Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS **MAY 2024** **VOL. 50, ISSUE 05**

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

Next CVRMS Meeting
Tues. May 21
7:15 pm

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

featured presentation

"Solar, Lunar and Other Eclipses; the History, Science and Discoveries Connected to Them"

by **Rick Austin**

CVRMS resident astronomer, Rick Austin, will be discussing the science and history of eclipses and what they have taught us about our universe as well as

*sharing his experiences while viewing the April 8 eclipse from the zone of totality in Texas. Rick suggested an alternative title for his presentation: **"My Favorite Rocks and How they Play Together"***

CVRMS Outreach in April

CVRMS members were busy with rock and fossil outreach in April. **Ray Anderson** visited with Julie Zastrow's fourth grade class at **Prairie Heights Elementary** in CR to talk about the rocks in the area and answer questions from several young rock collectors. On April 20 **Ray** and **Kim Kleckner** displayed rocks and fossils and answered questions at the **Boy Scout's Hawkeye Area Council's Earth Day celebration** near Central City. Finally, **Bill Desmarais** displayed some of his dinosaur collection and **Ray** some local rocks and minerals at the **Weber Elementary (Iowa City) Earth Week celebration** on April 23. Thanks for helping to educate kids and parents about rocks and fossils.

Kim Kleckner at the Boy Scout Earth Day celebration near Central City.

Bill Desmarais describing T-Rex teeth to eager students at Weber Elementary

CVRMS Meeting April 25 — Minutes —

MEETING CALLED TO ORDER: 7:25 pm by Marv, president. New members and guests. Denise and Kurt Waggoner and James Grundmeyer.

MINUTES FROM LAST MEETING: motion to accept by Bill and 2nd by Mary. Minutes accepted.

TREASURERS REPORT: checking account balance $14,098.32. Motion to accept by Karen and second by Kim Kleckner. Report accepted.

PROGRAM: Devonian Gorge by Ray Anderson. Entertaining and Educational. We had two major floods 1993 and 2008 which exposed the Devonian Gorge.

MARV WON: the door prize.

2024 ROCK SHOW: review; no books offered for sale; however, they were on listed on the flyer.

2025 ROCK SHOW: Motion made to have a show in 2025 by Sharon and 2nd by AJ, Motion to approve. We will have a show in 2025!

QUESTION WAS RAISED about rumors that Hawkeye Downs will be torn down?? Castle has bought the Sunline Corporation and eventually will replace some Hawkeye Downs buildings, but not right away.

TAKO 2024: River products May 18 will sponsor the TAKO (Take A Kid Outdoors). The club will help. Marv is taking names. Limit to about 15-20 people.

FIELD TRIPS: The Sheffield post-trip report. Awesome and nobody fell or broke anything.

RAY AND KIM got a nice thank you note from the Boy Scouts where they gave a program. **Bill and Ray** presented another program for elementary students and families.

QUESTION: about Governor Reynolds move to cut the money for AEAs. Karen responded by saying that a number of people have taken retirement.

REVIEW: of summer picnics and tentative places.

ROCK DONATION: Marv went to Waterloo to pick up a donated rock collection. Kim is storing them and now has the awesome task of separating the collection. Lots of Pint's Quarry material. Marv will send a thank you note to the people who donated it.

MOTION TO ADJOURN: 9:40pm by Jay and second by Laura. Meeting adjourned.

Respectfully Submitted.
Dell James, Secretary

HELP NEEDED

A volunteer who regularly attends CVRMS monthly meetings is needed to assume the duties of *Club Hostess*. You will be in charge of recruiting monthly hosts/ hostesses and bringing supplies to the monthly meetings beginning with our September 17 meeting.

CVRMS Board Meeting April 30 — Minutes —

MEETING CALLED TO ORDER: 7:05pm at Marv's House. Board Members Present; Marv, Dale, Sharon, Bill, Dell, Ray, Jay, Matt, and Kim.

MINUTES OF LAST BOARD MEETING: Bill moved to approve; Matt seconded; minutes approved.

TREASURER'S REPORT: Dale presented final accounting from 2024 rock show. Total profit =$13,694. By rule 90+% of profits go to scholarships, University of Iowa Geoscience-$6,000, Cornell College Geology=$4,000, VAST=$2,500. Bill moved to approve, Ray seconded, disbursement approved.

2025 ROCK SHOW THEMES: Suggested themes include Dinosaurs, The Ice Age, Ancient Animals, Artifacts. Themes will be discussed at club meeting then Board will choose.

2024 AUCTION: September 21-22. about 10 consignee contracts still outstanding. About 1250 lots consigned.

TAKO Event: Take a Kid Outdoors May 18, 9:00-11:30 am at Klein Quarry. CVRMS help should arrive ~8:00 am. Deb will bring Ernst Quarry calcite to pass out. Marv will check to see if Deb will allow rock hammers for kids. Member helpers may go into quarry to collect in afternoon.

UV FILTER GLASS: Excess filter material purchased by club for use in club's UV display will be sold at CVRMS auction.

NEW BUSINESS: Requests for outreach programs; Kim has requests from Boy Scout Day Camp and Kinder Care. Bill has June dinosaur program at Springville and July program at Sugarbottom (Corps). **Sunday at the Quarry** will be at the Raymond Quarry on October 6 from 10:00 am—4:00 pm. **Kim will send** Thank-You note to Waterloo rock collection donor. **Bill's Big Bus Boogie 2024** will go to the *Grotto of the Redemption* and *Calkins Nature Center* west of Iowa Falls on a Saturday in early October. **CVRMS members** will be recruited to take some of Sharon's workload for future Rock Shows.

