

Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS

APRIL 2024

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Ray Anderson, Editor: rockdoc.anderson@gmail.com

Next CVRMS Meeting
Tues. April 16
7:15 pm

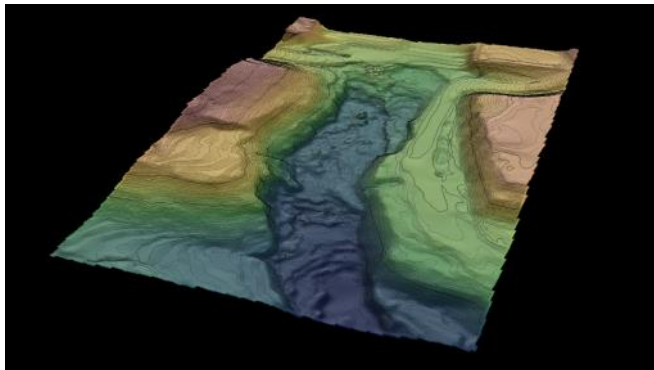
Hiawatha Community Center
101 Emmons St., Hiawatha - 7:15 pm

featured presentation

"The Geology of the Devonian Fossil Gorge"

by **Ray "Rock Doc" Anderson**

CVRMS Vice President



*Digital elevation model of the
Devonian Fossil Gorge*

By popular request, Ray has agreed to repeat the PowerPoint program that he presented at our 2024 Rocks, Minerals, and Fossils Show. The presentation includes the geology of the gorge and the forces that created it.

CVRMS 2024 Rock Show Was Another Success

Although attendance at this year's Rocks, Minerals, and Fossils Show (4,172 with ~1/4 children) was lower than last year's record 5,016 attendees, it was a very successful show that did set some records. All dealers were very happy with their sales (ZRS reported their best show ever) with many reporting better sales than last year. Thanks to the good work of Kim Kleckner and her team, this year's **Silent Auction** made a record \$4,000 to add to the CVRMS scholarship fund. The ever popular **Pebble Pit** was cleaned out! And, the fossil cast booth used up their entire stock of plaster of Paris! There were lots of "wows" around Tammy Kincaid's giant geode, Bill Desmarais' great dinosaur display, and Don Johnson's dinosaurs. The addition of the Army Corps of Engineers table and displays to this year's show was also well received, and they will be invited back next year. The **amethyst cathedral raffle prize** was won by Jerry Parton from Mount Pleasant (see photo below) who



drove to Iowa City the following morning to pick it up from Sharon. He was ecstatic about winning the prize and excited to get home and surprise his wife with it. A great big **thank you!!** to all of those club members who stepped up to the plate to help out to make the show great.

CVRMS Meeting March 19 – Minutes –

MEETING CALLED TO ORDER: by President Marv Houg at 7:22 pm. About 40 members present. Guests and new members introduced Sue Mortimer and Rita Yoder.

MINUTES OF PREVIOUS MEETING: Motion to accept by Kim Kleckner, 2nd by Lisa. Minutes accepted..

TREASURER'S REPORT BY DALE STOUT: Checking account balance \$916.86. Motion to accept by Kim Long and 2nd by Dennis Schlicht. Report accepted.

PROGRAM: by Dr. Rhawn Dennison and Cornell University students report on Grand Canyon field trip with spectacular pictures.

ROCK SHOW: Review of volunteers needed for Friday's set up day. **Potluck for Friday** bring extra. **Ray has** lineup for programs. **Raffle prizes** include agate table, wine goblets, polished coral heads, amethyst cathedral, agate collection, dinosaur selection.

NEW BUSINESS: Open house for River Products on May 18.

FIELD TRIP: Report on 3/16 field trip for geodes. It was cold and Lisa fell into a ditch fracturing her ankle.

OTHER BUSINESS: Correspondence, none. **Name Badges,** let Dale know if you desire one.

MOTION TO ADJOURN: by Jay and 2nd by AJ. meeting adjourned 8:50 pm

Respectfully Submitted.

Dell James, Secretary

Not a Fake Diamond Ring

So 30 years ago, when one London-based woman found a huge, gorgeous and fake diamond ring at a car boot sale (almost the equivalent of an American flea market), she knew she just had to have it. After negotiating a \$15 price, the deal was pretty much a steal and the ring became the woman's most coveted staple, even during the most "mundane activities." But decades later, after a jeweler alluded to the fact that the ring might not be so fake after all, the woman had the ring appraised -- And it turns out that the costume gem was in fact a very not-fake 26.27-carat diamond. The ring is now in the possession of Sotheby's London, where it will be auctioned on June 7. Jessica Wyndham, a representative for Sotheby's London, explained that the ring was most likely cut in the 19th century, explaining why it was able to go unnoticed for so long: "With an old style of cutting, an antique cushion shape, the light doesn't reflect back as much as it would from a modern stone cutting. Cutters worked more with the natural shape of the crystal, to conserve as much weight of the crystal rather than make it as brilliant as possible." The ring is estimated to go for up to \$455,000. And as for the lucky woman who found the gem so many years ago? She's chosen to remain anonymous

CVRMS Board Meeting Mar. 26 – Minutes –

MEETING CALLED TO ORDER: 7:15 by Marv. All board members present with the exception of Ray.

