunch and while eating a sandwich he looked up above and saw a *T. rex* metatarsal sticking out of the canyon wall. It was under 60 feet of over-burden. So excavation began. Due to the remote location it had to be air lifted out by helicopter. It was nicknamed B-Rex after my cousin Bob. It is famous for containing partially fossilized soft tissue in its femur, allowing study for the first time of its DNA structure. In 2016, it was announced scientists had found medullary bone which meant B-Rex was a female and egg producing. B-Rex is 68 million years old, the oldest *T. rex* ever found.

Jack Horner believes he can reverse engineer a dinosaur from a chicken egg. He's the inspiration for the scientist in the movie Jurassic Park and worked as a technical adviser on the movie. Jack and Bob were interviewed for a 60 Minutes segment several years ago. Jack retired from the museum in 2016, but continues his work on a chickensaurus. Bob is still working at the museum and loves his work. He's sent me a triceratops vertebra and a few other fossils. A very cool surprise when a box from the Museum of the Rockies shows up.



Bob Harmon and assistant preparing a fossil at the Museum of the Rockies.



B-Rex skull

Cave Bear Skull Provenance

By Brian Rauh

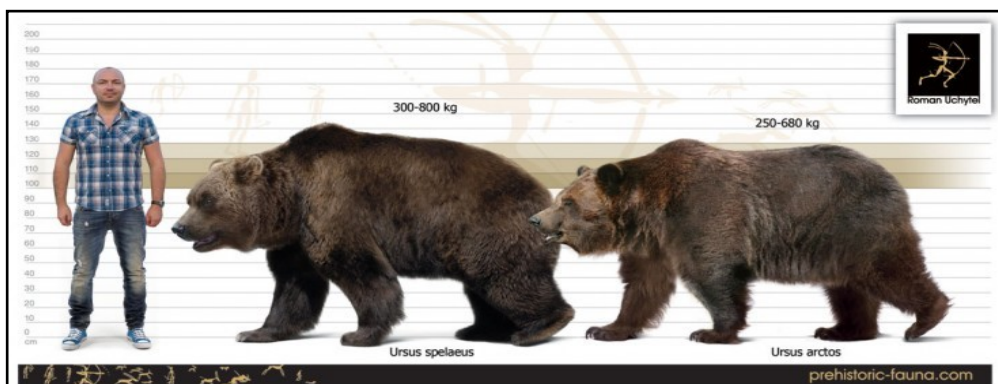
Editor's Note: Brian brought a cave bear skull to May's NARG meeting and shared it during show-and-tell. Here he describes how he came to purchase the skull.

Below is the write up from Brittany Burkhardt who owns 'Elemental Endeavors,' and rock shows in Washington and Oregon. She is the one that sold me the skull. I've been a pretty big customer of hers the last half year and brought Moon and Mars rocks from her late last year.

I got the skull from Brittany while she was at the Tucson show last February along with some other great stuff including a French human fossil found in a cave with some calcite nodules grown to the bone.

Per Brittany's email to me..

"The cave bear skull IS complete, with original lower jaw. Overall, it has less than 2% restoration. It did naturally have an "underbite," which the guy said he did see from time to time, but this was the best example he can remember seeing in over 3 decades. It is from the Carpathian Mountain caves in the area of Brasov or Kronstadt, Romania, Pleistocene era, 42,000 to 100,000 years old. The fossils were declared a national treasure of Romania about 15 years ago, so no more have been collected since then. All available today are from old collections. The caves were emptied decades ago. Even the government crushed over 100,000 pounds of these things for use in the pharmaceutical industry and agriculture before realizing their significance and banning all further collection of them. I will see what else I can find out when I go back in a few days to pay the remaining balance. As far as price, I still think I should be able to ship (and handle) it and still not go over \$10,000. The collector of it has spent his life collecting in those caves, and due to medical bills and old age, he has decided to sell to his long time friend, Joaquim, whom I have been buying from since I was



Size comparison of human to *Ursus spelaeus* (cave bear) and *Ursus arctos* (modern brown bear). <https://prehistoric-fauna.com/Ursus-spelaeus>

Double and Triple Crabs in Concretions

collected and prepared by Greg Gentry

You're lucky when you find a concretion that contains a complete preserved crab. Even then, the process of extracting the crab from the rock and preparing it for display becomes a gamble fraught with the possibility of ruin. To take the odds even further, there is always the chance that there might be two or sometimes three crabs hidden within the concretion. Greg Gentry has collected and prepared several hundred crabs over the years, and has come across a few that contain two crabs and twice, found one containing three crabs.

