

Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS

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Next CVRMS Meeting

Tues. Jan. 21

7:15 pm

Hiawatha Community Center
101 Emmons St., Hiawatha - 7:15 pm

featured presentation

“The Geology of the Saylorville Spillway”

by **Ray Anderson**



The **Saylorville Spillway** is the emergency overflow channel for the Saylorville Reservoir near Des Moines. Like the **Devonian Fossil Gorge**, several flooding events have cut downward exposing sequences of the underlying rocks.

Message from President Marvin Houg

First, I would like to wish everyone a late Happy Holiday Season. I hope everyone was safe in their travels and celebrations. At least this year the weather was cooperative in that for the most part we didn't have snow to contend with, unless you were going north.

I think everyone would agree that our Christmas party was a big success with about 59 people in attendance. The success was due to several people that put a lot of work into making an event that was enjoyable and filling (great food). I would like to thank Sharon Sonnleitner, Jeff Groff, Kim Kleckner, and Dell James for preparing the main dishes, and a big thank you to Sharon for the table decorations and the games, and Kim for putting together the gift bags. I would also like to thank everyone else who brought food and special door prizes. Everything was very tasty. A big thank-you also to Ray Anderson for putting together the slide show on Bill's Big Bus Boogie to Calkins Nature Center and The Grotto of the Redemption. I know there are probably other people I should be recognizing, so if I missed you, I apologize.

I would also like to thank Bill Desmarais for the years he has served as a Director on our CVRMS Board. One of the main contributions from Bill was Bill's Big Bus Boogie all-day field trips to visit some very nice attractions in Iowa and some adjacent states. Bill also served as a speaker for many groups in the area. Laura Hal-laday was elected to replace Bill on the Board, so we also need to thank Laura for joining the Board.

I wish the best for everyone for 2025, and I hope everybody gets the rocks they had on their Christmas list.

Thanks
Marv

A Bug Expert Went Shopping at Walmart, and Made a Historic Insect Discovery

Picture it—you walk into a typical Walmart in Arkansas on a grocery run, but instead of a traditional Walmart greeter welcoming you in, you find an insect whose origins date back to the Jurassic Period. This sci-fi-like story actually happened back in 2012, and luckily the person who spotted the insect is a bug expert. In the study, the team describes how the insect



This *Polystoechotes punctata*, or giant lacewing, was collected in Fayetteville, AR.

was originally misidentified, and how students in an online course helped re-identify the specimen. “We were watching what Dr. Skvarla saw under his microscope and he’s talking about the features and then just kinda stops,” said Codey Mathis, a doctoral candidate in entomology at Penn State. “We all realized together that the insect was not what it was labeled and was in fact a super-rare giant lacewing. I still remember the feeling. It was so gratifying to know that the excitement doesn’t dim, the wonder isn’t lost. Here we were making a true discovery in the middle of an online lab course.” To confirm, Skvarla and his colleagues performed molecular DNA analyses on the specimen and revealed that it was in fact a giant lacewing. The discovery could reveal a larger story about biodiversity in North America and changing environment since the giant lacewing was spotted in the urban area of Fayetteville, Arkansas. Skvarla says that the explanations for the giant lacewing’s disappearance from North America are varied and mostly a mystery. Scientists hypothesize that it may have disappeared due to increasing artificial light, pollution, and urbanization, the suppression of forest fires in the eastern part of North America since they rely on post-fire environments to live. Even the introduction of non-native predators like ground beetles may have had an effect. “Entomology can function as a leading indicator for ecology,” Skvarla said. “The fact that this insect was spotted in a region that it hasn’t been seen in over half a century tells us something more broadly about the environment.” The city of Fayetteville lies within the Ozark Mountains, which the team says is a suspected biodiversity hotspot. According to Skvarla, dozens of endemic species, including 68 species of insects, are known to live in these mountains and at least 58 species of plants and animals have highly disjunctive populations with representatives in the region. However, the mystery of how the elusive bug arrived on the outer facade of a Walmart remains. They believe that because it was found on the side of a well-lit building, it was likely attracted to the lights. “It could have been 100 years since it was even in this area — and it’s been years since it’s been spotted anywhere near it. The next closest place that they’ve been found was 1,200 miles away, so very unlikely it would have traveled that far,” said Skvarla. <https://www.popsoci.com/environment/giant-lacewing-jurassic-walmart/>

CVRMS Board Meeting Dec. 17 — Minutes —

MEETING CALLED TO ORDER: 7:05 pm by Marv Houg at his house. Board members present, Ray Anderson, Marv Houg (president), Jay Vavra, Matt Burns, Kim Kleckner, Sharon Sonnleitner, Dale Stout, and Bill Desmarais. Laura Halladay, incoming Director starting in January, was also present.

SECRETARY MINUTES FROM LAST MEETING. Jay moved to approve, Ray 2nd, minutes approved by vote.

TREASURERS REPORT. Dale presented report: \$1,991 in checking, \$2,965 in savings, total with cds \$5079. \$628 was collected for charity at Holiday Party (\$314 each for food bank and HACAP). Bill moved for approval, Matt 2nd, report approved.

2025 ROCK SHOW: March 22-23, Theme **ICE AGE**. Sharon said 2 dealers are not yet paid but are coming. Ray will contact IGS and Corps to see if they will participate. Sharon said 18 displays spoken for so far. Ray will speak to Tiffany about displays, and will check with the Corps of Engineers about a table. Several suggestions for raffle prizes were discussed.