COMMENTS FROM ROCK SHOW: Parking was a problem, and people were driving around 20 minutes to find a space to park. Reflects on our reduced attendance. **Total attendance** about 4172 with children being 1094. Report not totaled yet; however, the gross was about \$13,760 00. **Sharon did a count** of the raffle tickets that were dropped into the respective containers. Amethyst cathedral=532, agate collection=179, agate table=97, wine glasses=82, dinosaur collection=70, and polished coral heads=60. **Sharon reported** that the flintknapper was happy with the show. **Kim reported** that door prizes left were of the minor stuff. The **Silent Auction** sold most of its specimens, and the buy-it-now table went over quite well. We may offer more buy it now next year. People were complaining about the dust from the sand in the pebble pit. Since all the special specimens were sold, we will eliminate it next year. **Jackie suggests** that we buy Dave Malms fossil molds from him. The Sluice is for sale. **Doug DeRosear** is planning to retire, and Ithiel wants his spot. **Bill will not** do security next year. He wants to conserve his energy for the conversations he has all day both days on his dinosaur bones. **Marv commented** that a lot of show responsibility has landed on Sharon's shoulders. We need to lessen her load. We need some young people to take the lead on tasks.

OLD BUSINESS: No word from Deb at River Products about TAKO, planned for May 16, 2024. **Sharon has talked** to flintknapper Terry Carver about teaching a beginners class. He will let her know if he has time to do it..

NEW BUSINESS: Bill will do a program at Springville Library in June. **Kim will** do a summer school Kindercare.

FIELD TRIPS: Matt says that we may have one in the middle of April for geodes.

8:45 Motion to adjourn by Bill, 2nd by Jay. Meeting adjourned.

Respectfully submitted

Dell James, Secretary

This Bizarre, Long-Necked Dinosaur Had 500 Replaceable Teeth

In 1997, when paleontologist Paul Sereno first began to unearth the remains of a dinosaur in Niger's Sahara Desert, he didn't know what to think. He was excavating bones in a dry region called Gadoufaoua, which had a rich fossil bed first discovered by French uranium miners. There were a lot of light, aerated bones (usually associated with theropods, like *Tyrannosaurus rex*, and the birds that evolved from them) so the researchers assumed that was what they were dealing with. As Sereno began to piece together the fossils, he realized it must be a sauropod, or long-necked dinosaur. Most of the bones appeared fairly typical for long-necked dinosaurs, except for its bizarrely-shaped head. Eventually, back in the lab, Sereno had to ask for a second opinion from colleagues who worked on fossil fish and other reptiles before he figured it out.



There are a lot of strange-looking dinosaurs out there. But *Nigersaurus taqueti* (pronounced NI-juhr-SOR-us) might sit at the top of the list. The sauropod's jaw looks almost like a large nail clipper, with large rows of hundreds of teeth on its upper and lower jaws. It almost didn't seem to fit into its skull when Sereno was trying to piece it together. Sauropod dinosaurs, like *Nigersaurus*, walked on four legs, with a long "whiplash tail" and a long neck. But compared to other sauropods, it was relatively small, sitting somewhere between an African and Indian elephant in size. The dinosaur's vertebrae was filled with air pockets similar to those of birds, so the dinosaur was likely quite light, as well. Its brain was about the size of a walnut, which is more or less average for sauropods, Sereno says. Its head is what really stands out about *Nigersaurus*, though. The jaws, which have a flat front, are lined with about 500 teeth, which Sereno says were replaceable. These teeth were all the same in size, and he estimates that they probably only lasted about a month or so before they were worn down. Its jaw would have been angled downwards rather than forwards, which is why Sereno had such trouble fitting the bones together initially. These teeth and the shape of the sauropod's skull likely evolved to help it munch on plants low to the ground. Grass wasn't around yet during its time, but *Nigersaurus* probably spent much of its time grazing on something like it, wearing down its teeth in no time, a Mesozoic "lawnmower." All told, these were some of the most successful herbivores on the planet. *Nigersaurus* lived about 110 million years ago, during the Mesozoic Era, and the species was around for about 150 million years. Still, the plant-eating sauropods would likely have provided a great source of food for predators, likely including the long-snouted *Suchomimus*, a large spinosaur found in the same fossil deposits as *Nigersaurus*. What's more, just like grazing cows today, these creatures were the most common herbivore of the day. <https://www.discovermagazine.com/the-sciences/this-bizarre-long-necked-dinosaur-had-500-replaceable-teeth>

Spotlight Gemstone: Diamond



April's Birth Stone

On almost all modern birthstone lists, diamond is recognized as the birthstone for April. Diamond is also the gem that marks the 60th and 75th wedding anniversaries. Diamonds are thought to have been first recognized and mined in India, where significant alluvial (river) deposits of the stone could be found many centuries ago along the rivers Penner, Krishna and Godavari. Diamonds have been known in India for at least 3,000 years, and probably 6,000 years. Diamond is the only gem composed of one single element: carbon. Each carbon atom shares electrons with 4 other carbon atoms in a face-centered cubic crystal structure called a diamond lattice. Because of the extreme rigidity of this lattice, diamonds can be contaminated by only a very few types of impurities, such as boron and nitrogen. Small amounts of defects or impurities (about one per million of lattice atoms) color diamond blue (boron), yellow (nitrogen), brown (lattice defects), green (radiation exposure), purple, pink, orange or red. Diamond also has relatively high optical dispersion (ability to disperse light of different colors). Diamonds are the hardest material on earth (9 on the Mohs hardness scale): 58 times harder than anything else in nature. Most diamonds formed more than a billion years ago, at high temperature and pressure found only at depths deep in the Earth's mantle, about 90 to 120 miles beneath the surface. Diamonds are brought close to the Earth's surface through deep volcanic eruptions of magma, which cools into igneous rocks known as kimberlites and lamprolites. The diamonds are recovered by mining deep into these "pipes" or from rivers and near-shore deposits that include diamonds that nature eroded from the rocks. Diamonds are graded in quality based on the "4Cs", clarity, color, cut, and carat weight. **Clarity** grades assess the number, size, relief, and position of inclusions and blemishes. The less **color**, the higher the grade. Even the slightest hint can make a dramatic difference in value. **Cut** (proportions, symmetry, and polish) is a measure of how a diamond's facets interact with light. **Carat Weight**, larger diamonds of the same quality are much rarer than smaller ones and are worth more per carat. Although diamonds are made synthetically, their cost of production averages \$2,500 per carat, as compared to a cost of \$40 to \$60 per carat to mine the stones.