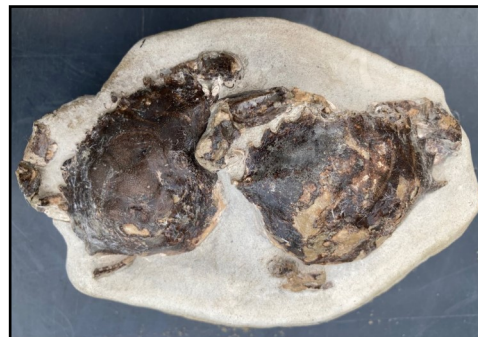
Here are three concretions with multiple crabs from the Cowlitz Formation in Western Oregon. The first one shows the ventral sides of two *Branchioplax* genera--probably *washingtoniana* species. The second larger concretion shows a *Branchioplax washingtoniana* paired with a *Raninoides willapensis*. The third concretion has 3 crabs—two *Raninoides* and a partial *Branchioplax*.



From the Keasey Formation in Western Oregon are two concretions that Greg found and prepared that both contain two *Megokkos microspinus* crabs.



Close-by, Greg also found a concretion that contained two *Maeandricampus triangulum* crabs, a species that is hard to find by itself—and rare to find two enclosed together.



Continued from previous page, Double and Triple Crabs



Here are two *Macroacaena schencki* crabs with an unidentified shell.



Here is large *Macroacaena schencki* crab paired with a newly-discovered crab described in 2016, and named after former NARG president, Bill Sullivan, called a *Macrocheira sullivanii*.



Greg has also found three other concretions containing double *Macroacaena schencki* crabs, and a beautiful example containing three of those same species. The last one containing three crabs is on display at the Oregon Aquarium at Newport, in the Ray Troll, Kirk Johnson exhibit for the book "Cruisin the Fossil Coastline" on exhibit until August 2022.



Submitted by Bruce Thiel

Making Cavity Mounts for Fossils – the Easy Way

Cavity mounts are custom-fit cradles used to hold and protect fragile fossils which do not need the support and strength of a custom-fit plaster cradle. Typically, they are used for smaller fossils that can easily be lifted up and held in one or two hands. I have used a method described in a YouTube video produced by the “Association for Materials & Methods in Paleontology”, modified to use materials available in big-box building supply stores. A link to the original YouTube video can be found here: <https://www.youtube.com/watch?v=40NSRlr9mgw>

The original materials used include cardboard half-boxes (bottoms) and Ethafoam® foam boards. These are specialty items. In my versions, I substitute 2 inch thick polystyrene foam (PS) insulating board (NOT Beadboard) combining the bottom and sides of the cavity into one material. Polystyrene-based plastic may not be quite as inert as polyethylene-based plastic, but they will still last many decades in storage environments with limited UV light. As of May 2022 a 4 foot x 8 foot insulating sheet costs about US\$42, which will make over 100 cavity mounts.

First of all, a block of PS about 2-4 inches larger than the specimen (in both dimensions) is cut from the large sheets which will give a 1-2 inch rim around the specimen. I use an Exacto® knife to cut the sheet, cutting from both sides, snapped off and smoothed with a coarse sanding block). You can cut several blocks at the same time, of course.

The fossil outline is traced onto the PS with about a ¼ inch clearance, which is easily used if you hold a Sharpie® marker vertically on the edge of the fossil and trace it around.



The cavity is then cut out, deep enough to hold the majority of the specimen. You do not want to cut through the entire sheet since it provides the bottom as well as the sides of the cavity. I cut the cavity with a trim router. Since the router bit is only about ¾ inch, sometimes it takes two passes to get a deep enough hole. You can contour the bottom of the hole to fit the object, but a tight fit is not necessary. You can also do it with an Exacto knife or a box cutter. Cut the outline, then cut the interior into cubes and tear out the cubes. Fit the specimen into the cavity and trim with a sharp knife to make a good fit.

Continued from previous page, Making Cavity Mounts

The cavity has to be lined with a clean inert liner. The material of choice is Tyvek®, a spun-bound polyester used as an air migration barrier in house construction. A cut is made in the surface of the PS block at least ¼ inch from the outside of the cavity, at least ½ inch deep. I used an Exacto® knife. A piece of Tyvek about 1 inch larger than the block is then pushed down into the slit to hold it in place. Crumple the Tyvek before inserting it – that really helps.



Cut off the excess material and push the cut edge down into the slit as well. It really helps hold the barrier.