2025 ROCK AUCTION: Sharon reported 870 lots committed so far.

NEW BUSINESS: Marv led a discussion of possible Director’s liability insurance. Discussion will be continued, and Marv will check to see if existing insurance covers field trips and bus trip. Laura volunteered to serve as delegate to MWF show and meeting on April 5-6 at Lincoln, NE.

FIELD TRIPS: Matt said none planned until Spring. **Thunder Bay** trip still in planning by Matt. **Haunted Ridge** trip questionable (Marv will check to see how that trip worked out for Fairfield club).

MOTION TO ADJOURN: by Jay, second by Ray. Meeting adjourned at 8:45 pm.

Respectfully submitted

Ray Anderson, Acting Secretary

World's Flat Earthers Went to Antarctica to Look at The Sun. Here's What Happened

In a surprise conclusion to a project dubbed **The Final Experiment**, several well-known believers in a non-spherical Earth have had a change of heart. *"All right, guys, sometimes, you are wrong in life,"* announced Jeran Campanella, a prominent flat-Earth theorist who joined an all-expenses-paid expedition to Antarctica to see the Sun circle the sky for an entire day.

"And I thought that there was no 24-hour Sun, in fact I was pretty sure of it." For the past three years a pastor from Denver, Colorado, named Will Duffy has worked to bring together a selection of 'globist' and 'flat-earth' YouTube content creators to *"settle the shape of the Earth"* in a single act of observation. Traveling to Union Glacier Camp, a full-service private facility just 707 miles from the South Pole, the two teams gathered to see with their own eyes whether reports of a non-setting Sun were fabrications of some greater conspiracy, or truthful observations of planetary physics at work. Throughout history, various cultures have held mixed views on what lies over the horizon, and how the land beneath our feet connects with what we see over our heads. In a modern sense, flat-Earth beliefs emerged in the 19th century as a counter to a scientific consensus, often buoyed by religious convictions or aligning with political values in a shared distrust of an academic authority. Today, social media has given voice and community to a legion of people who doubt what most of us take for granted as a well-supported fact. Though there's no agreement on what this non-curving world looks like from afar, most descriptions need to account for what can be experienced as individuals. Phenomena such as the changing position of the Sun, or differences in the heights of objects as we travel towards a horizon, still need to make sense if Earth is a huge pancake rimmed in Antarctic frosting. Scientific explanations of the Sun's seasonal shifts are relatively straight-forward. Perched on opposing ends of a tilted globe, each pole experiences alternating periods of uninterrupted sunlight or endless night as Earth completes laps of the Solar System. To some flat-Earth advocates, the existence of Antarctica's midnight Sun simply can't be reconciled with a position standing at the edge of a global circle. Like Campanella, they figured it simply didn't happen. Watching the Sun skirt the horizon in person might clear up claims of any conspiracy, though it may not necessarily be enough to make converts of "team flat-Earth." Flat-Earth YouTube creator Austin Whitsitt humbly admitted the Sun was *"doing what they said it would do, very clearly."* Yet when it comes to embracing a new view of the world, he's far from convinced. *"I don't think it falsifies plane Earth, I don't think it proves a globe, I think it's a singular data point."* Belief formation is a complex task for human brains, though, combining experiences shared by those we trust with a dusting of our own perceptions to construct personal stories that don't just explain what we see, but fit with what we value. As an exercise in trust-building and a demonstration of the value in putting our firmest convictions to the test when given a chance, Duffy's "Final Experiment" ought to be anything but final. <https://www.sciencealert.com/flat-earthers-went-to-antarctica-to-look-at-the-sun-heres-what-happened>



Spotlight Gemstones: Garnet

January's Birth Stone



Garnet, is the name used for a large group of rock-forming minerals. These complex minerals share a common crystal structure and a generalized chemical composition of $X_3Y_2(SiO_4)_3$. In that composition, "X" can be Ca, Mg, Fe^{2+} or Mn^{2+} , and "Y" can be Al, Fe^{3+} , Mn^{3+} , V^{3+} or Cr^{3+} . Despite their variable appearance, garnets are usually easy to identify by their hardness, crystal habit and occurrence in metamorphic rock. Garnets usually form at high temperature and pressure, so they typically occur in their crystal form as rounded dodecahedrons (twelve-sided) or twenty-four sided trapezohedrons with a Mohs hardness of 6.5-7.5. The birthstone of **January**, garnets are mined in a rainbow of colors (except blue). From the fiery orange of *Mandarin Garnets* to the rich green of *Tsavorite Garnets* and to the most widely recognized color, the deep red of *Pyrope Garnets*, the garnet is considered a great gift to symbolize friendship and trust. Garnets have been used as gemstones and abrasives since the Bronze Age. All species of garnets possess similar physical properties and crystal forms, but differ in chemical composition. The different species are pyrope, almandine, spessartine, grossular (varieties of which are hessonite or cinnamon-stone and tsavorite), uvarovite and andradite. The garnets make up two solid solution series: pyrope-almandine-spessartine and uvarovite-grossular-andradite. These minerals are found throughout the world in metamorphic, igneous, and sedimentary rocks. Most garnets found near Earth's surface formed when a sedimentary rock with a high aluminum content, such as shale, was subjected to heat and pressure intense enough to produce schist or gneiss. Garnet is also found in the rocks of contact metamorphism, subsurface magma chambers, lava flows, deep-source volcanic eruptions, and the soils and sediments formed when garnet-bearing rocks are weathered and eroded. In the United States, the major industrial uses of garnet in 2012 were waterjet cutting (35%), abrasive blasting media (30%), water filtration granules (20%), and abrasive powders (10%).

