The Paleo Times

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Rick Poropat, Editor

Rick's Ramblings

The April virtual meeting will be held on Friday, April 9 at 7:30 pm. Our program for the evening will be presented by Carlton Laird on the historical significance of paleontological lithographs from the 1800's. This talk will be quite a bit different than his talk on a similar subject last year. These are not your father's lithographs!

Members will receive an email prior to the meeting which will include the meeting number and passcode plus instructions on how to log into Zoom. Participants will be able to enter or leave the meeting at any time.

A Missouri Rock, Mineral & Fossil show not yet on our calendar is the Central Missouri Rock & Lapidary Show on May 7-9. It will be held at the Knights of Columbus Hall, 2525 N. Stadium Blvd. (Route E), Columbia Missouri. The show features agates, crystals, minerals, cabochons, slabs, beads, fossils, petrified wood, geode cracking and activities for kids. I'm guessing that Covid-19 precautions/restrictions will be in place, so don't forget to bring your mask.

It looks like Paleotrek will happen this year after a Covid-19 hiatus in 2020. Don't forget to contact Carl Campbell for additional information if you plan on joining the crew in Montana this summer.

Fun Fact

Echinoderms known as Brittle Stars (ophuroids) are considered to be invertebrates, but may actually be vertebrates because of structures called vertebrae supporting their long, slender arms.

Paleo Joke

What do you call a pirate that digs for fossils?

An Arrrr-cheologist

Apologies to everyone.

Fossil of the Month

The Fossil of the Month for April is an Ordovician nautiloid cephalopod found by Faye Whobrey in the Decorah formation of Jefferson County, Missouri. Cephalopods are usually found in the lower part of the formation.

The specimen measures 24 inches long and has a circumference of 16.5 inches. It was found in two pieces on different collecting trips several weeks apart, but Faye didn't realize that the pieces matched until she had performed extensive prep work on them. The specimen is most likely identified as *Orthoceras*, possibly *Orthoceras junceum*, Hall 1847, although this is now a defunct North American genus name in current literature.

The type locality of the Decorah formation is near Decorah in Winnishiek County, northeastern Iowa. It outcrops locally in eastern Missouri and western Illinois. Described as a green, shaley limestone with bands of limestone and chert, the formation is sometimes referred to as the Decorah Shale.

Most literature defines the age of the Decorah as Middle Ordovician, however, the USGS now considers it to be Late Ordovician (Mohawkian).

Here's What Killed the Dinosaurs, According to Harvard Scientists

It's largely agreed upon in the scientific community that a massive impactor was what ultimately doomed the dinosaurs to extinction.

Where that object came from has been the subject of debate, but Harvard scientists have proposed a possible explanation.

A team of researchers from the university offers the theory that the impactor originated near the edge of the solar system in a ring of debris known as the Oort cloud.

The debate over what may have killed the dinosaurs and led to the mass extinction of so many species (while also making room for mammals to begin to thrive) will likely never be completely settled. That being said, the scientific community has, in recent years, largely agreed that a massive impact off the coast of Mexico was probably the trigger that set off a series of devastating events that ultimately doomed the dinosaurs and many other plants and animals.

Harvard researchers including Avi Loeb and Amir Siraj are looking to expand on that theory by proposing where such an object may have originated. It's no easy task to determine the origins of an object that slammed into Earth tens of millions of years before humans even showed up on the planet, but the team used simulations to make the case that the impactor may have originated in the Oort cloud, which is a massive collection of debris situated on the edge of our solar system.

In a new paper explaining their findings, the researchers focus on the behavior of long-period comets. The team notes that when such objects pass close to the Sun they tend to produce a large number of fragments which would then be likely to pass through the orbital path of Earth. They calculated the likelihood that the impactor was an asteroid based on a wealth of data, including documented asteroid impacts, and did the same for comets, which have largely been dismissed as a possible cause of the dinosaur apocalypse.