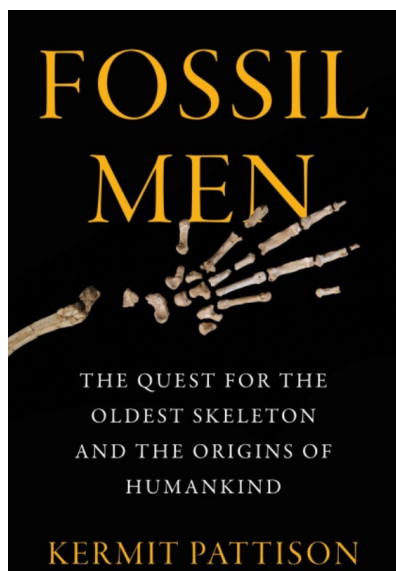
Finally, label your specimens. I didn't bother putting in the vertical 'bumpers' as detailed in the original video as there is no gap between box and foam to hold the plastic. Just be careful to not damage the fossil in a too-short storage space.



Here is example of good fossil to protect with a cavity mount – backbones from a Spike-Tooth Salmon (currently at OMSI).



Sincerely, Greg Carr



Book Review: Fossil Men

By Gerry Lukos

In the previous edition of the NARG newsletter, I offered a report on the book *Sediments of Time* by Meave Leakey. One of the characteristics of that book that I called out was that there was much more emphasis on collaboration than on the rivalries that I had seen in earlier coverage of the world of paleoanthropology. The latest book I have read on the hunt for human ancestors makes very short work of collaboration and is built around the rivalry and competition in this field.

Fossil Men: The Quest for the Oldest Skeleton and the Origins of Humankind, by Kermit Pattison, focuses on discoveries made in Ethiopia, specifically in the Middle Awash region, and the hominid that would be named *Ardipithecus ramidus*, aka Ardi.

The title *Fossil Men* has two meanings. It was once a term used to refer to human ancestors – even though some of the few specimens of the time were not men at all. In this volume, it also refers to the people – mostly men – who have devoted their energies to discovering and analyzing evidence of those early ancestors.

The selection of “fossil men” profiled in the book have very strong and not always compatible personalities. At the center of the narrative is Tim White, the strongest personality of them all and maybe one of “the most hated men” in the profession. The author certainly doesn’t hate White, but his telling makes it understandable why White’s colleagues and rivals found him, let’s say, challenging.

Among the others profiled are several Ethiopian scientists and team members. One of White’s (many) criticisms of others in his profession is that they do not develop the local talent or institutions. They swoop in to find fossils and fame, with little concern for the heritage of the country whose earth they are “mining.”

On the edges of the story are other big names in paleoanthropology. Early in his career, White was enlisted by Donald Johanson to help analyze the 1974 find known as Lucy. That collaboration would soon turn into a bitter rivalry. Toward the end of *Fossil Men*, we also meet Lee Berger, whose excavation of Homo Naledi in South Africa was the antithesis of White’s own field work, the results of which remained hidden from public view until he had more answers than questions.

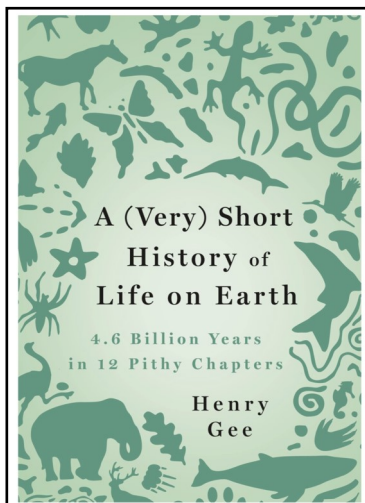
The book covers decades of field seasons in Ethiopia’s Middle Awash, sometimes interrupted for years by political upheaval and falling out among former colleagues. Over time, the team’s experience on the ground evolves from negotiating site access with the current government as well as with warring and armed tribal members who claimed each side of the valley to, in recent years, negotiating modern paved roads and commercial activity that combine to threaten still hidden fossils.

The central action takes place between 1994, when White’s team discovered the first evidence of Ardi, and 2009, when White at long last published the team’s findings and revealed the fossils to the world. During that time, they kept the fragile fossils out of sight while they hunted for more and meticulously analyzed and interpreted every aspect of the limited number of body parts they were able to rescue.

Ardi was not remarkable just because of her age – 4.4 myo – but because “[h]er skeleton challenged core beliefs about how we became human, how our ancestors split from other apes, how we came to stand upright, how we evolved our nimble hands, and whether the savannas were truly the crucibles of humanity.”