What in the World?



What in the World are we looking at here?

November's Photo



December's **What in the World** photo was **Ammolite**, an opal-like organic gemstone found primarily along the eastern slopes of the Rocky Mountains of North America and the Foothills of Alberta. It is made of the fossilized shells of ammonites, which in turn are composed primarily of aragonite, the same mineral contained in mother-of-pearl, with a microstructure inherited from the shell. It is one of few biogenic gemstones; others include amber and pearl.

ROCK CALENDAR CVRMS EVENTS OF INTEREST

2025

Jan. 21 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Dr. Ray Anderson
The Geology of the Saylorville Spillway
-this time for sure!

Feb. 18 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
University of Iowa Students and Faculty
Program to be announced

Mar. 18 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Cornell College Students and Faculty
Program to be announced

Mar. 22-23 — CVRMS Rock Show
Hawkeye Downs, Cedar Rapids
Show Theme: *The Ice Age*
more information in future newsletters

Apr. 15 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

May 20 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

June 17 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

July 15 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

Ask a Geologist by Ray Anderson aka Rock Doc, CVRMS Vice President

Ask a Geologist is a monthly column that gives CVRMS members an opportunity to learn more about a geologic topic. If you have a question that you would like addressed, please send it to rockdoc.anderson@gmail.com, and every month I will answer one in this column. Please let me know if you would like me to identify you with the question. I will also try to respond to all email requests with answers to your questions.

In a recent conversation with my friend and CVRMS member Jack Gilmore we were discussing crystal textures in geodes and I mentioned that one of my favorite words is "**botryoidal**" (I love the way it rolls off my tongue), and Jack asked how this hemispherical crystal texture formed. So that will be my topic for this month.

Botryoidal Texture

Wikipedia defines a "**botryoidal** (*BOT-ree-OY-dal*) texture or mineral habit, as one in which the mineral has an external form composed of many rounded segments, named for the Ancient Greek βότρυς (*bótrus*), meaning "*a bunch of grapes*." This is a common form for many minerals, particularly hematite and malachite, which are known for frequently forming botryoidal masses". Minerals take on a botryoidal habit when they form in an environment containing many nuclei, specks of sand, dust, or other particulate matter to serve as sources of crystal nucleation. Acicular or fibrous crystals grow outward from these "seeds" at the same or very similar rate, resulting in radial crystal growth. As these spheres grow, they can run into or overlap with others that are nearby, fusing together to form a botryoidal cluster. Since botryoidal growths are formed from many smaller crystals, botryoidal habit is usually independent of the specific crystal structure associated with any given mineral. This is how the habit can be observed in a variety of minerals that otherwise display distinct euhedral forms. In the case of chalcedony (a type of quartz that is made up of microscopic quartz crystals that are so small they can only be seen under a microscope) precipitates from silica in water, dissolved from silica-rich minerals such as quartz or chert in surrounding rocks. The botryoidal, or bubbly, texture forms when new microscopic chalcedony crystals nucleate on earlier ones, building up layers, with crystallites stacked perpendicular to the c-axis of the

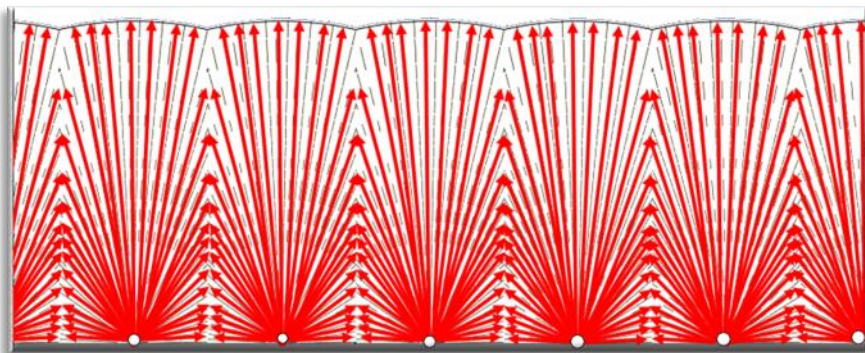


botryoidal chalcedony in a geode

underlying crystal, in a spherical shape (see illustration below). The chemistry of the water in which chalcedony forms can affect its color and texture. For example, chalcedony that forms in acidic water may have a yellow or orange color, while chalcedony that forms in alkaline water may have a blue or gray color. The presence of other minerals, such as iron oxides or manganese oxides, can affect the color and texture of chalcedony. For example, the presence of iron can give chalcedony a reddish-brown color, while the presence of manganese can give it a pink or purple hue. Chalcedony formation can be influenced by the temperature and pressure of the environment in which it forms. Higher temperatures and pressures can lead to larger crystal structures, while lower temperatures and pressures can result in smaller structures. Chalcedony formation is a slow process that can take thousands or even millions of years. The longer the process takes, the larger the crystals can grow and the more complex the texture can become.



botryoidal structure in malachite



Botryoidal texture created by growth in a geode

Ancient 'Land Bridge' that Connected Siberia to US Wasn't What it Seems, Scientists Find