The researchers say that the fact that comets may fragment when passing by the Sun would dramatically increase the odds of one of those fragments striking Earth. They then used the new math to see whether a comet (or at least a chunk of a comet) was a plausible explanation for the impact.

The team explains:

Here, we show that a fraction of long-period comets are tidally disrupted after passing close to the Sun, each producing a collection of smaller fragments that cross the orbit of Earth. This population could increase the impact rate of long-period comets capable of producing Chicxulub impact events by an order of magnitude. This new rate would be consistent with the age of the Chicxulub impact crater, thereby providing a satisfactory explanation for the origin of the impactor.

Observations suggest that approximately one out of every five long-period comets originating in the Oort cloud eventually comes close enough to the Sun to be disrupted, turning into fragments that increase the odds of an Earth impact by a factor of 10. This falls well short of proof that the impactor that is thought to have killed the dinosaurs was a comet, but it certainly swings the odds of its origins a bit.

Source: Mike Wehner, BGR, 02/17/2021.

2021 Calendar

Apr. 07-25	Tucson Mineral & Fossil Show 49 Venues, Tucson, Arizona MOST VENUES HAVE BEEN CANCELLED
Jun 04-06	Mineral Area Rock Swap Missouri Mines State Historic Site, Park Hills, Missouri
Jun. 25-27	Bedford Swap/Show Lawrence County Fairgrounds Bedford, Indiana
Aug. ??	EMSP Picnic has not been scheduled for 2021
Aug 20-22	GSLAESC Show Machinists Hall Auditorium Bridgeton, Missouri
Oct. 22-24	MAPS Fossil Expo Orr Building, Illinois State Fairgrounds Springfield, Illinois
Nov. 19-21	Mineral & Gem Club Show Affton-Rogers Recreation Center
Dec. 11	EMSP Holiday Party Kirkwood Community Center

Lightning May Have Sparked Life on Earth

Millions of lightning strikes may have been just what life needed to begin on Earth, according to a new study.

One of the key ingredients needed for life as we know it is phosphorus – and the multitude of lightning strikes that happened when Earth was young 4 billion years ago may have unlocked the necessary amount of phosphorus to create the foundation for life.

Phosphorus is needed in the molecules that form basic cell structures and cell membranes and

even makes up the phosphate backbone of DNA and RNA, said Benjamin Hess, study author and graduate student at Yale University in The Department of Earth & Planetary Sciences.

But this element was elusive on early Earth, trapped inside minerals.

"Most phosphorus on early Earth was trapped in minerals that are essentially insoluble and unreactive, meaning they couldn't be used to make biomolecules needed for life," Hess said. "Lightning strikes provide a new mechanism for creating phosphorus in a form that can make important compounds for life."

It has long been thought that meteorites delivered the necessary elements for life to appear on Earth. Meteorites have been known to contain schreibersite, a phosphorus mineral that can be dissolved in water. If enough of them crashed into Earth, that schreibersite could have provided the right amount of phosphorus.

However, life began between 3.5 to 4.5 billion years ago, and that's when fewer meteorites were impacting Earth.

Schreibersite has another source in glasses called fulgurite, otherwise known as the glass that forms when lightning strikes the ground.

Fulgurite has been found to contain phosphorus released from surface rocks – and it's soluble.

"Lightning is a mechanism that does not necessarily diminish through time as the commonly accepted source, meteorites, do," Hess added. "This mechanism may be very important for considering the formation of life on Earth-like planets after meteorite impacts have become rare."

Lightning has also been a subject of interest for scientists when thinking about life on early Earth, because it leads to the creation of gases like nitrogen oxides, which also played a part in the origin of life.

Hess and his fellow researchers used this existing research to investigate and refine the rate of lightning on early Earth.

On Earth today, we experience about 560 million lightning flashes per year. On early Earth, that number was anywhere between 1 and 5 billion annually, with 100 million to 1 billion of those striking the ground.

Over a billion years, that could have led to 1 quintillion lightning strikes – and a lot of phosphorus.