One of the discussions I found particularly interesting addressed something I have long wondered about. Much of the analysis I’ve read of early hominids involves comparisons with modern-day chimpanzees. The assumption seemed to be that chimpanzees have evolved less since we shared a common ancestor than has the branch off that became us. Analysis of the Ardi fossils suggests that this assumption is false and has misled scientists. Moreover, genomic research is showing that in some areas, humans have undergone *less* change than chimpanzees.

I found *Fossil Men* to be an engaging account of how scientists go about finding and interpreting tiny, disembodied fossils to reach conclusions about our long-extinct ancestors. The ebook version is available through the Washington and Multnomah county library systems.



Book Review: A (Very) Short History of Life on Earth

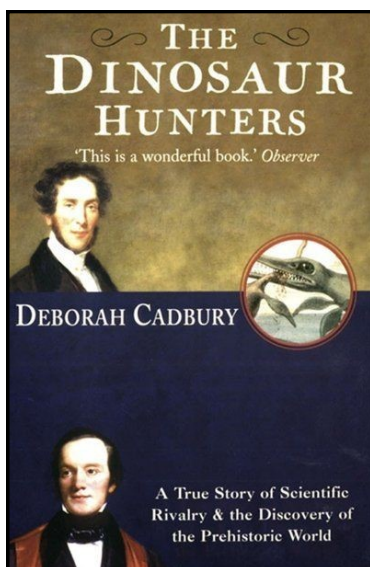
By Bruce Thiel

This is a book to read with two bookmarks. Each chapter can cover hundreds of millions of years—in short readable form with interesting paragraphs narrating such things as how a chemical soup became an ocean, or how microscopic mucous evolves into an amoeba. Each fact is footnoted, with interesting comments highlighting a scientific article—often cited from “Nature”—the world’s most renowned scientific journal—where the author has worked for the last 34 years and is now the Senior Editor. As I read, I became enthralled, flipping the pages back and forth, from bookmark to bookmark, reading about narrative and technical discoveries, I had not imagined. I read my way through mass extinctions, the continents breaking apart and later coming together again, and then onto glaciation—and warming eras when all polar ice disappeared.

While the book is true to its title, it has sufficient detail to cover everything thoroughly—especially the later chapters theorizing how the mammals survived and hominoids emerged and then evolved into present-day man.

If it's not enough to bring us up to present, the author takes us forward to our own extinction when our civilization is reduced to a few meters of ocean sediments waiting to slide under the tectonic plates. Eventually we will melt and then be recycled through volcanic eruption—a cycle continuing perhaps several times until our sun explodes and dies out, and we go back to being stardust.

It was the podcast interview with the author in Episode 52 of Paleo Nerds that led me to the book. Since it was newly published and listed for \$25, I wondered if it might be too technical for my taste—so I checked with Multnomah County Library—two of their 18 copies were available. Now that I've read it, I decided I'd like to have my own copy for future reference. A quick scan of Bookfinder.com—a favorite search engine for new and used books (which always include the shipping and postage in their price)—showed a gently-used copy for \$15.34, delivered, so now I can reread and browse at my leisure.



Book Review: The Dinosaur Hunters

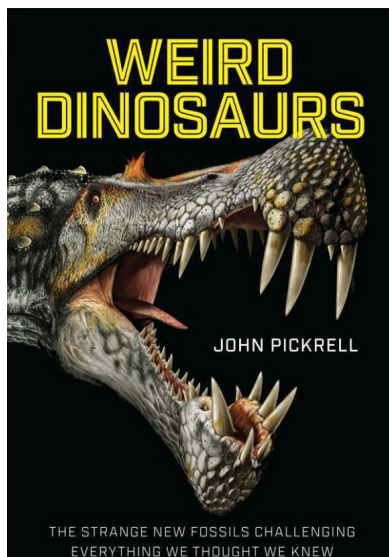
By Harold E Hinds Jr

Deborah Cadbury, *The Dinosaur Hunters : A True Story of Scientific rivalry and Discovery of the Prehistoric World* (London: Fourth Estate, 2012)

Interested in a compelling page-turner that traces the dawn of our understanding of dinosaurs? The list of principal characters : Mary Anning and plesiosaurs and ichthyosaurs; Rev. William Buchland and fossils that supported the Bible; Gideon Mantell who discovered the earliest known dinosaur , Iguanodon; Richard Owen, a brilliant anatomist and unprincipled scoundrel who gave dinosaurs their name; and Thomas Henry Huxley, Darwin's defender who defeated Owen. The minor cast is equally engaging : Georges Cuvier, the brilliant French anatomist and paleontologist; Jean-Baptist Lamarck, evolutionary theorist; Charles Darwin; the geologist Charles Lyell; Walter Mantell, New Zealand paleontologist; etc.

