

# Cedar Valley Gems



Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

[cedarvalleyrockclub.org](http://cedarvalleyrockclub.org)

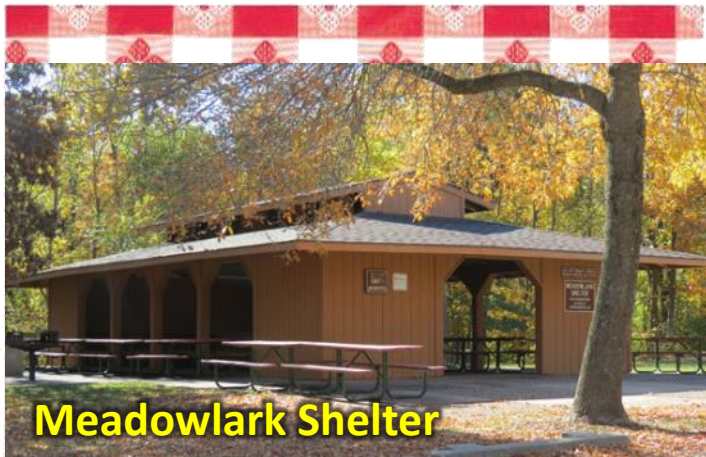
CEDAR VALLEY GEMS

JULY 2021

VOL. 47, ISSUE 07

Ray Anderson, Editor: [rockdoc.anderson@gmail.com](mailto:rockdoc.anderson@gmail.com)

**Next CVRMS Meeting**  
**Tues. July 20**  
**6:00 pm**  
**Picnic!**



**Meadowlark Shelter**

**Wanatee Park**  
**(formerly Squaw Creek Park)**

**Geode Splitting**

**• We are returning to**  
**a POT LUCK dinner**  
**this Month : so**

**• Bring Plates, Silverware**  
**and Your Best Dish to Share**



The 98-million-year-old remains of what might be the largest animal to walk Earth, a long-necked **titanosaur dinosaur**, were recently unearthed in Argentina. The remains of the unnamed dinosaur were first discovered in 2012 in Neuquén Province of northwest Patagonia, but have still not been fully excavated.



**left**-Titanosaur at the excavation site in Neuquén province, Argentina. **below**-an artist's impression of *Argentinosaurus huinculensis*, believed to be one of the closest related species to the newly discovered titanosaur.



However, the bones that have been unearthed so far suggest the ancient behemoth was likely a titanosaur, possibly the largest one on record. Titanosaurs were amongst the largest sauropods, long-necked, plant-eating giant dinos, and lived from the late Jurassic period (163.5 million to 145 million years ago) to the end of the Cretaceous period (145 million to 66 million years ago). "Given the measurements of the new skeleton, it looks likely that this is a contender for one of the largest, if not the largest, sauropods that have ever been found," said Paul Barrett, a paleobiologist at the Natural History Museum in London. Not enough of the remains have been uncovered for the researchers to declare this dinosaur as a new species or assign it to an already known one. However, the researchers are confident that once the excavation is complete, they'll be able to classify it as a completely new species. The remains themselves date to about 98 million years ago, meaning the creature lived during the Cretaceous period. Right now, the researchers can't say how large the new titanosaur was. However, analyses of the bones that have been found, including 24 vertebrae of the tail and parts of the pelvic and pectoral girdle, show that it was most likely larger than the largest known titanosaur, the *Patagotitan*, which was roughly 50 feet tall and weighed 69 tons, which is equal to nearly a dozen Asian elephants.

<https://www.livescience.com/largest-dinosaur-discovered-in-argentina.html>



Some 10 million years ago, the **Paratethys Sea megalake** (the largest lake in Earth's history) covered an area greater than the size of today's Mediterranean Sea. On a modern map, it would stretch from the Alps above Italy to Kazakhstan in central Asia.



Location map of the ancient Paratethys megalake.