Lightning was more prevalent on early Earth because there was more carbon dioxide in the atmosphere. Carbon dioxide contributes to the global temperature, and a higher global temperature causes more frequent and intense thunderstorms, Hess said.

Carbon dioxide levels were elevated on early Earth after a Mars-size object slammed into Earth to create the moon 4.5 billion years ago. This also released a lot of gases from inside Earth, like carbon dioxide – which then became trapped in Earth's atmosphere and led to more lightning, Hess said.

"Our proposal of lightning strikes as a significant mechanism for creating reactive phosphorus is important for our understanding of the emergence of life because lightning strikes are relatively constant through time," Hess said.

Understanding the role of lightning strikes as a way of creating usable phosphorous has implications in the search for life beyond Earth.

"Our findings are likely applicable to any planet which has an atmosphere that generates lightning. So long as a planet has a significant amount of lightning, it would have a source of phosphorus needed for the emergence of life," Hess said.

Source: Ashley Strickland, CNN, March 16, 2021.

Utahraptor State Park

In the early '90s, paleontologists discovered bones around Moab, Utah, from an unknown dinosaur, one that had strong, deadly claws like a velociraptor—but was nearly twice as big. After years of excavating, that dinosaur became known as the Utahraptor, a feather-covered carnivore that would have stretched more than 20 feet long and weighed more than 600 pounds, according to *Smithsonian Magazine.* Entire skeletons have been found in Utah's eastern region and the predator has gained so much fame that it replaced the equally imposing allosaurus as the state's official dinosaur. And now? It has its own state park.

On March 11, 2021 state legislators passed a bill to create Utahraptor State Park, just north of Moab and adjacent to Arches National Park, in an area where many of the 100 million-year-old skeletons have been found. Around 10 additional new (to us, at least) dinosaurs have been found in the area. It will cover 6,500 acres of land, including 150 miles of existing extensive mountain biking, hiking, and ATV trails.

The park has additional historical importance: the area once housed an internment camp where Japanese Americans were imprisoned during World War II.

Utah's state parks are the perfect alternative to its iconic Mighty Five national parks.

The state park status was urgently needed, according to Utah legislators. "[This land is] valuable because of the paleontology, the history, and the recreation," said Grand County commission chair Mary McGann in

a Senate committee meeting about the bill. “It is now being abused, terribly abused. It's not only ugly—it's also unhealthy.”

Currently, there are campgrounds in the area, but there are no restroom facilities or trash cans—and visitors have been making fire pits out of potentially significant rocks, McGann said. The millions of dollars that come with state park recognition will help rectify that situation and help protect the park for future visitors. (State funds will be allocated to both Utahraptor State Park and the new Lost Creek State Park, which was included in the bill and features a reservoir about an hour north of Salt Lake City.)

It will take time for the development of the state park, so don't expect spotless recreational facilities just yet, but if you're in the area, there are plenty of other prehistoric sites worth visiting. The future Utahraptor State Park is along the Dinosaur Diamond Prehistoric Highway, a National Scenic Byway that connects tons of kid-friendly, dinosaur-related sites, like the Utah Field House of Natural History State Park Museum, Dinosaur National Monument (which straddles the Colorado-Utah border), and a number of dinosaur quarries.

Source: Meredith Carey, 03/18/2021, Conde Nast Traveler.

Humans Share Genes With Weird Headless Creatures

Researchers traced genes found in humans back to some of the earliest multicellular animals to roam Earth.

The 555-million-year old fossils belong to oceanic creatures that predate the Cambrian explosion.

The animals may be the missing link between the first complex life forms on Earth and humans.

Peer back far enough into the fossil record and the evolutionary links between modern animals and ancient creatures become increasingly unclear. Although some of Earth’s first organisms lacked now-common features like heads, arms, and legs, researchers have traced back genes found in today’s animals—including humans—to some of the oldest complex multicellular creatures.