If the process and conflicts of scientific discovery, and especially of the Age of Reptiles, interests you , then this volume is a read.

Highly recommended, and is available in our circulating book collection.



Book Review: Weird Dinosaurs

By Harold E. Hinds Jr.

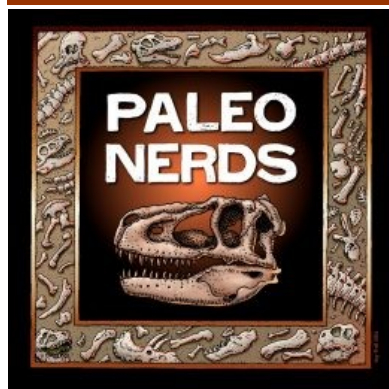
Paleontologists have barely begun to discover the many species of dinosaurs that previously existed over their 150-million-year history -- some 10,000 species are still extant, birds! John Pickrell in *Weird Dinosaurs : The Strange New Fossils Challenging Everything We Thought We Knew* (New York: Columbia University Press, 2016), samples the many new discoveries, some of which "fall outside existing stereotypes" and are "utterly unfamiliar to us in living animals today" (p.5).

Why have nearly 75 percent of all known dinosaur genera been discovered since 1990? The search is now worldwide. Our knowledge of where to look has improved, or the area has become accessible. There has been a rapid increase in knowledgeable searchers. Old collections are being reappraised. And previously known sites are being reassessed and revisited. This bonanza of recent discoveries is revealing just how diverse, and even bizarre, these denizens of the Age of Dinosaurs were.

Pickrell's survey is arranged geographically, and not by geological period. Chapters are devoted to the following: Sahara, Egypt; Hebei Province, China; Transylvania, Romania; Alberta, Canada; Gobi Desert, Mongolia; Alaska, U.S.; Lightning Ridge, Australia; Patagonia, Argentina; Mahajanga Basin, Madagascar; and Transantarctic Mountains, Antarctica. Beyond these, he further mentions "new locations with enormous potential...Greenland, Myanmar, Uzbekistan, Kazakhstan, Turkmenistan, Tunisia, Malawi, and Niger" (p.212).

A brief review cannot adequately suggest the richness of this world tour of recent discoveries. Perhaps a single example can whet your appetite: Yipi that "had both feathers and leathery gliding membranes like those of a bat" (p.6).

Highly recommended. Enjoy. This readable and engaging volume is in our circulating book collection.



Notes: Paleo Nerds Podcast

Many of you may be familiar with the Paleo Nerd Podcast series by Ray Troll and David Strassman, who have (to date) released 52 podcasts covering almost every paleo interest. (Episode 45 is with NARG member Kent Gibson.) Episodes, pictures and additional information on each episode are available on their website at:

<https://www.paleonerds.com>

Paleo nerd podcasts are also available for download from Apple, Spotify and other podcast sites.

Domestication - Accelerated Evolution?

"Darwin noted domestication as "observable evolution". We can see how wolves have been changed into pekinese, poodles, labrador and spaniels, over a couple of thousand years. and we see the same with cabbages, roses, horses and other things, through artificial selection and not natural selection. Darwin's point was that you don't need a human selector or breeder to do the transformation from wolf to pomeranian. Nature does it for you. Non-random survival is the equivalent of a human breeder doing the breeding.

What can be observed in a couple of hundred years is small. What can be achieved in a couple of thousand years is wolf to pekinese. What can be achieved in a couple of million years is Australopithecus to Homo sapiens, what can be achieved in a hundred million years is shrew to human, what be achieved in a couple of thousand million years is bacteria to human."

- Notes made while listening to a random episode of Paleo Nerds. Submitted by Bruce Thiel

Paleontology in the News

Compiled by E. Anne Sivers for April, 2022

1.5M-year-old fossil hints at hominins' early moves

A fossilized vertebra of a hominin child dating back about 1.5 million years has been found in Israel and researchers suggest its evidence that early hominins explored the world outside of Africa in waves to different places. Researchers aren't sure yet what species of hominin the vertebra belongs to, but they describe what they do know about the child in Scientific Reports. <https://arstechnica.com/science/2022/02/1-5-million-year-old-vertebra-hints-at-a-story-of-early-human-migration/>