Until now, little has been known about the ebb and flow of the Paratethys Sea during its lifetime, but a new study identifies four cataclysmic, climate-driven cycles that shrank the lake and most likely killed off a significant number of the species living within it. The aquatic life in the Paratethys Sea was unique, home to everything from mollusks and crustaceans to small whales and dolphins that evolved to suit their restricted environment. As water levels dropped and salt levels rose, however, very few of these creatures would have survived, the researchers say. The most severe dip was the last one recorded, between 7.65 million and 7.9 million years ago, previously named the Great Khersonian Drying. During this episode, Paratethys Sea water levels plummeted by as much as 820 feet, separating the megalake into mini lakes that at times would likely have been toxic to most aquatic life. According to the scientists' calculations, the megalake could have lost up to 70 percent of its surface area and up to a third of its volume during these dry periods. At its peak in terms of capacity, it would've covered an area of some 2.8 million square kilometers (over a million square miles), holding more than 10 times the amount of water that's found in lakes on the planet today. Temperature and precipitation shifts across Eurasia were also affecting changes on land, with open environments replacing forest environments, and types of woodland changing. How these evolutions fed into and affected each other is yet to be fully figured out. Created from tectonic shifts and the rise of central European mountains, the Paratethys Sea would have survived for around 5 million years in total, the geological record shows, before alterations in the landscape meant it drained away into the Mediterranean. The wider impacts and implications of these hydrological crises, in particular beyond the Paratethys area, are still poorly understood. <https://www.sciencealert.com/new-study-charts-the-rise-and-fall-of-eurasia-s-ancient-megalake>

## CVRMS Board Minutes June. 21

**MEETING CALLED TO ORDER:** 7:12 by Marv at his home.

Members present: Mav Houg, Dale Stout, Kim Kleckner, Bill Desmarais, Jay Vavra, Sharon Sonnleitner, Ray Anderson.

**MINUTES REVIEWED AS PUBLISHED:** Motion to accept by Bill, 2<sup>nd</sup> by Dale. Minutes approved as published.

**AUCTION:** Discussion of consignees. Marv says we can take a few more lots. Jay to contact Sandy Brandl about additional lots. If "no" then will contact Jim Baumer.

- Several contracts outstanding.
- Kalona food truck Saturday only. Sunday take orders for Casey's; we will provide chips, cookies, soda, water, & coffee.
- Gil Norris has books, rocks, & rock equipment to pick up.

**2021 SHOW:** Review of dealers, advertising, catered dinner, and programs. Ray will send Board posters file for review.

- 2022 Show theme discussed; "Iowa's Industrial Minerals"

**FUTURE MEETINGS:** will be in person at Hiawatha Community center beginning in September.

**PICNICS:** future picnics Potluck. July at Wanatee Park (formerly Squaw Creek Park)-geode cracking; August at Morgan Creek Park-bingo.

**T.A.K.O:** Oct. 2 at Klein Quarry

**MISC:** Ray will work on design for rock layout for River Products display cabinet. **Field trips**-discussion of possible future trips, more to come. **Crinoid State Fossil**-nothing heard so apparently failed in Legislature.

**8:18 p.m. Motion to adjourn** by Bill, 2<sup>nd</sup> by Jay, unanimous vote, meeting adjourned.

Respectfully submitted

*Ray Anderson*, Acting Secretary



## Spectacular Neon Blue Lava Pours From Indonesia's Kawah Ijen Volcano At Night

You've heard of "red hot" and "white hot" to describe searing temperatures. But what about "blue hot"?



That's the surreal hue of Indonesia's **Kawah Ijen Volcano**, which glows with an otherworldly "blue lava" at night. The mountain contains large amounts of pure sulfur, which emits an icy violet color as it burns, turning the rocky slopes into a hot (at least 239 degrees Fahrenheit), highly toxic environment.