The Bering land bridge that spanned between Siberia and Alaska during the Ice Age was more of a Bering land bog, new research finds. The discovery could help explain why some animals, such as birds, easily crossed the land bridge, while others, like woolly rhinos (*Coelodonta antiquitatis*), didn't make the migration. The land bridge, now submerged under the Bering Strait between Alaska and Russia, was above water from about 36,000 years ago to 11,000 years ago. Scientists thought it might have looked a lot



like the grassy, arid steppe landscape in Siberia and Alaska at the time, but no one had ever investigated the ocean floor where the "bridge" once stood. Last year, researchers led by University of Alaska Fairbanks geologist Sarah Fowell set out on the research vessel Sikuliaq to extract cores of sediment from the floor of the Bering Sea. It was the first attempt to reconstruct the ancient landscape and climate of the land bridge. The researchers presented their results on December 10 at the annual meeting of the American Geophysical Union in Washington, D.C. Instead of a grassy steppe, they found a marshy landscape criss-crossed by rivers and dotted with little lakes. "We were looking for several large lakes," Fowell said in a statement. "What we actually found was evidence of lots of small lakes and river channels." Lake sediments were apparent in the ocean floor cores, as were pollen, small fossils, ancient DNA and organic matter. The pollen and fossils revealed that the landscape hosted trees and mosses. The researchers also found egg cases from water fleas (*Daphnia*), a freshwater crustacean. This marshy environment may have been particularly welcoming for some species such as birds, but there were also spots where there was evidence of larger mammals making the migration. One site hosted mammoth DNA. Bison are also known to have crossed from Eurasia to North America during the time that the land bridge existed, and horses are known to have made it from North America to Eurasia. "Even if it was mostly floodplains and ponds, the grazers were around, just uphill following higher, drier areas," Fowell said. However, the environment may have been less conducive for species that did not make the move between continents, such as the woolly rhino (a Eurasian native), American camel (native to north and central America), and the short-faced bear (native to North America). "The watery, wet landscape could have been a barrier for some species," Jenna Hill, a geologist with the U.S. Geological Survey who is also presenting research on the Bering Sea core data at the AGU meeting, said in the statement, "or a pathway for species that actually travel by water." Further research will be needed to understand the full impact of the environment on migration. <https://www.livescience.com/planet-earth/ancient-land-bridge-that-connected-siberia-to-us-wasnt-what-it-seems-scientists-find>

Minerals in Lafayette Meteorite Were Exposed to Martian Liquid Water 742 Million Years Ago

An asteroid struck Mars 11 million years ago and sent pieces of the planet hurtling through space; one of these chunks eventually crashed into the Earth. During early investigations of this object, named **Lafayette meteorite**, scientists discovered that it had interacted with liquid water while on Mars. Now, researchers from the United States and the United Kingdom have determined the age of the minerals in the meteorite that formed when there was liquid water. Meteorites are solid time capsules from planets and celestial bodies from our Universe. They carry with them bits of data that can be unlocked by geochronologists. They set themselves apart from rocks that may be found on Earth by a crust that forms from its descent through our atmosphere and often form a fiery entrance visible in the night's sky. "We can identify meteorites by studying what minerals are present in them and the relationships between these minerals inside the meteorite," said Dr. Marissa Tremblay, a researcher at Purdue University. "Meteorites are often denser than Earth rocks, contain metal, and are magnetic." "We can also look for things like a fusion crust that forms during entry into Earth's atmosphere. Finally, we can use the chemistry of meteorites (specifically their oxygen isotope composition) to fingerprint which planetary body they came from or which type of meteorite it belongs to." According to the authors, some Martian meteorites, such as 1.75-pound *nakhlite* meteorite called the **Lafayette meteorite**, contain minerals that formed through interaction with liquid water while still on Mars. "Dating these minerals can therefore tell us when there was liquid water at or near the surface of Mars in the planet's geologic past," Dr. Tremblay said. "We dated these minerals in the Martian meteorite Lafayette and found that they formed **742 million years ago**. We do not think there was abundant liquid water on the surface of Mars at this time. Instead, we think the water came from the melting of nearby subsurface ice called permafrost, and that the permafrost melting was caused by magmatic activity that still occurs periodically on Mars to the present day." The researchers demonstrated that the age obtained for the timing of water-rock interaction on Mars was robust and that the chronometer used was not affected by things that happened to the Lafayette meteorite after it was altered in the presence of water. "The age could have been affected by the impact that ejected the Lafayette meteorite from Mars, the heating Lafayette experienced during the 11 million years it was floating out in space, or the heating Lafayette experienced when it fell to Earth and burned up a little bit in Earth's atmosphere," Dr. Tremblay said. "But we were able to demonstrate that none of these things affected the age of aqueous alteration in Lafayette. This meteorite uniquely has evidence that it has reacted with water," said Dr. Ryan Ickert, also from Purdue University. "The exact date of this was controversial, and our publication dates when water was present. We know this because once it was ejected from Mars, the meteorite experienced bombardment by cosmic ray particles in outer space, that caused certain isotopes to be produced in Lafayette," Dr. Tremblay said.