Fossilized tooth sheds light on human migration

A fossilized tooth suggests that Homo sapiens were present in Europe about 10,000 years earlier than initially believed, according to findings detailed in Science Advances. In addition, archaeologists found the tooth among the remains of Neanderthals, which means the two groups likely lived alongside each other in the area. <https://www.cnn.com/2022/02/09/europe/tooth-human-neanderthal-france-cave-scn/index.html>

Fossils hint at dinosaur's respiratory illness

Fossils belonging to a long-necked dinosaur that lived roughly 150 million years ago show evidence that the diplodocid was sick with a respiratory infection, according to Scientific Reports. CT scans revealed the herbivore had strange bony growths likely due to an air-sac infection, the first time such an infection has ever been detected in dinosaurs. <https://www.cnn.com/2022/02/10/world/dinosaur-respiratory-infection-scn/index.html>

Cretaceous crocodile last dined on dinosaur

The fossils of a new species of Cretaceous crocodile reveal that it had last ate an ornithomimid, according to findings detailed in Gondwana Research. Researchers say small bones belonging to the dinosaur were found in the stomach of the confragosuchus sauroktonos and that it's the first time evidence ever pointed to crocodiles dining on dinosaurs. <https://www.cnn.com/2022/02/14/world/australia-new-crocodile-species-young-dinosaur-intl-scli-scn/index.html>

Remains of 'world's largest Jurassic pterosaur' recovered in Scotland

Discovery shows pterosaurs with a 2.5-metre wingspan existed about 25m years earlier than previously thought. <https://www.theguardian.com/science/2022/feb/22/remains-of-worlds-largest-jurassic-pterosaur-recovered-in-scotland>

Rare fossil offers new insight on dinosaur evolution

Researchers are celebrating the discovery of a pristine, rare Jurassic-era pterosaur fossil in Scotland as "hugely significant." The fossil, named "Dearc sgiathanach," had a wing-span of 8.2 feet, proving the winged reptiles grew larger much earlier in history than previously thought, and is one of several recent paleontological discoveries made on Isle of Skye. <https://www.cnn.com/2022/02/22/europe/flying-reptile-pterosaur-fossil-skye-scotland-scn/index.html>

Prehistoric tooth proves human presence in Europe

The discovery of a 54,000-year-old baby tooth in France's Rhone Valley represents the oldest known evidence of Homo sapiens in Europe. Eclipsing the previous recorded discovery of 46,000-year-old bone fragments, this new discovery could serve to explain how modern humans and Neanderthals lived together <https://arstechnica.com/science/2022/02/members-of-our-species-were-in-western-europe-around-54000-years-ago/>

Tyrannosaurus Rex may have been three species, scientists say

After studying the bones of 38 Tyrannosaurus specimens, researchers believe they have identified enough variety in thigh bones and teeth to justify splitting the prehistoric predator into three separate species. The team's findings, published in the journal Evolutionary Biology, have drawn criticism from some paleontologists who believe the variations are not unique. <https://www.newscientist.com/article/2308160-tyrannosaurus-rex-may-actually-be-three-separate-species/>

Habitat helped prehistoric turtle outlive dinosaurs

A freshwater habitat may have been the key to helping a newly discovered species of prehistoric turtle in Transylvania survive when the dinosaurs could not, said Felix Augustin, lead author of the study of the 70-million-year-old fossil, which appeared in the Journal of Systematic Palaeontology. <https://www.livescience.com/extinct-transylvanian-turtle-discovered>

Continued from previous page, Paleontology in the News

Blade-toothed fossil tied to 'hypercarnivorous' beast

A fossil first collected in 1988 at a site in southern California has now been identified as a carnivorous saber-toothed creature that lived during the Eocene epoch, 55.8 million to 33.9 million years ago. Paleontologists studying the pristine, razor-jaw bone originally thought it belonged to a species known as "false saber-toothed cats," but the study published in PeerJ, now suggests the fossil that of the elusive carnivore species machaeroidines.

<https://www.livescience.com/newfound-saber-toothed-predator>

Trilobite fossils tell tale of prehistoric cannibalism

A new analysis of fossilized shells of trilobites dating back 514 million years show evidence that larger trilobites often attacked -- and consumed -- smaller ones. The study, which provides evidence the practice of cannibalism was present on Earth more than 50 million years earlier than first theorized, was published in *Palaeogeography, Palaeoclimatology, Palaeoecology*. <https://www.nytimes.com/2022/03/25/science/cannibal-trilobites.html>

Spinosaurus was a massive swimming predator

After studying its dense bones, the Spinosaurus, which researchers believe could have grown up to 15 meters, was an adept underwater hunter. The study, published in *Nature*, also found evidence of a sail-like structure on the dinosaur's spine, which aided its agility in the water. <https://edition.cnn.com/2022/03/23/world/spinosaurus-aquatic-dinosaurs-scn/>

Fossil shows creature in midst of evolution

A pair of fossils dating back 308 million years have preserved record of a species in transition, capturing the shift of the prehistoric animal from a lizard-like body to that of a snake with two tiny legs, according to a study published in *Nature Ecology & Evolution*. The newly discovered species -- *Nagini mazonense* -- likely moved in "a wave-like motion" similar to snakes, and researchers believe the small hind legs kept the ancient creature steady when it burrowed.