What in the World?



What in the World is this beautiful rock??

March's Photo



Last month's What in the World image was a photo of the **Kondyor Massif**, a circular intrusion of igneous rock about 5 miles in diameter. It is located in Khabarovsk Krai, Russia and is an important source of platinum.

ROCK CALENDAR CVRMS EVENTS OF INTEREST

2024

Apr. 7 — Black Hawk Gem, Mineral and Fossil Show

Waterloo Center for the Arts
225 Commercial Street, Waterloo, Iowa
11:00 am—5:00 pm

Apr. 16 — CVRMS Monthly Meeting

Hiawatha Community Center 7:15 pm
Geology of the Devonian Fossil Gorge
By Ray Anderson

May. 18 — TAKO Rockin' Rocks & Fossils

River Products Klein Quarry 9:00-Noon

May. 21 — CVRMS Monthly Meeting

Hiawatha Community Center 7:15 pm
Program to be announced

June. 18 — CVRMS Monthly Meeting

Picnic at Thomas Park, Marion 6:30
Rock Show and Tell and Polishing

July. 16 — CVRMS Monthly Meeting

Picnic at Wanatee Park, Marion 6:30
Rock Show and Tell and Geode Cracking

Aug. 20 — CVRMS Monthly Meeting

Picnic at Morgan Creek Park, Marion 6:30
Rock Show and Tell and Rock Bingo

Sept. 27, 28, & 29 — Geode Fest

First Christian Church Parking Lot
3476 Main Street, Keokuk, Iowa
[Keokuk Area Convention & Tourism Bureau](#)
[Official Website \(keokukiowatourism.org\)](http://www.keokukiowatourism.org)

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.

Since no one came to me last month with a question or suggestion for this month's "Ask a Geologist" I picked out an article that I thought might be of interest to CVRMS members. Our early Solar System was much different than the orderly group of planets circling the Sun that we see today. Astronomers modeling this early system say that planets moved toward the sun and then away, switched positions, smashed into one another, and many dived into the sun to be lost forever. But, it is rare to find hard evidence to validate these models. A meteorite has been recovered that provides some evidence of these early planets.

Diamonds Buried Within Rare Meteorites Reveal Existence of "Lost Planet"

Diamonds found in a meteorite that exploded over the Nubian desert in Sudan a decade ago were formed deep inside a "lost planet" that once circled the sun in the early solar system, scientists say. Microscopic analyses of the meteorite's tiny diamonds revealed they contain compounds that are produced under intense pressure, suggesting the diamonds formed far beneath the



A different ureilite meteorite

surface of a planet. In this case, the mysterious world was calculated to be somewhere between Mercury and Mars in size. Astronomers have long hypothesized that dozens of fledgling planets, ranging in size from the moon to Mars, formed in the first 10 million years of the solar system and were broken apart and repackaged in violent collisions that ultimately created the terrestrial planets that orbit the sun today. If the latest findings are confirmed, the **Almahata Sitta** meteorite will be the only known remnant of one of these long-lost planets. The material will give scientists a unique window into the cosmic conditions that prevailed in the deep history of the solar system. "Simulations have suggested that the early solar system had tens of these embryonic planets that collided with each other to form the terrestrial planets, but having evidence of one of them? I wasn't expecting that," said Farhang Nabiei, who studied pieces of the meteorite at the Federal Institute of Technology in Lausanne, Switzerland. Philippe Gillet, a senior author on the study, said: "We are doing archaeology, looking into the past, and trying to decipher the story of the solar system." The Almahata Sitta meteorite was the first to be tracked by telescopes as it sped

towards Earth and exploded over the Nubian desert in 2008. The event prompted a recovery effort by the University of Khartoum, which gathered 480 pieces of the meteorite amounting to 4kg of battered material. Early inspections of the meteorite revealed it to be a **ureilite**, an unusual composition that does not match other space rocks known to have come from the moon or Mars. The finding led some scientists to speculate that it may have had a more exotic origin. That suspicion grew when researchers noticed little diamonds in the meteorite material. While other meteorites are known to contain diamond crystals, they are generally far smaller. Typical meteorite diamonds are only a few millionths of a millimeter across and are thought to form in collisions with other space rocks that send brief but intense shockwaves through the carbon-rich asteroids. In 2015, researchers at the Swiss lab teamed up with Japanese scientists to argue that the diamonds in the Almahata Sitta meteorite, which are up to 100 micrometers long, were much larger than could be formed in collisions with other asteroids. They speculated at the time that the meteorite might have come from a lost planet, but sought more evidence to bolster their theory. Writing in the journal *Nature Communications*, the Swiss team now describe fresh analyses that show that diamonds in the meteorite contain specks of an iron-sulfur compound that is thought only to form at pressures greater than 20 gigapascals. They conclude that the diamonds formed with the specks inside them, deep beneath the surface of an unknown world. "We are probably looking at an object that was one of the first planets to circle the sun before they collided with each other to create the actual planets we have today," said Gillet. James Wittke, who runs the meteorite laboratory at Northern Arizona University, said the scientists' conclusions were reasonable. "We think that there were probably many larger 'parent' bodies in the early solar system, which have since been destroyed, so a since-destroyed body the size of Mercury is reasonable," he said. "One as large as Mars seems a little surprising, but this paper presents the best, and perhaps only, type of evidence for determining the sizes of these parent bodies."

<https://www.geologyin.com/>

Earth's Oldest Fossilized Forest Has Been Hiding Its Bizarre Trees For 390 Million Years

The highest sea cliffs in England have been hiding the oldest fossilized forest yet found on planet Earth. The long-lost ecosystem's palm-like trees, called *Calamophytos*, are **390 million years** old. That's roughly three or four million years older than the previous record holder in New York State. In southwest England, the red sandstone where scientists found the imprints of logs, roots, and twigs was once considered "barren of trace fossils."