Their research, published in the journal *Proceedings of the Royal Society B*, uses genetic analysis to link the appearance of 555-million-year-old fossils of simple oceanic critters to the genes found in complex modern-day animals. These findings could help biologists understand the evolution of the first animals on Earth during one of the most critical

The Cambrian explosion has long been considered the “big bang” of the evolution of life on Earth. During this period, beginning more than half a billion years ago, almost every major animal group inhabiting the planet today appeared in the fossil record over the span of a few million years.

But recent discoveries are leading scientists to believe the Ediacaran era, a brief period beginning 40 million years before the Cambrian explosion, may have been just as pivotal in the history of evolution. The Ediacaran period is marked by the emergence of the earliest known complex multicellular organisms on Earth. It’s also when scientists believe some of the defining characteristics of animals first took form.

“None of them had heads or skeletons,” study coauthor Mary Droser, Ph.D., a geology professor at the University of California, Riverside, said in a statement. She continued:

“Many of them probably looked like three-dimensional bath mats on the seafloor, round discs that stuck up. These animals are so weird and so different, it’s difficult to assign them to modern categories of living organisms just by looking at them, and it’s not like we can extract their DNA—we can’t.”

Lacking concrete DNA evidence, the researchers examined the appearance and likely behaviors of the animals that are clearly represented by genetic markers in modern animals. These markers include genes like *SoxB2*, which is believed to play a key role in the formation of an animal’s nervous system.

“The fact that we can say these genes were operating in something that’s been extinct for half a billion years is fascinating to me,” said study coauthor Scott Evans, Ph.D., a professor in the department of geosciences at Virginia Tech.

From more than 40 species identified from the Ediacaran period, the researchers picked four animals to study closely.

The most iconic and largest of the bunch, the oval-shaped *Dickinsonia,* has been found to grow to almost a meter in length with a series of raised bands on its surface.

Recently, scientists discovered *Dickinsonia* may have been capable of repairing itself from damage, showing the possibility of it having a primitive immune system.

The smallest critter, *Ikaria*, which Droser and her colleagues recently discovered, was about the size and shape of a grain of rice. It’s also one of the oldest bilaterians—an animal with two front and back openings connected by a gut—ever found.

Scientists believe *Ikaria* was one of nature’s first scavengers, crawling using primitive muscles across the

sea floor and eating organic matter.

The researchers also analyzed a teardrop-shaped animal called *Kimberella,* which may have scraped the ocean floor for food using a proboscis. Lastly, they studied *Tribrachidium*, a living ninja-star that the scientists, using computational fluid mechanics simulations, believe used gravity to filter out particles of food falling into its spiral trap.

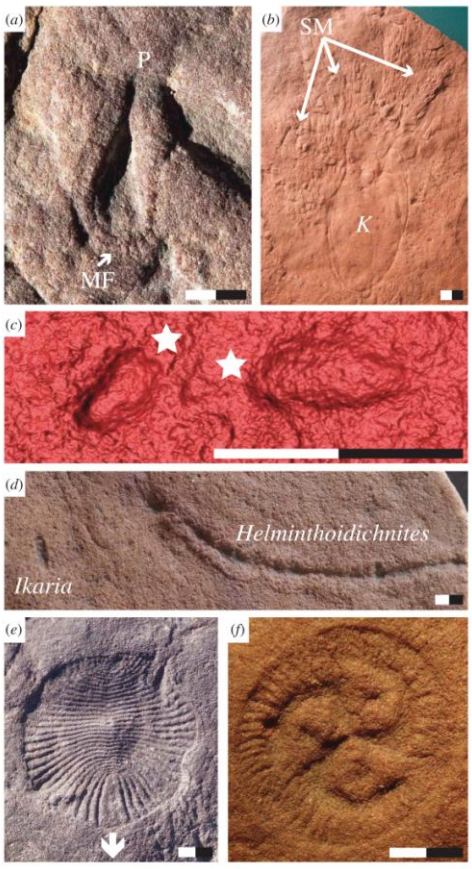
"Our work is a way to put these animals on the tree of life, in some respects," Droser said. "And show they're genetically linked to modern animals, and to us."