CVRMS FIELD TRIPS: Recent trips include April 14 trip to Sheffield to collect geodes with Matt went well; April 28 trip to Bellevue Sand and Gravel with Kim went very well. **Future trips** will go to Riverside rock and gravel and Linn County Sand and Gravel. Dates not decided.

FACEBOOK ACTIONS: Kim will limit postings on our Facebook page 2 weeks before our rock show so dealers' postings of their offerings will not get buried.

OTHER ITEMS: Members presenting outreach programs will be asked to report information on their presentations on a form that Kim will prepare. **Karen Desmarais** will step down as CVRMS Hostess after our August meeting, Marv will ask for volunteers to replace her at the September Meeting.

MOTION TO ADJOURN: 9:15pm by Ray and second by Jay. Meeting adjourned.

Respectfully Submitted.
Ray Anderson, Acting Secretary

A massive prehistoric salmon had tusk-like teeth that protruded from either side of its snout, a new study finds. Capable of reaching 8.8 feet in length by some estimations, ***Oncorhynchus rastrosus***, a Pacific species, was the largest salmon ever known to live, over double the size of the largest Pacific salmon alive today, the Chinook salmon (*Oncorhynchus tshawytscha*), which typically grows to around three feet long. Scientists initially thought the teeth curved downward like those of a saber-toothed cat, leading the common name of *"saber-toothed salmon"* to be bestowed upon the species. However, a new study published April 24 in the journal *PLOS* One shows that the teeth more resembled a warthog's tusks, projecting sideways, not downward. First described in the 1970s, *O. rastrosus* swam in what are now the waters of the Pacific Northwest. A 2016 paper on *O. rastrosus* reported that fossils date to between 12 and 5 million years ago. *O. rastrosus* is a close relative, but not an ancestor, of modern Pacific salmon, especially the sockeye, according to researchers. Like modern Chinook salmon, *O. rastrosus* would have been born in freshwater rivers and streams but spent the majority of their lives out at sea, returning only to spawn (and likely die). But unlike Chinook salmon, whose diets primarily consist of other fish, these ancient fish were filter feeders that dined on plankton, sucking the microscopic creatures into their mouths through sieve-like gill rakers. By around 4.75 million years ago, *O. rastrosus* had gone extinct. The first fossils were collected in California and Oregon, but they were disarticulated, meaning the teeth had separated from the rest of the skull. With no visual means of identifying the position of the teeth in the skull, investigators, knowing that modern Pacific salmon have downward-facing teeth, inferred *O. rastrosus* did, too. In the 2010s, scientists found evidence that challenged this assumption. During a 2014 expedition to the Gateway Quarry in Jefferson County, Oregon, crew members recovered additional *O. rastrosus* fossils, including the skulls of a male and female believed to have comprised a breeding pair, Claeson said. Both of these skulls differed from the early specimens in a key way: The bones of the jaw were still connected and the sideways orientation of the teeth was visually apparent. While the exact purpose of the teeth is not clear, they may have helped *O. rastrosus* defend against predators, compete with rivals and/or dig nests in the riverbed, according to the study.

Artist impression reveals the salmon's tusks jutting out from its face.

https://www.livescience.com/animals/extinct-species/giant-prehistoric-salmon-had-tusk-like-teeth-just-like-a-warthogs

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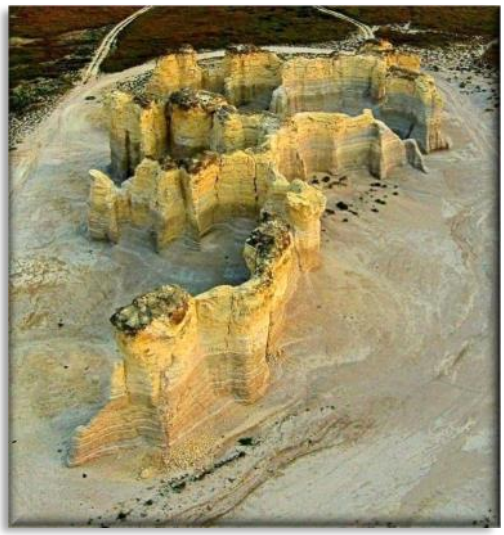
May's birthstone, the emerald, is one of the most regal of all and one which denotes life and love. It is also one of the most valuable (the very highest quality emeralds can be more expensive than diamonds). Emeralds are the deep green variety of the mineral beryl [$Be_3Al_2(Si_6O_{18})$], colored by the element chromium. Emeralds are very hard, 7.5-8 on the Mohs scale. The best emeralds are found in South America, having been cherished by the Inca and Aztec peoples, who regarded emerald as a holy gemstone. In contrast, *"Cleopatra's Mines"* in Egypt had already been exhausted by the ancient Egyptians, so that when they were rediscovered in the 19th century, there was simply nothing left! These are only a few of the cultures which treasured this gemstone. In Roman times, emerald was associated with Venus, goddess of beauty and love. Its pigment was so venerated that Pliny remarked that green *"gladdened the eye without tiring it!"* It is also valued in the Catholic Church, green being considered the most elemental and natural of the colors used in their worship. The Vedas, Hinduism's oldest scriptures, acknowledge the healing powers of emeralds, promoting well-being as well as good fortune. Emeralds are also highly prized in Islam - green was the Prophet Muhammed's favorite color, and all dwellers of paradise are said to be dressed in green. In the 1960s, the

The world's largest uncut emerald

American jewelry industry changed the definition of "emerald" to include the green vanadium-bearing beryl as emerald. As a result, *vanadium emeralds*, purchased as emeralds in the United States, are not recognized as such in the UK and Europe. In America, the distinction between traditional emeralds and the new vanadium kind is often referred to as "*Colombian Emerald.*"

What in the World?



What in the World is this unusual landscape and where in the U.S. is it??