Recent investigations, however, have found the site actually provides a wonderful cross-section of life in the Devonian Period, a time when plummeting sea levels surrounded two massive continents, Gondwana and Euramerica. Animals and primitive plants alike were quick to make use of the new environment. The first trees to colonize the continents were unlike anything you'd see today. Initially, they didn't have roots, leaves, spores, seeds, or any vascular system to transport water and nutrients, forcing them to stick close to coastlines and rivers. The *Calamophyton* trees discovered on the **Somerset coastline near Minehead** had evolved roots and strands of vascular tissue in their stems, but they were only 3 to 8 feet high, and their trunks were thin and hollow. Others of their kind have previously been discovered in fossil form in Germany, New York, and China. Some of the fossilized trees are preserved exactly where they grew or fell, giving scientists a first glimpse into the layout of the forest ecosystem. Unlike the fossil forest found in upstate New York, the trees in this ancient floodplain are shorter and appear to have grown close together, tightly packed in. "This was a pretty weird forest," says geologist Neil Davies from the University of Cambridge. "There wasn't any undergrowth to speak of and grass hadn't yet appeared, but there were lots of twigs dropped by these densely-packed trees, which had a big effect on the landscape." *Calamophyton* trees had no leaves, but they were covered in hundreds of little twigs that were regularly shed. In fact, in one lifetime, *Calamophyton* trees may have shed as many as 800 branches. As the woody debris accumulated on the forest floor, Earth's soil was infused with its first reserves of organic matter. Surrounded by a network of rivers and channels, seasonal floods would have been common. The trees probably evolved deeper roots to survive bouts of water scarcity. These roots, in turn, would have stabilized and sculpted the land to form the slopes of hills, river bars, and channels for other plants to then colonize. As water washed through the floodplain, it deposited mud in ripples around the vegetation in ways that were later fossilized, preserving the plants and their position for millions of years. "The Devonian period fundamentally changed life on Earth," says Davies. "It also changed how water and land interacted with each other, since trees and other plants helped stabilize sediment through their root systems, but little is known about the very earliest forests." The Devonian is sometimes called the 'age of fishes,' but given how much plants like *Calamophyton* appear to have altered Earth's landscape, the time could just as well be known as the age of trees. <https://www.sciencealert.com/earths-oldest-fossilized-forest-has-been-hiding-its-bizarre-trees-for-390-million-years>

Workers at the nearby Svartsengi power plant were evacuated from the facility due to high levels of the gas, Icelandic news site RÚV reported, and locals were temporarily warned to stay inside, according to Iceland's Civil Protection. Sulfur dioxide emissions have diminished significantly since March 18. However, new data from the Copernicus Atmosphere Monitoring Service (CAMS) shows that the initial outpouring of gas formed a 3-mile-tall concentrated column. The column has since blown toward other countries in northern Europe. CAMS will continue to track the plume "although we don't expect there to be any impact on surface air quality or climate," senior CAMS scientist Mark Parrington said in a statement emailed to Live Science. However, tracking sulfur dioxide emissions is still important because the gas can react with atmospheric ozone molecules, depleting the amount of this protective substance in the ozone layer, which shields Earth's surface from the sun's harmful ultraviolet rays. In October 2023, scientists partially attributed the near-record-largest ozone hole above Antarctica to the 2022 eruption of an underwater volcano in Tonga, which released high levels of water vapor into the atmosphere that may have depleted ozone levels. Experts predict that the recent eruptions in Iceland could be the beginning of a new centuries-long period of activity in the region. As a result, the amount of sulfur dioxide being pumped toward the Arctic could also rise over the next few years, which could lead to larger northern ozone holes in the future. "The impacts of the volcanic eruptions in Iceland in the atmosphere have not yet been so severe, but it is relevant to keep monitoring the evolution of the situation," CAMS director Laurence Rouil said in the statement. <https://www.livescience.com/planet-earth/volcanos/iceland-volcano-gigantic-plume-of-toxic-gas-from-latest-eruption-is-moving-across-europe-satellite-data-shows>

Gigantic Plume of Toxic Gas from Iceland volcano's Latest Eruption

Scientists are tracking a massive plume of toxic gas moving across northern Europe that was spat out by the ongoing volcanic eruption in Iceland. The gas cloud is unlikely to cause any serious health problems. However, it could impact the ozone hole above the Arctic, experts warn. On March 16, an underground volcano in Iceland's Reykjanes Peninsula blew its top for the fourth time in as many months, opening up the largest fissure of the current eruption cycle and unleashing a massive lava flow that narrowly missed the evacuated town of Grindavík. But the eruption did release sulfur dioxide, a colorless, toxic gas that can be extremely dangerous in high concentrations. On March 17, the volcano was spitting out around 110 pounds of sulfur dioxide every second, according



to a translated statement from the Icelandic Met Office.