Despite the dangers, photographer Olivier Grunewald captured the scene, along with a group of men who toil on the volcano at night, battling noxious gases to mine sulfur from the crater and carry it out by hand. Miners carry between 176 and 220 pounds of sulfur chunks per trip and sell the pieces for around 2.5 cents per pound. Yahoo reports they average two loads every 24 hours, thereby doubling their salaries amid sulfurous flames that can reach 16 feet high. <http://www.geologyin.com/2014/06/spectacular-neon-blue-lava-pours-from.html>

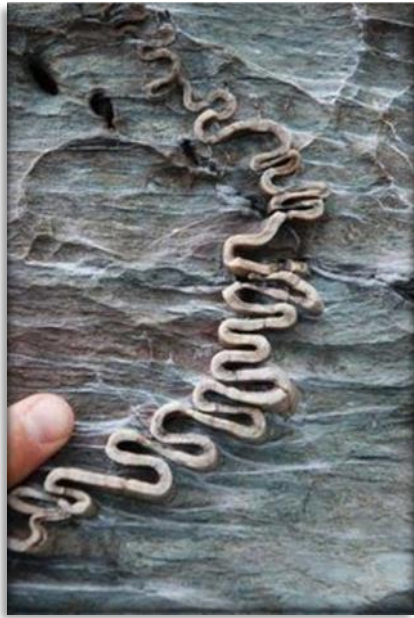
## Spotlight Gemstone: Ruby

*July's Birth Stone*



Ruby ( $\text{Al}_2\text{O}_3:\text{Cr}$ ) is the most valuable variety of the corundum mineral species, which also includes sapphires. Rubies can command the highest per-carat price of any colored stone. This makes ruby one of the most important gems in the colored stone market. In its purest form, the mineral corundum is colorless. Trace elements that become part of the mineral's crystal structure cause variations in its color. Chromium is the trace element that causes ruby's red, which ranges from an orangey red to a purplish red. The strength of ruby's red depends on how much chromium is present—the more chromium, the stronger the red color. Chromium can also cause fluorescence, which adds to the intensity of the red color. The most renowned rubies, like those from Myanmar, the Himalayas, and northern Vietnam, typically form in marble. They're found in layers that are distributed irregularly within the surrounding marble. Marble forms as part of the metamorphic (rock-altering) process, when heat and pressure from mountain formation act on existing limestone deposits. Marble has low iron content, so the rubies that originate in marble (called "marble-hosted" by gemologists) lack iron. Because of this, many have an intense red color. In addition, rubies found in marble typically fluoresce red under ultraviolet light—even the ultraviolet light in sunlight. Fluorescence can make a ruby's color even more intense and increase its value. In other locations, rubies can be found in basalt rocks. Rubies from these sources can have higher iron content, which can make the rubies darker and less intense in color. Higher iron content in the chemical makeup of a ruby can also mask the red fluorescence, eliminating that extra glow of red color seen in marble-hosted rubies. Historically, rubies have also been mined in Thailand, in the Pailin and Samlout District of Cambodia, as well as in Afghanistan, Australia, Brazil, Colombia, India, Namibia, Japan, and Scotland; after the Second World War ruby deposits were found in Madagascar, Nepal, Pakistan, Tajikistan, Tanzania, and Vietnam. The Republic of North Macedonia is the only country in mainland Europe to have naturally occurring rubies. They can mainly be found around the city of Prilep. Macedonian rubies have a unique raspberry color. The ruby is also included on the Macedonian coat of arms. A few rubies have been found in the U.S. states of Montana, North Carolina, South Carolina and Wyoming.

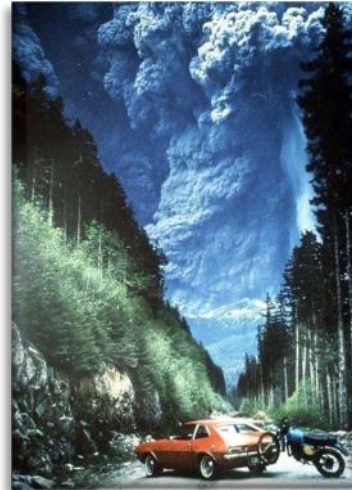
# What in the World?



**What in the World?**  
Is this unusual geologic feature and how did it form??

# June's Photo

June's **What in the World** photo was a classic image of the erupting Mount St. Helens that has been published and viewed widely over the years since the billowing plume dumped untold tons of powdered volcanic ash over a dozen states. The photo of the May 18, 1980, eruption was posted , on



Facebook by Michael S. Keys, whose good friend took the photo of the erupting volcano with his car and hitched motorcycle in the foreground. The major volcanic eruption in southwest Washington, blew away the peak's top 1,300 feet instantly, producing a near-supersonic lateral blast. The collateral damage took the form of shockwaves and pyroclastic flows that flattened forests and sent melted snow and ice rushing off the mountain as massive mudflows.