April's Photo

Last month's **What in the World** photograph was a opalized fish jaw from Lightning Ridge in South Australia. The region is famous for opalized fossils, shells, and teeth.

ROCK CALENDAR
CVRMS EVENTS OF INTEREST

2024

May 18 — TAKO Rockin' Rocks & Fossils
River Products Klein Quarry 9:00-11:30

May 21 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
"Solar, Lunar and Other Eclipses; the History, Science and Discoveries Connected to Them"
By Rick Austin

June 18 — CVRMS Monthly Meeting
Picnic at Thomas Park, Marion
Rock Show and Tell and Polishing

July. 16 — CVRMS Monthly Meeting
Picnic at Wanatee Park, Marion
Rock Show and Tell and Geode Cracking

Aug. 20 — CVRMS Monthly Meeting
Picnic at Morgan Creek Park, Marion
Rock Show and Tell and Rock Bingo

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

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)

Oct. 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.

Once again no one came to me last month with a question or suggestion for this month's **"Ask a Geologist"** So again I picked out an article that I thought was interesting and informative and might be of interest to CVRMS members.

Here's the basic science behind New Jersey earthquakes and the Ramapo Fault

by Lucas Frau

That was not your imagination. New Jersey and other areas on the East Coast experienced a **4.8 magnitude earthquake** on Friday (April 5) morning, according to the United States Geological Survey. After Friday's unusual experience, many may wonder what caused the earthquake and how strong it was compared to others in the state or worldwide. Here is what the experts say about the science behind an earthquake.

What causes an earthquake? An earthquake occurs because of slippage between the earth's tectonic plates, according to the U.S. Geological Survey. The edges of the plates, or plate boundaries, are made up of many faults, and most earthquakes occur on these faults. *"Since the edges of the plates are rough, they get stuck while the rest of the plate keeps moving,"* according to the USGS. *"Finally, when the plate has moved far enough, the edges unstick on one of the faults and there is an earthquake."* In New Jersey and elsewhere, earthquakes usually occur "when slowly accumulated strain within the Earth's crust is suddenly released along a fault, according to *"Earthquake Risk in New Jersey,"* a publication of the New Jersey Geological Survey. *"The energy from this movement travels as seismic waves along the ground surface and within the earth,"* the publication says. The earthquake waves are caused by the release of energy as the Earth's plates move, said Dr. Matthew Gorring, an associate professor of Earth and Environment Studies at Montclair State University. The surface where that slippage occurs is called a fault. While there are many faults in New Jersey, the best known is the Ramapo Fault, which runs northeast-southwest in North Jersey. The majority of New Jersey's quakes occurred around this fault area. The Ramapo Fault system runs from southeastern New York to eastern Pennsylvania, according to the earth Institute at Columbia University. *"These faults were active at different times during the evolution of the Appalachians, especially in the Mesozoic when they served as border faults to the Newark Basin and other extensional basins formed by the opening of the Atlantic Ocean approximately 200 million years ago."* In New Jersey, fault lines do not generally break the Earth's surface, but are based several miles below. Earthquakes east of the Rockies are generally less intense than to the west, but because of geologic differences, eastern earthquakes tend to affect areas 10 times larger than western ones of the same magnitude, according to the New Jersey Geological Survey. The location below the earth's surface where the earthquake starts is called the hypocenter and the location directly above it on the surface of the earth is called the epicenter. The epicenter for Friday's earthquake was near Readington in Hunterdon County according to a post on X from Gov. Phil Murphy.

Physiographic provinces of New Jersey and the location of the Ramapo Fault.

How major is a 4.8 earthquake? Earthquakes are recorded using seismographs and magnitude measures the strength of an earthquake. A 4.8 earthquake usually calculates minor to no damage to the surrounding areas. As the magnitude increases by one whole number, the size of the earthquake increases by a factor of 10. So an earthquake that measures a magnitude of 5.0 would result in 10 times more ground shaking than one with a magnitude of 4.0, and about 32 times as much energy would be released. According to a New Jersey Office of Emergency Management report, "*New Jersey is in an area where the rarer plate interior-related earthquakes occur. As plates continue to move and plate boundaries change geologically over time, weakened boundary regions become part of the interiors of the plates. These zones of weakness within the continents can cause earthquakes in response to stresses that originate at the edges of the plate or in the deeper crust."* **Friday's earthquake will go down in the history books in New Jersey as it was the largest in the state in centuries, in fact the largest since 1783**. ***https://www.northjersey.com/story/news/2024/04/05/earthquakes-nj-science-cause-history-ramapo-fault-scale/73217244007/***

Stunning Remains of Great White Shark's Giant Ancestors Reveal a Surprising Diet

The absolutely incredible discovery of several fully articulated shark fossils from the Late Cretaceous, 105 to 72 million years ago, is shedding some much-needed light on the mysterious shark family tree. In the **Lagerstätte fossil beds of Vallecillo** in Mexico, paleontologists have made the find of a lifetime: several exceptionally well-preserved fossils of an extinct genus called ***Ptychodus***. These