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evacuated from the facility due to high levels of the gas, Icelandic news site RÚV reported, and locals were temporarily warned to stay inside, according to Iceland's Civil Protection. Sulfur dioxide emissions have diminished significantly since March 18. However, new data from the Copernicus Atmosphere Monitoring Service (CAMS) shows that the initial outpouring of gas formed a 3-mile-tall concentrated column. The column has since blown toward other countries in northern Europe. CAMS will continue to track the plume "although we don't expect there to be any impact on surface air quality or climate," senior CAMS scientist Mark Parrington said in a statement emailed to Live Science. However, tracking sulfur dioxide emissions is still important because the gas can react with atmospheric ozone molecules, depleting the amount of this protective substance in the ozone layer, which shields Earth's surface from the sun's harmful ultraviolet rays. In October 2023, scientists partially attributed the near-record-largest ozone hole above Antarctica to the 2022 eruption of an underwater volcano in Tonga, which released high levels of water vapor into the atmosphere that may have depleted ozone levels. Experts predict that the recent eruptions in Iceland could be the beginning of a new centuries-long period of activity in the region. As a result, the amount of sulfur dioxide being pumped toward the Arctic could also rise over the next few years, which could lead to larger northern ozone holes in the future. "The impacts of the volcanic eruptions in Iceland in the atmosphere have not yet been so severe, but it is relevant to keep monitoring the evolution of the situation," CAMS director Laurence Rouil said in the statement. <https://www.livescience.com/planet-earth/volcanos/iceland-volcano-gigantic-plume-of-toxic-gas-from-latest-eruption-is-moving-across-europe-satellite-data-shows>

A Complete Dinosaur Timeline to Extinction: How Long Did They Roam Earth?

Dinosaurs roamed Earth for millions of years, during a major geologic era known as the **Mesozoic**. Fossils, scientific discoveries and tireless research efforts have gradually unveiled the mesmerizing tapestry of the dinosaur timeline. Their captivating tale begins in the **Triassic period**, reaches its peak during the well-known **Jurassic period** and comes to a dramatic end in the late **Cretaceous period**. Discover how each of these distinct periods served as a stage for the evolutionary dramas that unfolded, as new species emerged and others faded away.

How Long Ago Did Dinosaurs Live?

The dawn of dinosaurs began with the *Permian mass extinction*, also known as the *Great Dying*. This event, around 252 million years ago, killed more than 90 percent of life on Earth at the time. Scientists are unclear on what actually caused this mass die-off (warming temperatures and volcanic activity likely played a role) but it is widely recognized as the worst extinction ever to have occurred.

The Triassic Period—252-201 million years ago



After this catastrophe, ecosystems changed and mammal-like reptiles came to dominate on land. This era is known as the Triassic Period. They were also accompanied by archosaurs, a group that included early dinosaurs. Exactly when dinosaurs emerged during this period, however, is up for debate; for some time, paleontologists believed *Eoraptor* was the first. A paper published in 2013, on the other hand, argued that the two-legged *Nyasasaurus* (dating back to around 243 million years ago) is actually the earliest dinosaur, or at least one of its relatives. And another fossil recently found in Africa, belonging to *Mbiresaurus raathi*, is recorded as the continent's earliest known dinosaur and an early relative of the towering sauropods.

The Jurassic Period—201-145 million years ago

At the beginning of the Triassic, Earth's landmass was one supercontinent called Pangea. As the period drew to a close and Pangea began to split in two, however, another mass extinction occurred. Like the previous one, the exact causes are still unknown, though a changing climate is considered a likely cause. Fortunately, dinosaurs survived. As the dinos entered the Jurassic period, Pangea's gradual separation into Laurasia in the North and Gondwana in the South coincided with cooler temperatures and increased rainfall. This spurred the growth of new vegetation, such as ferns and conifer trees. As the flora changed, dinosaurs diversified. Most striking in the Jurassic is perhaps the rise of the sauropods, such as *Brachiosaurus* and *Diplodocus*. They spread far and wide, and grew to enormous sizes, feasting on the abundant plant life. Theropods, two-legged meat-eaters, also grew larger, *Allosaurus* and *Ceratosaurus* are two prominent examples. Meanwhile, iconic armored herbivores like *Stegosaurus* appeared on the scene, too.

The Cretaceous Period—145-66 million years ago

At the end of the Jurassic, some 145 million years ago, a further shift in the continents prompted yet more flourishing dinosaur evolution. What came next is known as the Cretaceous, a period that lasted 79 million years. During this time, sauropods reached ever greater sizes and heights; one of the largest was *Patagotitan* (literally "the titan from Patagonia"), stretching to heights of more than 120 feet as it roamed the Early Cretaceous. We owe some of the most famous and largest meat-eating dinosaurs, such as *Tyrannosaurus Rex*, *Spinosaurus*, and *velociraptor*, to the Cretaceous, too. Dinosaurs filled all kinds of ecological niches, and some researchers believe the giant reptiles reached their peak diversity during the mid-Cretaceous period.

Why Did Dinosaurs Go Extinct?

But this success was not meant to last. Around 66 million years ago, an asteroid thought to be roughly 6 miles wide struck the Yucatán Peninsula in Mexico. This collision triggered a mass die-off that reverberated through ecosystems, wiping out all non-bird dinosaurs. Paleontologists continue to uncover new facets of dinosaur behavior, ecology and appearance through fossils, however. And much remains to be learned about how they came to rule Earth for so long. It's entirely possible that a large swathe of dinosaurs remains to be discovered.

<https://www.discovermagazine.com/the-sciences/the-dawn-of-dinosaurs-to-extinction-how-long-did-they-roam-earth>

Paleontologists Uncover Enormous Fossilized River Dolphin Skull in Peru

Not all dolphins live in the salty ocean. While rare, some river dolphins live and eat in freshwater and are best known for their candy colored hues. Now, paleontologists have uncovered a fossilized skull belonging to a 16-million-year-old extinct river dolphin species in Peru named *Pebanista yacuruna*. It could grow to about 10 to 11 feet long and is the largest known species of river dolphin known to science. The name *Pebanista yacuruna* is inspired by the Yacuruna, a mythical aquatic people that legends say inhabit underwater cities in the Amazon basin and are similar to the god Neptune in Greek mythology. The fossilized skull was found in the Peruvian Amazon and belongs to the group Platanistoidea. This group was a common animal in the Earth's ocean between 24 and 16 million years ago. The team believes that their primarily salt water dwelling ancestors



invaded the prey-rich freshwater ecosystems of the early Amazon and learned to adapt to this new environment. "Sixteen million years ago, the Peruvian Amazonia looked very different