<https://www.sci.news/space/lafayette-meteorite-13427.html>

You Can Now See Apex, the World's Most Expensive Dinosaur Fossil, on Display at a New York City Museum

Visitors to the American Museum of Natural History in New York can now feast their eyes on a rare new display: the fossil of a 150-million-year-old, fully grown *Stegosaurus* named Apex. The exhibit opened Sunday, December 8, and will remain on view for



four years. As an herbivore, Apex was certainly no apex predator during its heyday, but the fossilized specimen occupies another kingly position to be deserving of its name: It's the world's most expensive dinosaur skeleton sold to date, garnering a **record-breaking price of \$44.6 million** during a Sotheby's auction in July. The last holder of that title was the fossil assemblage of a *Tyrannosaurus rex* named Stan. After Stan raked in \$31.8 million in an auction in 2020, the sale generated much buzz among paleontologists over the identity of its anonymous buyer. The identity of Apex's owner is much less mysterious: The winning bidder was Kenneth C. Griffin, the billionaire hedge fund manager and founder of the company Citadel. He has temporarily loaned his extravagant acquisition to the New York museum. Last month, Apex's bones arrived at the museum grounds and were quietly put together by the staff, according to Zachary Small and Julia Jacobs of the *New York Times*. Journalists, photographers, museum staff and elementary school children got an advance look at the assembled dinosaur in all its glory on Thursday morning as the mounted fossil was unveiled with a flourish from behind a beige curtain. Besides being available for public viewing, the fossil will be accessible for

scientists to study how the *Stegosaurus* lived during the Late Jurassic period. Apex is unique for its near completeness, which explains how it earned such an extreme sticker price. While most *Stegosaurus* fossils are far from whole, Apex, by contrast, contains 254 bones out of a total of approximately 320, a whopping 80 percent of the full set. At 11.5 feet tall and 27 feet long, it's also the biggest specimen so far, about 30 percent larger than others of its ilk. That Apex grew to an advanced age provides a valuable opportunity for paleontology, because its remains can reveal insights on metabolism and growth rate throughout the creature's lifetime. Museum researchers are planning to extract a sample from inside the dinosaur's thigh bone for further study. "As the bone grows, it preserves a record of growth similar to tree rings," says Roger Benson, museum curator of dinosaur paleontology. Apex "holds the key to understanding things like the structure of the skeleton of a *Stegosaurus* and how that changed through the growth of the animal." As part of Apex's loan agreement, museum scientists will perform high-resolution 3D scans of Apex's skeleton and make the data available to the wider scientific community. They also plan to make a cast of the fossil that they can continue to display after the loan is over. There are no visible signs that Apex was attacked while it was alive, leading scientists to believe that it died of natural causes. However, its skeleton bears a curious scar for those who look closely. The shoulder blade contains a puncture wound that's embedded with a bone fragment from Apex's own tail. Perhaps the wound was self-inflicted when the dinosaur curled around itself, Benson tells the publication. While *T. rex* might be one of the most beloved dinosaurs thanks to movies like *Jurassic Park* and *The Land Before Time*, the *Stegosaurus* is also iconic in its own right. Its most recognizable feature is the row of tall diamond-shaped plates along its spine. Since the first discovery of *Stegosaurus* in the 19th century, scientists have been debating what functions the back plates serve, and it remains an enigma to this day. Suggestions range from temperature regulation to come-hither ornamentation for attracting mates, to tools of self-defense. The dinosaur's primary weapon, however, is its barbed tail; researchers know this from observing that one fossil of a contemporaneous dinosaur predator bears a painful-looking hole matching the size of a *Stegosaurus* tail spike. Plus, the tails in fossils often come damaged, as if the animals had used them in battle. Apex was discovered by commercial paleontologist Jason Cooper in 2022 just outside the fittingly named town of Dinosaur, Colorado, near the Utah border. The rise of selling fossils to private collectors has stirred up much concern among the scientific community. As fossils fetch ever growing sums of cash from bidders, paleontologists are concerned that they'll be priced out of the ability to gain access to these specimens for research. Per the *New York Times*, some scientists have fretted that Apex won't be available for research after its four-year tenure at the museum. "This is a new gray area for us," Stuart Sumida, the president of the Society of Vertebrate Paleontology, tells the *New York Times*. The society is deliberating the ethics of how the paleontological community should handle fossils on loan and will release their recommendations around next spring. For now, many other researchers see Griffin's loan as an immeasurable gift, given how singular of a fossil Apex is. "It's one of the dinosaurs that every kid knows how to draw," Sean M. Decatur, the museum's president, told the *New York Times* before Apex's grand reveal. [It] is really a pretty special specimen to understand." <https://www.smithsonianmag.com/smart-news/you-can-now-see-apex-the-worlds-most-expensive-dinosaur-fossil-on-display-at-a-new-york-city-museum-180985606/>

Dog-Like Predator's Bones Belong to Oldest Known Mammal Relative

Before the time of the dinosaurs, a naked, warm-blooded egg-layer known as a **gorgonopsian** sipped water from Pangea's tropical floodplains amid herb-grazing reptiles off what's now Mallorca in the Mediterranean. Its death **270 million years ago** may provide us with a critical glimpse into our own evolution. Paleontologists suspect it might be the oldest gorgonopsian specimen on record, up to 15 million years older than any previously studied, making it the



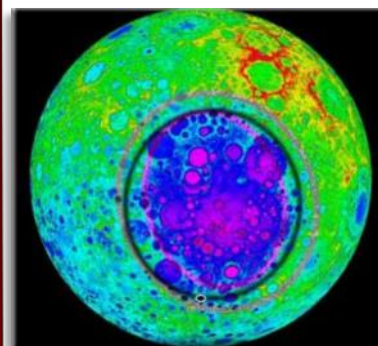
earliest known example of a mammalian relative.