fossils preserve not just the sharks' articulated bones, but some of their cartilaginous structures, outlines of their entire bodies, and possibly even organs. These details reveal how the sharks' teeth and vertebrae fit in with the context of their bodies, a new tool for estimating their sizes and where they fit in, phylogenetically. The fossils finally confirm that *Ptychodus* are a type of shark belonging to the **Lamniform family**, which includes great white sharks. *Ptychodus* would have dwarfed modern great whites, reaching up to a whopping 32 feet in length. Though their feeding strategy also couldn't have been more different: their teeth consisted of crushing plates that allowed the animals to feast on the shelled animals that would otherwise be too difficult to eat. *"Our results support the view that lamniforms were ecomorphologically highly diverse and represented the dominant group of sharks in Cretaceous marine ecosystems,"* write a team of paleontologists. "*Ptychodus may have fed predominantly on nektonic hard-shelled prey items such as ammonites and sea turtles rather than on benthic invertebrates, and its extinction during the Campanian, well before the end-Cretaceous crisis, might have been related to competition with emerging blunt-toothed globidensine and prognathodontine mosasaurs."* *Ptychodus* fossils have posed a mystery ever since the first fossils of its grinding teeth were found in England back in 1729. Most of the remains that have been found in the intervening centuries have been teeth and vertebrae, the only parts of a shark's skeleton that are made of bone. The rest, being cartilage, don't tend to survive long enough to be fossilized, leaving a lot up to the imagination. Fragmentary though they are, those few remains found around the world offered enough clues to hint at the animal that left them. There are sharks that adopt a similar feeding strategy today, known as **durophagy,** providing precedence for such a diet. The relative absence of other remains when so many teeth have been found in Late Cretaceous fossil beds confirms it likely had a skeleton of cartilage. And the rare *Ptychodus* vertebrae we do have are consistent with vertebrae found in other sharks. Based only on the sorts of remains sharks usually leave behind, it's impossible to infer with certainty what those sharks looked like. Even our understanding of the famed megalodon is based on a whole lot of educated guesswork. But then we get something like the Vallecillo Lagerstätte. A Lagerstätte is a type of fossil bed that tends to preserve remains incredibly well, including the soft tissues that usually decompose before the fossilization process can take place. Vallecillo Lagerstätte yielded six specimens of *Ptychodus* that are finally revealing the literal shape of this ancient predator. https://www.sciencealert.com/stunning-remains-of-great-white-sharks-giant-ancestors-reveal-a-surprising-diet

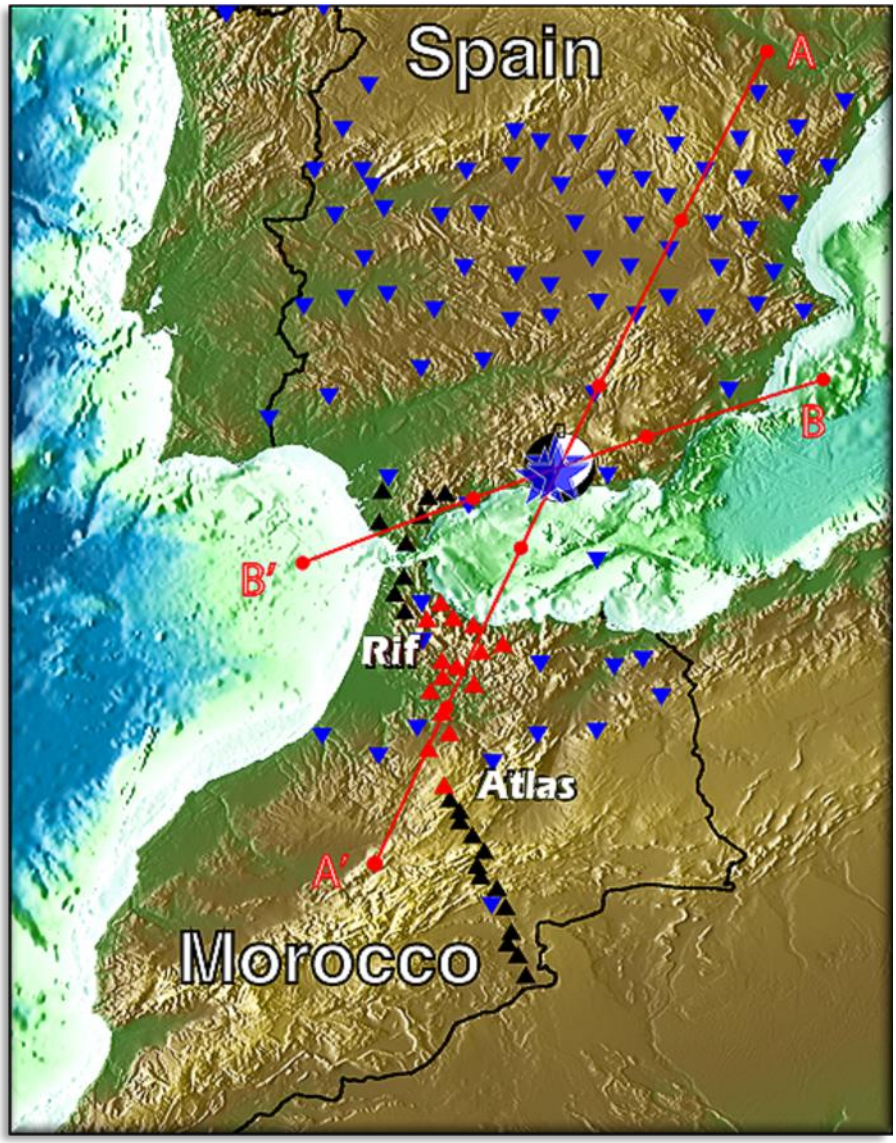
Gigantic Ancient Volcanic Eruption Near Japan Shook The World With a Record Blast