from what it is today," researchers said. "Much of the Amazonian plain was covered by a large system of lakes and swamps called Pebas." This landscape stretched across present day Colombia, Ecuador, Bolivia, Peru, and Brazil and included a variety of ecosystems in its lakes and swamps. About 10 million years ago, the Pebas system began to give way to the floodplain that Amazonia looks like today. *Pebanista's* prey began to disappear as the landscape began to change, driving these giant dolphins to extinction. With *Pebanista* out of the picture, the relatives of today's Amazon river dolphins called *Inia* had an opportunity to sneak in. While these pink dolphins may look similar to the extinct *Pebanista*, they are not directly related. *Pebanista's* closest living relatives of this newly discovered species are actually found in South Asia. Both *Pebanista* had a highly developed facial crest that help them with echolocation. That is when they emit high-frequency sounds and listen to their echoes in order to "see" their prey through sounds. For river dolphins, echolocation, or biosonar, is even more critical as the waters they inhabit are extremely muddy, which impedes their vision. *Pebanista's* elongated snout with many teeth suggests that it fed on fish the way other river dolphins do. Modern Amazon river dolphins called *boto* are considered critically endangered and their primary threats include habitat loss and degradation and getting entangled in fishing gear. The Amazon rainforest remains a very difficult place for paleontological fieldwork. Fossils like these are only accessible during the dry season, when water levels drop low enough to expose ancient layers of bedrock. If the fossils are not collected in time, they can be swept away during the rainy season. The specimen was found in 2018 by an expedition team that traveled more than 180 miles of the Napo River in northeastern Peru and collected dozens of other fossils. The dolphin skull is now housed at the Museo de Historia Natural in Lima. <https://www.popsoci.com/environment/river-dolphin-fossil-skull/>

What is Irradiated Quartz, Is it Safe?

Quartz may be the **second most common mineral** on our planet's crust, but everyone from the ancient Egyptians and Australian Aborigines to modern-day New Age practitioners believe that this crystal holds mystical or healing properties.

Black quartz is a variety of quartz that ranges in clarity from almost complete transparency to an almost-opaque black crystal. Like other quartz gems, it is a **silicon dioxide** crystal. The smoky color results from free silicon formed from the silicon dioxide by natural irradiation. The color of smoky quartz is caused by irradiation and traces of aluminum built into its crystal lattice. Aluminum replaces silicon to form an $[AlO_4]$ group instead of $[SiO_4]$. To compensate for the imbalance of charge in the lattice, small monovalent cations (H^+ , Li^+ or Na^+) are built into the lattice, as well. High energy radiation transfers the extra electron from $[AlO_4]$ to the cation, and a color center is formed. Interestingly, H^+ seems to interfere with this process, and higher concentrations of built-in hydrogen inhibit the formation of color-centers. In normal geological environments this process can only take place at temperatures below $50^\circ C$, otherwise the rate of color center destruction surpasses that of



Morion, a variety of smoky quartz

color center formation. So the color of the crystals appeared long after the crystals have grown. It is estimated that it takes several million years for a crystal to assume a deep color in a granite of average composition. True smoky quartz will lose its color when heated to about $200^\circ C$, and the color will occur again when the crystal is irradiated with x or gamma-rays. It's still common practice

to artificially irradiate colorless quartz and sell it as smoky quartz. There is **no radiation hazard** associated with irradiated smoky quartz. Irradiating a crystal will cause some energy to be stored in the crystal structure, which can change the optical properties, typically observed as a change in color. Smoky quartz is usually found in intrusive igneous and certain high grade metamorphic rocks, like granite and orthogneiss, as these contain traces of radioactive elements whose radiation cause the coloration. Smoky quartz from volcanic rocks is more uncommon; here amethyst and colorless quartz dominate. Smoky quartz from sedimentary rocks is very unusual. Their content of radioactive elements is usually very low. Much of the "smoky" quartz reported from sedimentary rocks is actually not true smoky quartz, but quartz containing black or brown *inclusions*. There are 2 varieties of irradiated quartz. **Cairngorm** (Smoky Quartz) is used mostly in Scotland, specifically for the deposit in the Cairngorm Mountains where it is found. **Morion** is a very dark brown to black opaque variety. Morion is the German, Danish, Spanish and Polish synonym for smoky quartz. <http://www.geologyin.com/2020/02/is-black-quartz-natural.html>

470 Million-Year-Old Fossils Convey Prehistoric Climate History

As the world gears up for an inevitable spike in temperatures over the coming decades, a newly found deposit of fossils might provide insight on the future actions of modern species. *"The distant past gives us a glimpse of our possible near future,"* said Jonathan Antcliffe, researcher at the University of Lausanne and co-author of the study.



An artistic reconstruction of the Cabrières Biota

Two paleontology enthusiasts came across the fossil site in Montagne Noire, a mountain range in southern France, where they unearthed over 400 fossils of various ancient fauna. The fossils appeared to be in near-perfect condition; they consisted of not only shell-like components, but also rare softer features like digestive systems and cuticles. These remains belong to species that lived during the Lower Ordovician period, around 470 million years ago. Researchers at the University of Lausanne in Switzerland have now taken a comprehensive look at the fossils and published their results in