Though the remains are incomplete, the variety of bones surprised the paleontologists who found them. The fossils include frag-

ments of skull, vertebrae, and ribs, as well as a well-preserved femur, providing vital details on the diversification of what would become the first true mammals. *"Gorgonopsians are more closely related to mammals than they are to any other living animals,"* says Ken Angielczyk, a paleomammalogist from the Field Museum of Natural History in the US. *"They don't have any modern descendants, and while they're not our direct ancestors, they're related to species that were our direct ancestors."* While gorgonopsians lacked external ears, they had a precursor feature in their jawbone that later developed into our characteristic mammalian ear bones. Their legs are also positioned more under their bodies than the side-splayed reptilian legs of our older, non-mammalian ancestors. *"If you saw this animal walking down the street, it would look a little bit like a medium-sized dog, maybe about the size of a husky, but it wouldn't be quite right,"* explains Angielczyk. *"It didn't have any fur, and it wouldn't have had dog-like ears."* Just like mammals today, this 3 foot long gorgonopsian had jaw-muscle attachment holes on the sides of their skull. These fossils paint a detailed picture of what's also the earliest known saber-toothed animal. This tooth arrangement suggests gorgonopsians were the superpredators of their time, likely devouring the herbivorous, ancient lizard-like creature, *Tramuntanasaurus tiai*, whose bones were found at the same fossil site. *"The saber teeth are a common feature in large predators of ecosystems, and what we have found was likely one in the environment in which it lived,"* says ICP paleontologist Àngel Galobart. *"We know that this is a carnivorous animal, a characteristic shared by all gorgonopsians worldwide."* The team suspects the mass extinction event that occurred 273 million years ago, Olson's Extinction, may have provided the ecological space for gorgonopsian and other mammalian ancestors to grow into and flourish, planting the seeds for our later evolution once the dinosaurs had their turn. That this discovery was unexpectedly found in what was a tropical region suggests there may be more clues on the origins of mammals in these regions too. <https://www.sciencealert.com/dog-like-predators-bones-belong-to-oldest-known-mammal-relative>

The Biggest Crater on The Moon Is Much Bigger Than We Ever Realized

The Moon bears its history on its skin. Earth's only permanent natural satellite is scored and scarred with billions of years' worth of cratering, a record of constant bombardment. The biggest and oldest of these scars is a monster crater, one of the largest, not just on the Moon, but in the entire Solar System. **The South Pole-Aitken basin** covers nearly a quarter of the Moon's surface, with a diameter of some **1,550 miles**. It's not easy to study the South Pole-Aitken basin. It's over 4 billion years old, and huge; in addition, time and subsequent impacts have done much to obscure it. But new research suggests that the ancient, gargantuan crater may not have formed the way we thought, and may be much bigger than previous studies suggest, a discovery that has exciting implications for future lunar missions to the basin. *"It's challenging to study the South Pole-Aitken basin holistically due to its sheer enormousness, which is why*



The South Pole-Aitken basin, compiled from data collected by JAXA's Kaguya mission

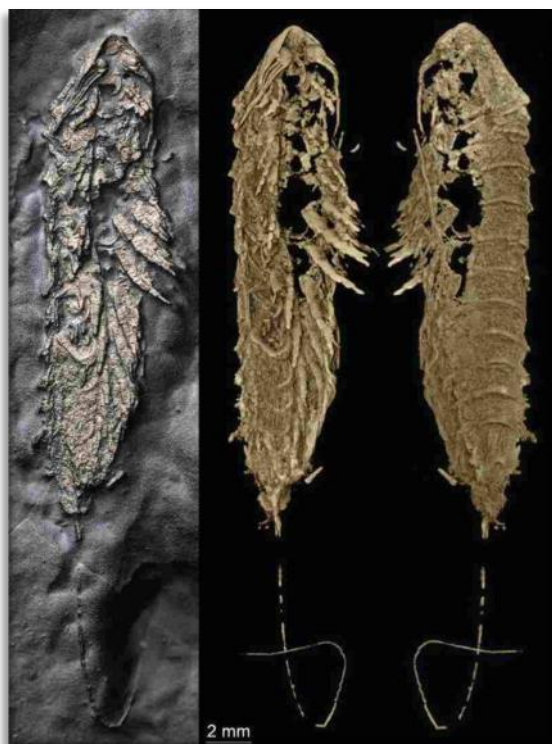
scientists are still trying to learn its shape and size," says geologist Hannes Bernhardt of the University of Maryland. *"Our work challenges many existing ideas about how this massive impact occurred and distributed materials, but we are now a step closer to better understanding the Moon's early history and evolution over time."* Previous work on the South Pole-Aitken basin found that the impact

was created by an oblique collision with a large object, leaving behind a crater shaped more like an oval than a circle. Under this model, the debris would have sprayed predominantly in one direction, away from the lunar south pole. Bernhardt and his colleagues wanted to investigate the way this impact played out by studying the geological features on the surface of the Moon today. NASA's Lunar Reconnaissance Orbiter has been circling the Moon since 2009, mapping its surface and collecting a wealth of lunar geology data. The research focused on more than 200 mountain features scattered around the outskirts of the basin that the team thought may be remnants of the crater rim. When the cataloging and the mapping was complete, however, the shape formed by these features was far more circular than the researchers expected. Impacts gouge out materials from deep under the lunar crust and spray them over the surface. Because the Moon doesn't experience erosion from geological or atmospheric weather processes that obscure impact evidence here on Earth, those materials should still be there. *"A rounder, more circular shape indicates that an object struck the Moon's surface at a more vertical angle, possibly similar to dropping a rock straight down onto the ground,"* Bernhardt says. *"This circular impact implies that debris from the impact is more equally distributed around it than was originally thought, which means that Artemis astronauts or robots in the south pole region may be able to closely study rocks from deep within the moon's mantle or crust, materials that are typically impossible for us to access."* <https://www.sciencealert.com/the-biggest-crater-on-the-moon-is-much-bigger-than-we-ever-realized>