Through a detailed analysis of the **Kikai Caldera** near Kyūshū Island in Japan, scientists think they've confirmed the biggest eruption ever discovered to take place in the Holocene, an epoch that began around 11,700 years ago and continues today. While the volcano has erupted more than once throughout its active history, accurately assessing the size of each blast has been tricky. To determine the size of an event that occurred around 7,300 years ago known as the Kikai-Akahoya (K-Ah) eruption, a team of researchers from Kobe University in Japan combined sediment samples from the seabed with seismic imaging to map out the shape of the caldera and the materials in it, looking for evidence of volcanic ejecta. The team focused on what's called the **pyroclastic flow** of the K-Ah eruption; the intensely hot funnels of ash, rock, and gas that would've powered through the water all those millennia ago. As you might imagine, this flow is hard to model underwater, especially so far into the past. However, water does do a good job of preserving this ejecta. The instruments used by the researchers

were able to look deep below the seafloor, comparing different types of material in terms of where they originated and where they ended up. The team found the material ejected by the eruption would've covered around 1,737 square miles, an area several times bigger than large metropolitan cities like London or Los Angeles. Sending hundreds of cubic miles of rock and dust scattering, **it is by some distance the largest volcanic eruption of the Holocene ever measured.** Even the 1883 eruption of Krakatoa, which was heard around the world, blasted a mere dozen square miles of material into the stratosphere. *"By using seismic reflection surveys optimized for this target and by identifying the collected sediments, we were able to obtain important information on the distribution, volume, and transport mechanisms of the ejecta,"* says Satoshi Shimizu, a marine geophysicist at Kobe University. The research should give experts a better idea of how volcanic eruptions pass through water in the future, all of which helps in volcano modeling. The more we understand past eruptions, the more accurately we can predict future ones. Although we've seen some major eruptions in living memory, they're nothing like the super eruptions of the past, and considering the damage that one of them could do, it's something we need to be ready for. https://www.sciencealert.com/ancient-volcanic-eruption-near-japan-shook-the-world-with-a-record-blast

Earth's Crust Flipped Upside Down After 'Nosediving' Beneath The Mediterranean

As Africa and Eurasia slowly collide, Earth's rumblings paint a seismographic picture of what once was a piece of our planet's surface now lying upside down deep beneath the Mediterranean. Spain's unusually prone to rare, deep earthquakes, and a new study suggests this capsized tectonic slab might have something to do with it. *"Since 1954, there have been five closely located large deep-focus earthquakes with depths greater than 375 miles beneath [the Spanish city of] Granada,"* explain geologists Daoyuan Sun from the University of Science and Technology of China and Meghan Miller from Australian National University. Earthquakes at such depths are usually followed by significant aftershocks. But when Sun and Miller examined seismic data from Spain's 2010 earthquake, there were no aftershocks to be seen. When tectonic plates push into each other, they're often displaced so one slides beneath the other in a process called subduction. Sometimes these collisions destroy the sinking part of the plate, raising the crust to create mountains and interlocking the two plates' fates as one. Other times the wrestling crusts will remain separate but stacked, with one slab gradually sinking further towards Earth's mantle. This is what's happening at the border between the African and Eurasian plates, where the Mediterranean floor is gradually sinking beneath Europe. A subducted slab forms hydrous magnesium silicates in its uppermost layers when they're exposed to ocean water. As the slab sinks, these silicates dehydrate and become more brittle, becoming more prone to earthquakes and slowing seismic waves in a way that can be detected by seismologists. The seismic waves during the 2010 Granada earthquake lasted unusually long and had a late extra phase of activity. This could be explained by the seismic waves moving slower at the bottom of the Alboran slab instead of the top. *"A significant amount of water has been carried down to the mantle transition zone, indicating a relatively cold slab,"* explains Sun. *"Considering a relatively young seafloor age in the western Mediterranean, for the slab to remain cool, the subduction speed must be quite fast, such as a moderate speed of about 2.8 inches per year."* It seems the rapid speed of slab sinking helped this part of Earth's crust to flip over, taking a pocket of water with it. This slab rollback process occurs when gravity helps pull the slab into a vertical downward rotation, like a nosedive. The new study goes a step further by concluding it has completely overturned, landing silicate-side-down in a way that could explain the strange complexity of the region's tectonic structures and occasional earthquakes greater than 375 miles deep. *"[This] confirms that the slab beneath the Betics of southern Spain is a subducted oceanic lithosphere,"* the team writes, explaining this process formed the Beltic-Rif (or Gibraltar) arc that shapes the western Mediterranean.



Triangles mark seismic stations across Spain and Morocco, red indicate those used to study the strange slab.

https://www.sciencealert.com/earths-crust-flipped-upside-down-after-nosediving-beneath-the-mediterranean

The Megalodon Was Less Mega than Previously Believed

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***, a team of 26 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."* 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* [was] *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