<https://www.livescience.com/snakelike-fossils-with-missing-limbs?>

Owl fossil sheds light on daytime hunting habits

According to a report in *Proceedings of the National Academy of Science*, the pristine condition of a fossil found in China of the extinct owl species *Miosurnia diurnal* enabled researchers to gather new data on the bird. Evidence of bony rings and elongated sockets suggest it was a day-time predator, said paleontologist Li Zhiheng of the Chinese Academy of Sciences. <https://www.nytimes.com/2022/03/31/science/owl-daytime-fossil.html>

T-Rex's tiny arms cut risk amid feeding frenzies

One researcher's quest to understand the evolutionary benefit of the small arms tyrannosaurs are known for supports the hypothesis that these reduced limbs provided an advantage to the giant carnivores as they feasted on prey with other large predators. The scarcity of fossils with bite marks on the arms indicates they were less likely to be injured and thus less likely to die by infection, according to Kevin Padian, author of the study in *Acta Palaeontologica Polonica*.

<https://www.forbes.com/sites/davidbressan/2022/04/03/why-were-tyrannosaur-forelimbs-so-ridiculously-puny/?sh=30094d5571b7>

Scientists find fossil of dinosaur 'killed on day of asteroid <https://www.theguardian.com/science/2022/apr/07/fossil-dinosaur-killed-asteroid-strike-thescelosaurus-north-dakota-extinction>

We're finding out more about dinosaurs than ever – but their sex lives still elude us

<https://www.theguardian.com/commentisfree/2022/apr/08/dinosaurs-leg-north-dakota-bbc-david-attenborough>

Battle sealed famous triceratops' fate

Famous triceratops "Big John" likely died due to complications from injuries sustained in a fight with another triceratops, according to a study in *Scientific Reports*. Triceratops' head armor of two big horns and a neck frill helped protect them in fights, but Big John probably developed an infection in his frill after a fight.

<https://www.nbcnews.com/science/science-news/triceratops-tussle-big-jon-skull-shows-signs-battle-scientists-say-rcna23095>

Nesting spot confirms titanosaurs didn't migrate

The rare discovery of several fossilized egg clutches and shell fragments spread across multiple layers of sediment is the first proof paleontologists have that titanosaurs remained in one area year-round, to nest and live. The site, now a Brazilian limestone mine, is the northern most nesting spot every identified for titanosaurs, and confirms the colossal creatures did not migrate south to lay eggs as previously thought, according to the paper in *Scientific Reports*.

<https://arstechnica.com/science/2022/04/titanosaur-nesting-spot-found-in-brazil/>

Continued from previous page, *Paleontology in the News*



Art by Christian McCall, copyright ROM)

Rare fossil shows blind, stilt-walking marine creature

Some 450 million years ago *Tomlinsonus dimitrii* -- a tiny, soft-bodied arthropod with curved horns and many limbs -- died while roaming the shores of Canada's Lake Simcoe, an area known as Paleo Pompeii. The report, published in the *Journal of Paleontology*, found that the creature had no eyes but did sport an "amazing pair of limbs" with foot-like growths used to walk across the seafloor as if on stilts. <https://www.livescience.com/ordovician-weirdo-at-paleo-pompeii>

Oregon's Checkered Past-Volcanic History and Fossils



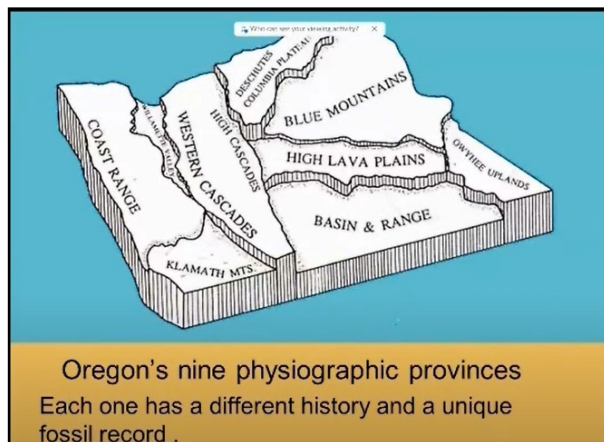
Recorded lecture by Bill Orr for a March 2022 virtual meeting of the Lower Columbia Chapter, Ice Age Floods Institute.