Nature Ecology & Evolution. Multiple types of species represented the fossil deposit, now known as the **Cabrières Biota**. Present at the site were arthropods (animals that have an exoskeleton and molt, like millipedes and shrimps), cnidarians (jellyfish and corals) and a large number of algae and sponges. All of these species were once located close to the South Pole; the biodiversity displayed at the site could indicate that it was a haven for species that migrated south to avoid the temperatures ramping up further north. *"At this time of intense global warming, animals were indeed living in high latitude refugia, escaping extreme equatorial temperatures,"* said one researcher. The amateur paleontologists who found the deposit, Eric Monceret and Sylvie Monceret-Goujon, also expressed their enthusiasm. *"When we came across this amazing biota, we understood the importance of the discovery and went from amazement to excitement."* Further research will help better understand the internal and external anatomy of the organisms. For now, it seems that the history of these species and their reaction to warming temperatures may provide valuable insight in assessing future climate implications. The Ordovician Period started approximately 485 million years ago, after the end of the Cambrian Period. The transition between these two periods entailed a wipeout of nearly half of all species, referred to as the **Cambrian-Ordovician extinction event**. The mass extinction transpired as a result of drastic environmental changes, including depletion of oxygen in the ocean and increased volcanic activity. In addition, environments became extremely sulfidic, restricting nutrient supplies. However, an incredible turnaround followed at the start of the Ordovician; upwelling brought cold, nutrient-rich water from deep in oceans to the surface, moderating the sulfidic conditions. This triggered the *"Ordovician radiation,"* an explosion in the number of species that ultimately tripled marine biodiversity. For the most part, species flourished in the Ordovician, although climate fluctuations plagued certain stretches of the period. The Ordovician period came to a chaotic end with a major mass extinction event that rocked Earth, eliminating about 85 percent of all species. Cemented as one of the *"big five"* mass extinctions in history, the Late Ordovician mass extinction was probably caused by glaciation and dropping sea levels, most researchers say. <https://www.discovermagazine.com/the-sciences/470-million-year-old-fossils-convey-prehistoric-climate-history>

Triassic "Tank" Unearthed in Texas Was a Croc Cousin that Lived 215 Million Years Ago

A huge armored crocodile cousin with plates embedded in its skin and curved spikes along its flanks roamed our planet 215 million years ago, scientists revealed. The newfound species, discovered in the Cooper Canyon Formation in northwestern Texas, was an **aetosaur**. These stout-limbed beasts grew up to 16 feet long and were covered in bony plates called *osteoderms* for protection. They were "tanks of the Triassic," according to a statement released by The University of Texas at Austin. Researchers



An illustration of the newly discovered aetosaur, *Garzapelta muelleri*.

unearthed a large portion of the creature's dorsal carapace, or back armor, the researchers said in a study, published in the journal *The Anatomical Record*. "We have elements from the back of the neck and shoulder region all the way to the tip of the tail," researchers said. "Usually, you find very limited material." Aetosaurs ruled Earth during the **late Triassic** (237 million to 201 million years ago), living on every continent except Australia and Antarctica. Unlike modern crocodiles, which are strictly carnivores, aetosaurs were primarily omnivores. The paleontologists discovered the newly described fossil in 1989. Preliminary research in the early 2000s found that the animal was likely a new species of aetosaur, but didn't decipher its evolutionary history. The researchers named the animal *Garzapelta muelleri*. The genus name combines "Garza" from Garza County, where it was found, with "pelta," meaning "shield" in Latin. The species name honors the discoverer. The fossil stands out among known aetosaurs because of a variety of unique features, including a never-before-seen combination of bony plates. However, the team had trouble figuring out where it sat on the aetosaur family tree. Most aetosaurs fit into one of two major groups: Aetosaurinae and Stagonolepidoidea. However, *G muelleri* had osteoderms on its back that resembled a species of Aetosaurinae called *Rioarribasuchus chamaensis* and lateral osteoderms (midsection spikes) that resembled a genus of species in Stagonolepidoidea called *Desmotosuchus*, according to the study. The team cautiously concluded that *G muelleri* had more in common with Aetosaurinae overall and that its spikes likely evolved independently in a process called convergent evolution, where two unrelated or distantly related species evolve similar traits independently. "Convergence of the osteoderms across distantly related aetosaurs has been noted before, but the carapace of *Garzapelta muelleri* is the best example of it and shows to what extent it can happen and the problems it causes in our phylogenetic analyses," researchers said. <https://www.livescience.com/animals/extinct-species/triassic-tank-unearthed-in-texas-was-a-croc-cousin-that-lived-215-million-years-ago>

Largest Uncut Diamond Was a Mammoth Gem

The largest uncut diamond ever found was the Cullinan, discovered in 1905 about 18 feet below ground in the walls of the Premier diamond mine, about 24 miles east of Pretoria, South Africa. The magnificent stone was weighed, and replicas were made before it was cut into nine major gems and 96 small gems. The largest was 530.4 carats (slightly less than one-quarter pound) and was named the *Great Star of Africa*. It and its smaller cousin (the 317.3-carat *Lesser Star of Africa*) are mounted in the British Crown Jewels. Before cutting, the stone weighed a whopping 3,106.75 carats (more than 1.3 pounds) but it was not a complete crystal. Most diamonds occur as crystals with a characteristic shape called an octahedron, think of two four-sided pyramids stuck together at their bottoms. The Cullinan was obviously part of such a crystal, it had a curved surface and triangular shaped depressions characteristic of many diamond crystals, but it was only about one-third of an octahedron. A recent article in *The Mineralogical Record* reconstructed the original diamond crystal. Using a replica of the original replica, the missing portions of the crystal were filled in with clay. The results were striking, an octahedron measuring about 4 inches on each side. The original crystal might have weighed around 8,300 carats, or more than 3.5 pounds. So where's the rest of it? The crystal probably was fragmented by the explosive emplacement of the diamond pipe lava, which