New Pieces in the Puzzle of First Life on Earth

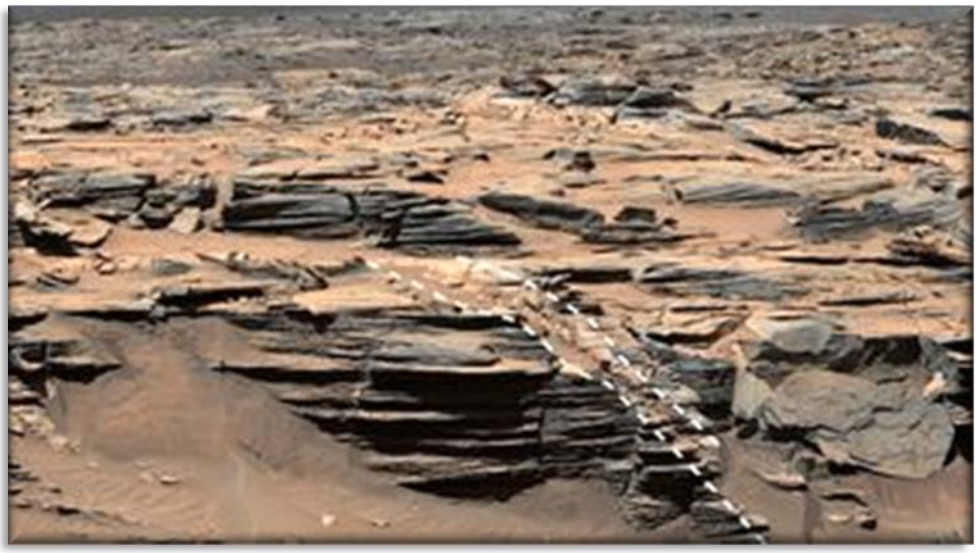
Microorganisms were the first forms of life on our planet. The clues are written in 3**.5 billion-year-old rocks** by geochemical and morphological traces, such as chemical compounds or structures that these organisms left behind. However, it is still not clear when and where life originated on Earth and when a diversity of species developed in these early microbial communities. Evidence is scarce and often disputed. Now, researchers led by the University of Göttingen and Linnæus University in Sweden have uncovered key findings about the earliest forms of life. In **rock samples from South Africa**, they found evidence dating to around **3.42 billion years ago** of an unprecedentedly diverse carbon cycle involving various microorganisms. This research shows that complex microbial communities already existed in the ecosystems during the Palaeoarchaean period. The results were published in the journal *Precambrian* ***Research.*** The researchers analysed well-preserved particles of carbonaceous matter, the altered remains of living organisms -- and the corresponding rock layers from samples of the Barberton greenstone belt, a mountain range in South Africa whose rocks are among the oldest on the Earth's surface. The scientists combined macro and micro analyses to clearly identify original biological traces and distinguish them from later contamination. They identified geochemical *"fingerprints"* of various microorganisms, including those that must have used sunlight for energy, metabolized sulphate and probably also produced methane. The researchers determined the respective role of the microorganisms in the carbon cycle of the ecosystem at the time by combining geochemical data with findings on the texture of the rocks obtained from thin section analysis with a microscope. *"By discovering carbonaceous matter in primary pyrite crystals and analysing carbon and sulphur isotopes in these materials, we were able to distinguish individual microbial metabolic processes,"* explains the senior author of the study, Dr Henrik Drake from Linnæus University. First author Dr Manuel Reinhardt, from Göttingen University's Geosciences Centre, adds*: "We didn't expect to find traces of so many microbial metabolic processes. It was like the proverbial search for a needle in a haystack."* The study provides a rare glimpse into the Earth's early ecosystems. *"Our findings significantly advance the understanding of ancient microbial ecosystems and open up new avenues for research in the field of palaeobiology."*

A drill core sample from the Barberton greenstone belt used in the study. The dark layers contain carbonaceous matter, the altered remains from Palaeoarchaean microorganisms.

https://www.sciencedaily.com/releases/2024/01/240124132716.htm

Mars Crater is 'Chock-Full' of Opal Gemstones, Hinting at Widespread Water and Possible Microbial Life

An ancient, dried-up lake bed on Mars may be teeming with **opal gemstones,** new data from NASA's Mars Curiosity rover suggests. Beyond giving the cracked surface of Mars' **Gale Crater** a semiprecious glint, these opals could be evidence that water and rock have been interacting beneath the Martian surface much more recently than was previously thought, improving the prospects that microbial life once lived there, according to a study published Dec. 19 in the *Journal of Geophysical Research: Planets*. Scientists often focus on water when searching for signs of extraterrestrial life because it's critical for life as we know it. But because water no longer flows on Mars, scientists must hunt for geological signs of the water that once existed there. These signs are present in the Red Planet's rocks and soil, where certain minerals and structures form only where rock and water have interacted. Researchers spotted one such sign in the past few years around fractures in the Martian surface. Surrounding some of these fractures are *"halos"* of lighter-colored rock, which researchers found are likely rich in opal. For opal to form, silica-rich rocks must interact with water. Now, researchers have dug into the Curiosity rover's vast archive of images and found that these opal-rich halos aren't isolated. Rather, they appear to exist all over Gale Crater, a 96-mile-wide ancient lake bed that Curiosity has explored since its mission began in 2012. *"Our new analysis of archival data showed striking similarity between all of the fracture halos we've observed much later in the mission,"* lead study author Travis Gabriel, a research physicist at the U.S. Geological Survey, said in a statement. *"Seeing that these fracture networks were so widespread and likely chock-full of opal was incredible."* Gabriel and his colleagues were studying old images from Curiosity's traverse around Gale Crater and noticed, in an image taken much earlier in the mission, a light halo of rock surrounding a fracture. That halo looked almost exactly like halos found more recently. Data from **Curiosity's ChemCam instrument,** which analyzes rocks using images and spectrometry, showed that those recently studied light rocks likely contained silica-rich opals. To confirm the chemistry of those rocks, Gabriel's team ran an additional analysis on another set of fracture halos in a different location within the crater called the Lubango drill site. Here, the team used Curiosity's Dynamic Albedo of Neutrons (DAN) instrument, which measures neutrons that are knocked off the Martian surface by cosmic rays, high-energy particles from outside the solar system that constantly bombard Mars. These bouncing neutrons slow down in the presence of hydrogen, which is one of the main components of water. When DAN detects a higher proportion of slow-moving neutrons, that means there's more water-bearing rocks (like opal) in a given area. At the Lubango site, the DAN results confirmed that the lighter-colored halos on the ground do indeed contain opal, just like other sites around Gale Crater. This data, along with the pictures of fracture halos from much earlier in the mission, tell researchers that water must have existed all over Gale Crater in more recent history. *"Given the widespread fracture networks discovered in Gale Crater, it's reasonable to expect that these potentially habitable subsurface conditions extended to many other regions of Gale Crater as well, and perhaps in other regions of Mars,"* Gabriel said. *"These environments would have formed long after the ancient lakes in Gale Crater dried up."* This new realization that water must have survived in Gale Crater long after the lake evaporated means that life could have held on there a bit longer, the researchers said, possibly even into Mars' modern geological period, which began 2.9 billion years ago. (Mars is thought to be approximately 4.6 billion years old.) These results add to a mountain of evidence that water was once widespread on Mars. To better understand the planet's watery past, the study authors propose the opal-rich fractures in Gale Crater as a new destination for collecting geological samples or for potential human exploration missions.