## ROCK CALENDAR CVRMS EVENTS OF INTEREST

### 2021

**July 2 — Central Iowa Mineral Society**  
MONTHLY VIRTUAL MEETING - 7:15pm  
speaker and topic to be announced

**July 13 — Blackhawk Gem & Min. Soc.**  
MONTHLY VIRTUAL MEETING - 7:15pm  
speaker and topic to be announced

**July 20 — CVRMS Monthly Meeting**  
July Picnic - 6:00 pm  
Wanatee Park Meadowlark Shelter  
"Geode Cracking"  
More details on Page 1

**July 26 — 3 Rock Clubs Monthly Program**  
Virtual - 7:15 pm  
<https://us02web.zoom.us/j/89524404665>  
The History of the "Grand Canyon" of the Des Moines River; The Saylorville Gorge

**Sept 18-19— CVRMS Auction**  
Amana RV Park and Event Center  
Amana, Iowa  
more details to follow

**Sept. 24-26 — Geode Fest**  
First Christian Church Parking Lot  
3476 Main Street  
Keokuk, Iowa  
[http://www.keokukiowatourism.org/event\\_calendar/geode\\_fest/index.php](http://www.keokukiowatourism.org/event_calendar/geode_fest/index.php)

**Oct. 22-24 — MAPS 2021 Fossil Expo**  
Illinois State Fair Grounds  
Springfield, Illinois  
[http://www.midamericapaleo.org/content/news/2021\\_Jan\\_Prelim\\_Announce.pdf](http://www.midamericapaleo.org/content/news/2021_Jan_Prelim_Announce.pdf)

**Nov. 6-7 — CVRMS Rks, Fos, & Min Show**  
Hawkeye Downs  
Cedar Rapids, Iowa  
more details to follow

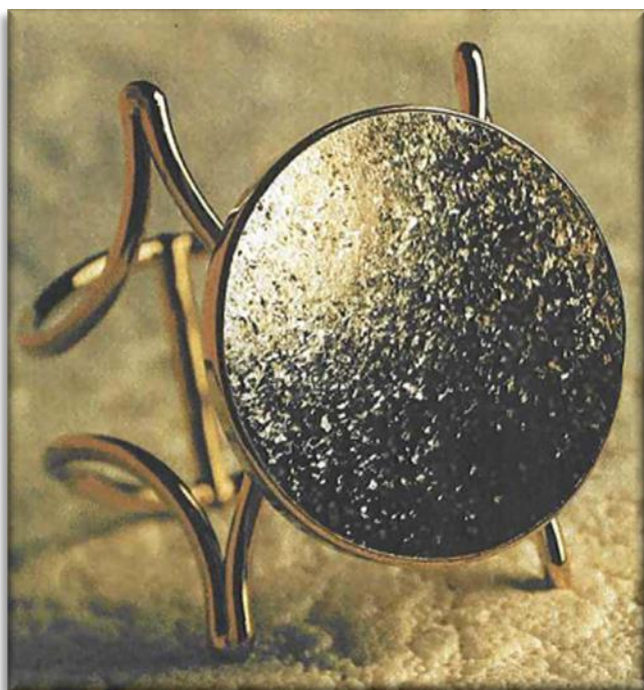
## Ask a Geologist by Ray Anderson aka "Rock Doc", CVRMS Vice President

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](mailto: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.