Golden Bugs: Spectacular New Fossil Arthropods Preserved in Fool's Gold

A team of researchers led by Associate Professor Luke Parry, Department of Earth Sciences, University of Oxford, have unveiled a spectacular new 450-million-year-old fossil arthropod (the group that contains spiders, centipedes, and insects). Besides being an extraordinary-looking new scientific species, the specimens are entirely preserved by fool's gold. The work is published in the journal *Current Biology*. Associate Professor Parry said, "As well as having their beautiful and striking golden color, these fossils are spectacularly preserved. They look as if they could just get up and scuttle away." The new fossil, named ***Lomankus edgecombei***, after arthropod expert Greg Edgecombe of London's Natural History Museum, belongs to a group called megacheirans, an iconic group of arthropods with a large, modified leg (called a "great appendage") at the front of their bodies that was used to capture prey. Megacheirans like *Lomankus* were very diverse during the Cambrian Period (538–485 million years ago)

but were thought to be largely extinct by the Ordovician Period (485–443 million years ago). This discovery offers important new clues towards solving the long-standing riddle of how arthropods evolved the appendages on their heads: one or more pairs of legs at the front of their bodies modified for specialized functions like sensing the environment and capturing prey. Such appendages include the antennae of insects and crustaceans, and the pincers and fangs of spiders and scorpions. "Today, there are more species of arthropod than any other group of animals on Earth. Part of the key to this success is their highly adaptable head and its appendages, that has adapted to various challenges like a biological Swiss army knife," Associate Professor Parry continued. While other megacheirans used their large first appendage for capturing prey, in *Lomankus* the typical claws are much reduced, with three long and flexible whip-like flagella at their end. This suggests that *Lomankus* was using this frontal appendage to sense the environment, rather than to capture prey, indicating it lived a very different lifestyle to its more ancient relatives in the Cambrian Period. Unlike other megacheirans, *Lomankus* seems to lack eyes, suggesting that it relied on its frontal appendage to sense and search for food in the dark, low-oxygen environment in which it lived. "Rather than representing a 'dead end,' *Lomankus* shows us that megacheirans continued to diversify and evolve long after the Cambrian, with the formerly fearsome great appendage now performing a totally different function," Associate Professor Parry continued.



The holotype specimen of *Lomankus edgecombei*. Photograph at left, other images at right are 3D models from CT scanning.

The fossil offers new clues towards solving the highly-debated question of what the equivalent of the great appendage of megacheirans is in living species. Co-corresponding author Professor Yu Liu (Yunnan University) said, "These beautiful new fossils show a very clear plate on the underside of the head, associated with the mouth and flanked by the great appendages. This is a very similar arrangement to the head of megacheirans from the early Cambrian of China except for the lack of eyes, suggesting that *Lomankus* probably lived in a deeper and darker niche than its Cambrian relatives." This arrangement of features on the head is similar to living arthropods, suggesting the great appendage is the equivalent of the antenna of insects and the chelicera (mouthparts) of spiders and scorpions. The fossil was found at a site in New York State, U.S. that contains the famous "Beecher's Trilobite Bed," a layer of rock containing multiple trilobites with incredible preservation. Aside from trilobites, other kinds of organisms are much less common at this site, reflecting the rarity of this find. The animals preserved in Beecher's Trilobite Bed lived in a hostile, low oxygen environment that allowed pyrite, commonly known as fool's gold, to replace parts of their bodies after they were buried in sediment, resulting in spectacular golden 3D fossils. Pyrite is a very dense mineral, and so fossils from this layer can be CT scanned to reveal hidden details of their anatomy. This technique involves rotating the specimen while taking thousands of X-ray images, allowing the fossils to be reconstructed in three dimensions. Professor Derek Briggs, a co-author of the study at Yale University said, "These remarkable fossils show how rapid replacement of delicate anatomical features in pyrite before they decay, which is a signature feature of Beecher's Trilobite Bed, preserves critical evidence of the evolution of life in the oceans 450 million years ago." <https://www.geologypage.com/2024/11/golden-bugs-spectacular-new-fossil-arthropods-preserved-in-fools-gold.html>