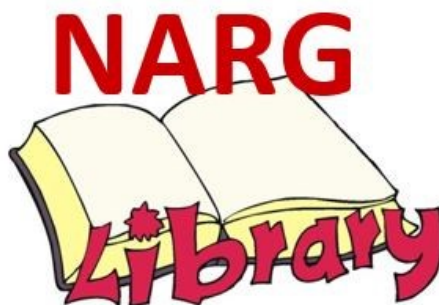
Recording Available at <https://www.youtube.com/watch?v=g5b9xjSkKEI>.

One of the best kept secrets in Oregon Geoscience is the close relationship between the tectonic history of the state and its magnificent fossil record of both plants and animals. Thomas Condon's book, *The Two Islands*, alludes to this and Bill came to this realization some ten years into his career in Eugene. The fossil record entombed in terrestrial, aquatic marine and non-marine sediments is both diverse and very well preserved, owing to Oregon's location on the leading edge of a moving tectonic plate.

Bill Orr took his training in Geology in Oklahoma, California and Michigan. He retired in 1997 from the University of Oregon as Emeritus Professor of Geology and continues to write and teach from his home near Salem. The 30 or so books he has written include the standard references for Oregon Geology and Paleontology.

Taken from email sent out from Lower Columbia Chapter, Ice Age Floods Institute on March 21, 2022.





The NARG library has just become easier for members to use. The 430 books can be viewed by using the link below. Once you find a book you want, click on it and find its "index" number. Requests for books using the index number are made to danolough@aol.com. He will notify you if the book is already checked out. If it is not, he will bring it to the next NARG meeting. Members can check out 2 books at a time and should return them at one of the following 2 meetings.

<http://cloud.collectorz.com/danolough/books>

NARG Membership

NARG's membership dues are due January 1, 2022.

Individual Membership	\$25
Family Membership	\$40
Student Membership	\$10

Pay your membership by:

***Mail a check to:**

NARG
Membership
PO Box 726
North Plains, OR 97133

***Pay via credit card with PayPal (No account necessary.):**

Use the following links:

Family membership \$40 https://paypal.com/cgi-bin/webscr?cmd=s-xclick&hosted_button_id=AXASMFKA8MZU4
Single Membership \$25 https://paypal.com/cgi-bin/webscr?cmd=s-xclick&hosted_button_id=438FVX4E6CTQY
Student Membership \$10 https://paypal.com/cgi-bin/webscr?cmd=s-xclick&hosted_button_id=9QCCT4D7FTFRU

Fossil Calendar

June 1	NARG Monthly Meeting @ Tualatin Heritage Center, Tualatin. The Zoom link will be sent via the listserv if you want to attend virtually. For questions, please email Aaron-Currier at fossils@curriergraphics.com
June 18-19	Field Trip to Madras quarry. For field trip questions, email Greg Carr (greg.fossil.hunter@gmail.com).
July 6	NARG Monthly Meeting @ Tualatin Heritage Center, Tualatin
July 23-24	Field Trip to Arbuckle Mountain
August 3	NARG Monthly Meeting, Tualatin Heritage Center, Tualatin
August 6	Fossil Fest @ Tualatin Heritage Center, Tualatin
August 20	Field Trip to Mist Bluff
September 7	NARG Monthly Meeting, Tualatin Heritage Center, Tualatin
September 17-18	Field Trip to Mitchell
September 30-October 2	Portland Regional Gem and Mineral Show, Wingspan Event Center, Hillsboro
October 8-9	Field Trip to Post

Please check the web-site and emails for any changes or alternatives.

For a listing of local gem and mineral shows check out:

<http://www.mineralcouncil.org/shows.pdf>

<http://orerocon.com/> Click on Portland Area Rock Clubs, includes PNW Clubs)

NARG Officers:

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Vice President:	Greg Carr	(503) 754-6392
Secretary:	Tami Smith	(503) 620-5317
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Robert Rosé	(541) 367-2052
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Debbie Shannon	(503) 887-7423
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Michael Santino	(503) 981-8902
Larry Purchase	(360) 254-5635

Committees:

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	Peg Johnson
	Dan O'Loughlin
FossilFest:	Linda Harvey
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NARG Auction	Linda Harvey
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NORTHWEST FOSSIL FEST

August 6, 2022

*A Celebration
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