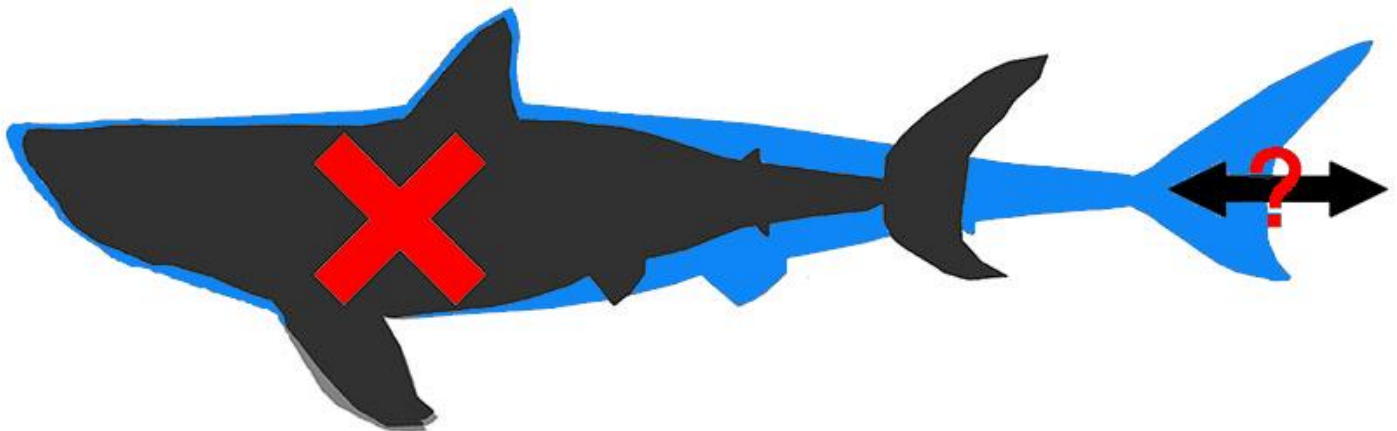


traveled from 100 miles below ground at supersonic speed some 1.2 billion years ago. It brought with it diamonds that might have formed as long ago as 3 billion years. (That's one reason the idea

that diamonds are compressed coal is a myth, coal comes from ancient trees, and there were no trees that far back in time.) The Premier Mine has produced quite a number of other large diamonds, so some fragments might have been recovered during earlier or later mining and not recognized as parts of the Cullinan. Other parts might have been transported farther up the pipe, exposed at the surface and carried away by erosion millennia before mining ever started. Alternatively, some might still lie buried miles below the surface and will never be recovered. Or maybe tomorrow's *Dispatch* will carry the news that another major fragment of this magnificent stone finally has been found. <https://www.geologyin.com/2014/11/largest-uncut-diamond-was-mammoth-gem.html>

The Megalodon Was Less Mega Than Previously Believed

A new study shows the Megalodon, a gigantic shark that went extinct 3.6 million years ago, was more slender than earlier studies suggested. This finding changes scientists' understanding of Megalodon behavior, ancient ocean life, and why the sharks went extinct. The Megalodon or megatooth shark is typically portrayed as a super-sized monster in popular culture, with recent examples in the sci-fi films *"The Meg"* (2018) and *"Meg 2: The Trench"* (2023). Previous studies assume that the shark likely reached lengths of at least 50 feet and possibly as much as 65 feet. However, the Megalodon is largely known only from its teeth and vertebrae in the fossil record, a rather incomplete set of data from which to draw assumptions. Thus, the modern great white shark was traditionally used as a model for Megalodon bodies in previous studies. That model led researchers to conclude that the shark was round and stocky like great whites. *"Our team reexamined the fossil record, and discovered the Megalodon was more slender and possibly even longer than we thought. Therefore, a better model might be the modern mako shark,"* said UCR biologist and paper first author Phillip Sternes. *"It still would have been a formidable predator at the top of the ancient marine food chain, but it would have behaved differently based on this new understanding of its body."* For the new study published in the journal [Palaeontologia Electronica](https://doi.org/10.1093/iob/obz012), a team of 26 scientists from around the world, co-led by Sternes and DePaul University paleobiology professor Kenshu Shimada, was inspired by differences in previously estimated body lengths for the Megalodon. *"It was a 'eureka-moment' when our research team realized the discrepancy between two previously published lengths for the same Megalodon specimen,"* said Shimada. The team then weighed in on a new comparison of Megalodon vertebra fossils to those of living lamniform shark relatives. *"We measured the whole vertebral skeleton of a living great white shark with a CT scanner and compared that to the previous reconstruction of the Megalodon vertebral column,"* Sternes said. *"It was still a giant, predatory shark. But the results strongly suggest that the Megalodon was not merely a larger version of the modern great white shark."*



The black silhouette depicts the previously reconstructed *O. megalodon* body form based on the extant white shark. The blue outline showing the newly interpreted body which is more elongated than the extant white shark. Note: the exact extent of body elongation remains unknown.

A revised understanding of the Megalodon body type would in turn affect scientists' understanding not only of the giant shark itself, but also of its impact on the ecology and evolution of marine ecosystems that shaped the present-day oceans. There is no doubt the Megalodon is one of the largest marine predators ever to have lived. But a slimmer and more elongated body would suggest the Megalodon also had a longer digestive canal. Sternes explained that in this case, the sharks might have enjoyed enhanced absorption of nutrients, and may not have had to eat as often as previously believed. *"With increased ability to digest its food, it could have gone for longer without needing to hunt. This means less predation pressure on other marine creatures,"* Sternes said. *"If I only have to eat one whale every so often, whale populations would remain more stable over time."* Some shark scientists have theorized that a natural decrease in prey led to the extinction of Megalodons. However, Sternes has another theory, in part supported by the revised understanding of its shape. *"I believe there were a combination of factors that led to the extinction, but one of them may have been the emergence of the great white shark, which was possibly more agile, making it an even better predator than the Megalodon,"* Sternes said. "That competition for food may have been a major factor in its demise.

<https://www.sciencedaily.com/releases/2024/01/240121192137.htm>

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Next Meeting:
TUESDAY MARCH 19
Hiawatha Community Center
“The Geology of the
Devonian Fossil Gorge”
 by **Ray Anderson**
 Cedar Valley Rocks and Minerals Society

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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 1st 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:

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