2024 CVRMS HOLIDAY PARTY



Famous 280-Million-Year-Old Fossil is Partially Fake

Who among us hasn't had their prized 280-million-year-old fossil eventually be proven to partially be a good fake? A new examination of a specimen first discovered almost 100 years ago reveals that parts of it are a forgery. The detective work is highlighted in a study published February 15 in the journal *Palaeontology* and urges caution in how this fossil is used in future studies. The fossil of an extinct reptile called *Tridentinosaurus antiquus* was first discovered in the Italian Alps in 1931. It was billed as one of the oldest fossils of a backboned creature found in Italy. Its body outline looked dark against the surrounding rock and was initially interpreted as soft tissues that had been preserved over millions of years. Unlike hard bones and teeth, soft tissues mostly disintegrate over time, so specimens uncovered with skin intact are considered a big find. "Fossil soft tissues are rare, but when found in a fossil they can reveal important biological information, for instance, the external coloration, internal anatomy and physiology," said Valentina Rossi, paleobiologist at University College Cork in Ireland. The somewhat strange preservation left many experts uncertain about what group of reptiles this strange lizard-like animal belonged to and more generally its geological history. It was initially classified as a member of the group Protorosauria. These reptiles went extinct towards the Late Triassic era and are known for long necks. The scientists believed it was an important find in understanding the evolution of early reptiles. The purported fossilized skin had previously been hailed in books and other studies, but had never been studied in great detail. The team on this new study reexamined the fossil and found that the fossil is primarily **just black paint on a carved lizard-shaped rock** surface. Microscopic analysis revealed that the texture and composition of the material didn't match genuine fossilized soft tissues from other specimens. Preliminary investigation using ultraviolet photography also revealed that the full specimen was treated with some sort of coating material. In the past, coating fossils with varnishes and lacquers was normal and sometimes still is necessary to preserve fossils. The team hoped that the original soft tissues were beneath the coating so that they could extract solid palaeobiological data. The body outline of *Tridentinosaurus antiquus* was likely artificially created to enhance the fossil's appearance. However, the authors say that the fossil itself is not a complete fake. The bones of the animal's hind limbs are genuine, but were poorly preserved. This new analysis also revealed that tiny bony scales called osteoderms are present. These scales similar to that of a crocodile may have lined the back of the animal. This study is an example of how nondestructive methods with lasers and micro CT scanners can reexamine specimens found in the past to yield new discoveries. <https://www.popsoci.com/environment/famous-280-million-year-old-fossil-is-partially-fake/>

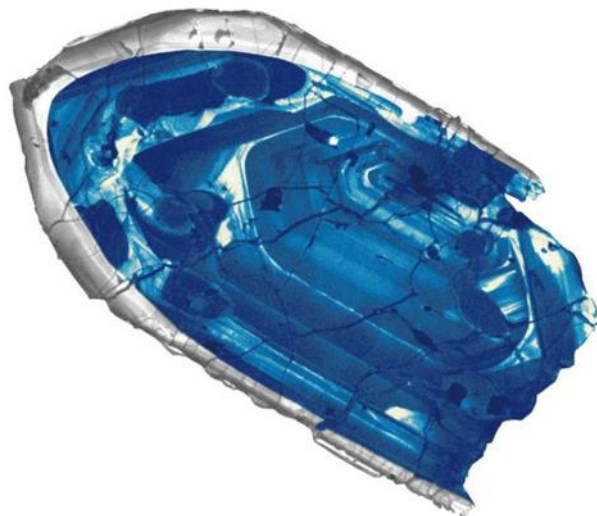


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How do we know that the Earth is 4.543 billion years old?

How do we know that the Earth is 4.543 billion years old? Let me tell you about zircons. Well, when zircon ($ZrSiO_4$) is forming it really likes to absorb uranium atoms, which are very nearly the same size as zirconium atoms so can easily substitute into a zircon's crystal structure. But, what makes it interesting is that zircon really repels lead, so you won't find any lead in the newly formed zircon crystals. So once



A very nice zircon crystal, similar to those that are used for radiometric dating of rocks. Zircon crystals average about 0.1 to 0.3 millimeters in size in granitic rocks.

the crystal is formed, all the uranium that is already sealed in the crystal structure can naturally decay into lead through a process of *radioactive decay*, and as it decays all of the decay products remain sealed in the zircon crystal.. Now, because we already understand how fast uranium isotopes decay (the *decay rate*), it's easy for us to determine the ratio between uranium (which has not yet decayed) and lead (which is formed from the decay of uranium), and from there we can calculate how long ago the uranium was sealed in the crystal. Therefore we know when the zircon crystals were formed. From there we can determine the age of very old rocks. By sequencing, what we believe are the oldest rocks we can find on this planet, the oldest zircon ages probably identify the oldest rocks formed around the same time as Earth was formed. From there we can get an estimate of the age of our planet.

Ray Anderson, Editor
 2155 Prairie du Chien Rd. NE
 Iowa City, Iowa 52240-9620



Next Meeting:
TUESDAY JAN. 21
Hiawatha Community Center
“The Geology of the Saylorville Spillway”
 by **Ray Anderson**
 Cedar Valley Rocks and Minerals Society

CEDAR VALLEY GEMS

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2024 & 2025 Officers, Directors, and Committee Chairs

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Webmaster	Sharon Sonnleitner (sonnb@aol.com).....	310-0085

Club meetings are held the 3rd Tuesday of each month from September through November and from January through May at 7:15 p.m. Meetings are held at the Hiawatha Community Center in the Hiawatha City Hall, **101 Emmons St., Hiawatha IA**. The December meeting is a potluck dinner held on the 2nd Tuesday at 6:30. June, July, and August meetings are potlucks held at 6:30 p.m. at area parks on the 3rd Tuesday of each month

CEDAR VALLEY ROCKS & MINERAL SOCIETY

CVRMS was organized for the purpose of studying the sciences of mineralogy, geology, and paleontology and the arts of lapidary and gemology. We are members of the Midwest (MWF) and American (AFMS) Federations. Membership is open to anyone who professes an interest in rocks and minerals.

Annual dues are \$15.00 per family per calendar year. Dues can be sent to:

Dale Stout
 2237 Meadowbrook Dr. SE
 Cedar Rapids, IA 52403

CVRMS website:
cedarvalleyrockclub.org