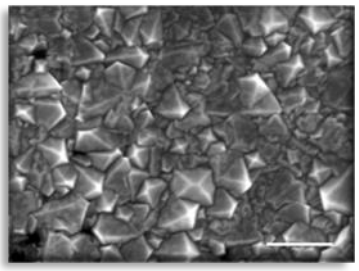


Light-toned fracture halos as seen crosscutting the bedrock extend into the subsurface. These fracture networks would have served as safe havens from harsh surface conditions in a modern period on Mars.

https://www.livescience.com/mars-opal-gemstone-crater

Forget Billions of Years: Scientists Have Grown Diamonds in Just 150 Minutes

Natural diamonds take billions of years to form in the extreme pressures and temperatures deep underground. Synthetic forms can be produced far quicker, but they typically still require some intense squishing for up to several weeks. A new method based on a mix of liquid metals can pop out an artificial diamond in a matter of minutes, without the need for a giant squeeze. While high temperatures were still required, in the region of 1,877°F, a continuous diamond film was formed in 150 minutes, and at 1 atm (or standard atmosphere unit). That's the equivalent of the pressure we feel at sea level, and tens of thousands of times less than the pressure normally required. The South Korea research team behind the innovative approach is confident that the process can be scaled up to make a significant difference in the production of synthetic diamonds. Dissolving carbon into liquid metal for the manufacture of diamond isn't entirely new. General Electric developed a process half a century ago using molten iron sulfide, for example. But these processes still required pressures of 5–6 gigapascals and a diamond *'seed'* for the carbon to cling to. The reduction in pressure was achieved using a carefully mixed blend of liquid metals: gallium, iron, nickel, and silicon. A custom-made vacuum system was built inside a graphite casing to very rapidly heat and then cool the metal while it was exposed to a combination of methane and hydrogen. These conditions cause carbon atoms from the methane to spread into the melted metal, acting as seeds for the diamonds. After just 15 minutes, small fragments of diamond crystals extruded from the liquid metal just beneath the surface, while two-and-a-half hours of exposure produced a continuous diamond film. Though the concentration of carbon forming the crystals decreased at a depth of just a few hundred nanometers, the researchers expect the process can be improved with a few tweaks. Those modifications are going to take time, and research into this process is still at its very early stages, but the authors of the new study think that it has plenty of potential, and that other liquid metals could be incorporated to get similar or even better results. The process currently used to create most synthetic diamonds, used for a wide variety of industrial processes, electronics, and even quantum computers, takes several days and needs a lot more pressure. If this new technique fulfills its potential, making diamonds is going to become a lot faster and a lot easier. *"The general approach of using liquid metals could accelerate and advance the growth of diamonds on a variety of surfaces, and perhaps facilitate the growth of diamond on small diamond (seed) particles,"* write the researchers. https://www.sciencealert.com/forget-billions-of-years-scientists-have-grown-diamonds-in-just-150-minutes



Scanning electron micrograph of a diamond film grown in liquid metal

What is Andalusite?

Andalusite is an aluminosilicate mineral with a chemical composition of **Al_2SiO_5.** It forms at low to medium metamorphic temperatures and pressures where argillaceous rocks (such as shale) are exposed to regional and contact metamorphism. Exceptional crystals of andalusite are valued by mineral collectors.

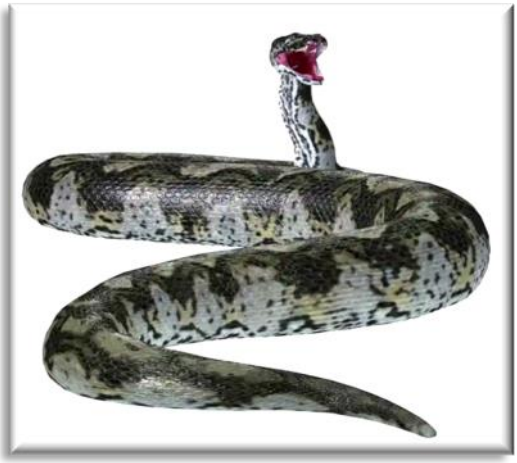
Andalusite is a strongly pleochroic gem. "Pleochroic" means that it can display different colors when viewed from different directions. Expert cutters working with excellent specimens can produce faceted stones that display both of a specimen's pleochroic colors in the face-up position.

Specimens with spectacular color and clarity are cut into gemstones. Transparent specimens of andalusite are often strongly pleochroic. This makes them have different apparent colors when viewed from different directions. This pleochroic effect allows andalusite to be cut into unique gemstones. Although twinning is not common in andalusite, nicely crystallized specimens that possess twinning can be distinctive. Twinning can produce cross-shaped structures perpendicular to the crystallographic c-axis, similar to what is shown in the rock in the accompanying photo below. **Chiastolite** is a variety of andalusite that contains black particles of graphite arranged in geometric patterns. The graphite is pushed aside by crystal growth within a rock that is being metamorphosed. As growth occurs, the particles become concentrated at crystal interfaces. The result can be a cross-shaped pattern within the mineral - similar to the *"cross-stone"* shown in the accompanying photo. People have known about these cross stones for centuries and have valued them for their perceived religious or spiritual meaning. Attractive specimens are often cut and polished for use as amulets, charms, and novelty gems. Andalusite has a number of useful physical properties. It has the ability to withstand high temperatures without alteration. For that reason it is used to make high-temperature ceramics and refractories. The white porcelain of some spark plugs is made using andalusite. Andalusite is one of a small number of minerals that commonly forms prismatic crystals with a square cross-section. This can be important information for identification in the field.
https://geology.com/minerals/andalusite.shtml