Given their complexity, the researchers believe the animals likely had the genetic building blocks responsible for the formation of heads and sensory organs that could form a central nervous system. This includes genes like *Hox*, which are responsible for specifying the organization of parts of the body during development. However, the interaction between those building blocks wasn't yet complex enough to create the concentrated nervous systems found in Cambrian-period animals.

In the future, the scientists hope to examine muscle development and perform functional studies to better understand this ancient period of animal evolution.

Source: Tim Childers, Popular Mechanics, 03/19/2021,

Photo credit: Evans, et. al./Proceedings of the Royal Society B/Courtesy Christine Hall



Did You Know?

Orthoceras is a genus of extinct nautiloid cephalopods that are restricted to Middle Ordovician marine limestones of the Baltic States and Sweden. This genus is sometimes referred to as Orthoceratites, Orthocera, Orthocerus or Orthoceros.

These cephalopods have slender, elongate shells with the middle of the body chamber transversely constricted and containing a prominent subcentral orthocoanitic siphuncle. The surface is ornamented by a network of fine lirae. Many other very similar species are now included under the genus *Michelinoceras*.

Orthoceras was formerly thought to have had a worldwide distribution due to the genus' use as a wastebasket taxon for numerous species of conical-shelled nautiloids throughout the Paleozoic and Triassic.

Originally *Orthoceras* referred to all nautiloids with a straight-shell, called an "orthocone" (Fenton & Fenton 1958:40). But later research based on their internal structures, such as the siphuncle, cameral deposits, and others, showed that most specimens actually belong to a number of groups, and even different orders.

According to the authorative Treatise on Invertebrate Paleontology, the name *Orthoceras* is now only used to refer to the type specimen *Orthoceras regulare* (Schlotheim 1820) from the Middle Ordovician of Sweden and parts of the former Soviet Union, such as Russia, Ukraine, Belarus, Estonia and Lithuania. The genus might also include a few related species.

Orthoceras and other related orthoconic nautiloid cephalopods are often confused with the superficially similar ammonoid *Baculites* and related Cretaceous orthoconic ammonoids. Both fossils are long and tubular in form and both are common items for sale at rock shops and shows. (often under each other's names). Both lineages evidently evolved the tubular form independently of one another, and at different times in earth history. *Orthoceras* lived much earlier (Middle Ordovician) than *Baculites* (Upper Cretaceous).

The very different types of fossils can be most easily distinguished by their respective suture lines; simple in *Orthoceras* and intricately foliated in *Baculites* and related forms.

The label, *Orthoceras* has also been used to identify Jurassic belemnites, carboniferous scaphopods and other tube or cone-shaped marine animals.

Time to change those Missouri specimen labels!?

Source: Wikipedia open source.

The Eastern Missouri Society for Paleontology

(EMSP) is a registered Missouri not-for-profit organization dedicated to promoting the enjoyment and scientific pursuit of fossil collecting. It is open to all individuals interested in learning about the history of ancient life on earth. The club membership includes professional paleontologists as well as amateur hobbyists providing an open forum for the exchange of information as well as access to expertise on collecting, identifying, preparing and displaying fossils.

EMSP meetings are held on the second Friday of every month (except July, August and December) at 7:30pm in Room 203, on the second floor of the Earth and Planetary Sciences Building on the campus of Washington University. The building is located at the SW corner of the intersection of Forest Park Parkway and Hoyt Drive. Each meeting includes an informal exchange of information and speakers on a variety of fossil-related topics. Note: the building doors automatically lock at 7:30pm.

Club activities include occasional field trips led by experienced collectors, a great way to augment discussions at the monthly meetings. The club also participates in joint field trips with other paleo clubs, visiting fossil sites throughout the United States. EMSP is also proud to be involved in a partnership with the St. Louis Science Center as well as STEM outreach to classrooms, community events and science fairs.

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