A cabochon cut from the chiastolite variety of andalusite

Enormous Snake in Ancient India Was Longer Than a School Bus

Another day in science, another massive, ancient snake discovery. Paleontologists in India have unearthed fossilized vertebrae from a snake that slithered around the sub-continent about 47 million years ago and may have grown as long as nearly 50 feet. The newly discovered, extinct species is named ***Vasuki inidicus***, after the mythical serpent coiled around the neck of the Hindu god Shiva, and is described for the first time in a study published April 18 in the journal *Scientific Reports*. Beyond reptiles, the fossil find carries broader clues to India's climate tens of millions of years ago. *"It's also just a cool snake because it was so big,"* they say, comparing its length to longer than that of a yellow school bus. Sunil Bajpai, co-author of the study, first discovered the fossilized snake remains in 2005 at a coal mine in western India. Over the course of a slow and careful excavation, 27 vertebrae, all likely to be from the same individual, were uncovered. By analyzing the size ratios of various parts of the vertebrae and the fossil's unique shapes and protrusions, Bajpai and his co-researcher established the remains were that of a new species in the extinct family of **Madtsoiidae,** which were primitive snakes similar to boas and pythons. The fist-sized fossils are second only in girth and width to those of *Tintanoboa*, another giant snake estimated to have lived about 58 million years ago in what is now present-day Colombia. Based on the age of the rock the newly described vertebrae were found in, the researchers date *Vasuki* to about 47 million years ago, just a few million years after the Indian tectonic plate began colliding with Eurasia. According to the new study, the timing supports the idea that Madtsoiids originated in India, and later moved to North Africa and southern Eurasia, where other, later fossil specimens have been found. It's a challenge to accurately deduce total species body size from a single individual's incomplete skeleton. But using model equations incorporating data on current, living snakes and the known fossil record, Bajpai and his colleague, Debajit Datta–another vertebrate paleontologist at the same institution, estimate that *V. indicus* was somewhere between about 36 and and 49.9 feet long. The only known snake of comparable size was *Titanoboa*, currently the record-holder for the largest snake to have ever lived. *Titanoboa* clocked in at an estimated 35 to 50 feet long, with the mean estimate around 42 feet in length. The relative vertebrate sizes indicate that *Titanoboa* was a heavier, thicker-bodied snake than *V. indicus,* yet it's impossible to know exactly which snake species would've won the measuring contest. *"Based on the data at hand Vasuki was only slightly smaller in length than Titanoboa,"* Bajpai and Datta write. *"However, we cannot entirely rule out the possibility of Vasuki being slightly larger than Titanoboa, because the fossil vertebrae in our collection may not have come from the largest individual of Vasuki. The same, however, can also be said for Titanoboa. Since neither of these snakes are known from complete skeletons, we cannot say with certainty whether one was longer or wider than the other."* Exact size estimates are liable to change as more fossils are found and more analysis is done. *"Everything shrinks when the tape measure comes out,"* says Alexandra Howard, a paleobiologist and herpetologist at Texas A&M University who was not involved in the new research. *"The past was full of giant snakes. That's really cool,"* she says. And, either way, second place in size isn't so bad, especially when you're separated from your closest competitor by about 10 million years. *Vasuki* was probably a slow-slithering ambush predator that constricted its prey like a python, according to Bajpai and Datta. Based on morphology and the location it was found in, the researchers believe the monstrous snake was either terrestrial or semi-aquatic–living in marsh or coastal swamp. It was found in rock that also contains fossils of rays, sharks, bony fish, turtles, crocodiles, and primitive whales, Bajpai and Datta note–though what it ate is unclear. Beyond its massive size, the new paleontological discovery is notable for what it can tell us about our planet 47-50 million years ago. *"It's an important discovery because it shows us another example of extreme gigantism in snakes… and because you can use snakes as a thermometer to reconstruct climates of the past,"* says one of the primary researchers involved in discovering *Titanoboa*. We know from geological and paleontological research that the time period, part of the Eocene Epoch, was warm, but *Vasuki* offers another data point indicating exactly what the climate may have been like where it was found. Snakes are ectotherms (commonly known as "*cold-blooded*"), so their body temperature and size is closely linked with the ambient temperature. The larger a snake is, the slower its metabolic rate, and so the warmer the climate must be for it to survive, Head explains. Estimates from modeling equations indicate that *Vasuki*'s habitat averaged around 82.4 degrees Fahrenheit, which is slightly warmer than the average annual temperature in the same region today. The ancient climate data can aid in understanding the present and where we're headed under current climate change, says Head. *"Those are the hottest latitudes and the hottest intervals, that's going to tell us a lot about what those places might be like in the future."* As paleontologists continue to dig into the past, predictions of the future may become clearer. And also, massive, ancient snakes are liable to keep appearing. *"We understand so little about the past diversity of life on Earth," Head notes. "I think there are probably more giant snakes to come."* https://www.popsci.com/environment/giant-snake-india-fossil/



Titanoboa snake tail. This predatory carnivorous Titanoboa snake lived during the Paleocene Period of Columbia, South America

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Next Meeting:
TUESDAY MAY 21
Hiawatha Community Center
"Solar, Lunar, and Other Eclipses; the History, Science and Discoveries Connected to Them"
by Rick Austin
Cedar Valley Rocks and Minerals Society

CEDAR VALLEY GEMS MAY 2024 VOL. 50, ISSUE 5

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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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