### WHAT THE HECK IS SPANGOLD??

The other day I was doing a little research about gold alloys and I ran across the word "*spangold*." I had never heard of spangold, so I looked into the word. I found the story very interesting and thought I might share it. Spangold is an alloy of gold that gets its name from its *spangled* surface texture. Spangold is an alloy of gold, copper, and *aluminum*. **I didn't know that gold alloyed with aluminum.** Spangolds are a relatively recent discovery, a family of gold alloys formulated to undergo a phase transformation with effects that are especially prized by jewelry manufacturers. Its unusual appearance is created by inducing a surface *martensitic-type*

*phase transformation* to take place, which disperses light, producing a unique texture (**Figure 1**). When heated, spangold alloys (in 18 and 23 carat gold) give rise to a multicolored spangled surface which is shown to produce the best aesthetic effect on large flat or curved surfaces. This spangle arises from a rumpling of the surface caused by a change in crystal structure, but the effect is due to more than a simple surface reaction. It goes throughout the bulk alloy and is a reversible effect. Available in yellow and pink shades in both wrought and cast forms, it offers an exciting new effect that cannot be simulated by conventional treatments to the jewelry surface. **Figure 2** shows a highly magnified picture of the effect—an array of needle-shaped surface rumples that give the spangle effect. As a relatively new finding, this kind of material is only now being taken up by designers and manufacturers, albeit in a limited way. Spangold is a  $\beta$ -phase alloy with a nominal stoichiometry of  $Au_7Cu_5Al_4$  and a nominal composition of 76% Au, 19% Cu, 5% Al by mass.  $Au_7Cu_5Al_4$  alloy is a decoration alloy, which shows fine surface corrugation (*spangles*) at room temperature, hence its name, "*Spangold*". This formulation of spangold is the yellow gold variety with its unique spangling effect. Alternative "*recipes*" involve a slight reduction to copper and a slight increase in the amount of aluminum added, which results in a pinkish-hued spangold. Any change in the composition of the metal, so long as the aluminum is left intact will result in different hues, without compromising the unique sparkling effect that is elicited due to the presence of aluminum in the alloy. Despite the special characteristics of spangold, its use in jewelry is still somewhat limited, with pieces of spangold used by themselves or as settings for precious gemstones. Because spangold is unique, it is usually preferred as settings for valuable stones. Nowadays, specialized markets have the option for a customized creation of spangold jewelry, although it has not yet experienced general exposure in the wider market. Despite this, some rare examples do exist, albeit at a very hefty price.



**Figure 1:** A spangold tension bracelet, finished with yellow gold



**Figure 2:** Microstructure of  $Au_7Cu_5Al_4$  alloy

If you are interested in more information on spangold, see a publication by Wolff & Cortie, 1994, *The Development Of Spangold*; it can be viewed at [file:///G:/Working%20Files/Projects/Cedar%20Valley%20Rocks%20and%20Mineral%20Society/Society%20Newsletter/62%20July%202021/info/Wolff-Cortie1994\\_Article\\_TheDevelopmentOfSpangold.pdf](file:///G:/Working%20Files/Projects/Cedar%20Valley%20Rocks%20and%20Mineral%20Society/Society%20Newsletter/62%20July%202021/info/Wolff-Cortie1994_Article_TheDevelopmentOfSpangold.pdf)



# Earth's magnetic Field Flipped 42,000 Years Ago, Creating a Climate "Disaster"

A reversal in Earth's magnetic field thousands of years ago plunged the planet into an environmental crisis that may have resembled "a disaster movie," scientists recently discovered. Our planet's magnetic field is dynamic, and, numerous times, it has flipped — when the magnetic North and South Poles swap places. In our electronics-dependent world, such a reversal could seriously disrupt communication networks. But the impact could be even more serious than that, according to the new study. For the first time, scientists have found evidence that a polar flip could have serious ecological repercussions. Their investigation connects a magnetic field reversal about 42,000 years ago to climate upheaval on a global scale, which caused extinctions and reshaped human behavior. Earth's magnetosphere (the magnetic barrier surrounding the planet) originates from the churning of hot, molten metal around its iron core. This perpetually sloshing liquid flow generates electricity that in turn produces magnetic field lines, which curve around the planet from pole to pole. Like a protective bubble, the magnetic field shields Earth from solar radiation. On the planet's sun-facing side, constant bombardment from solar winds squishes the magnetic field, so that the field extends to a distance no more than 10 times Earth's radius. However, on the side of the planet facing away from the sun, the field extends much farther into space, forming an enormous "magnetotail" that reaches beyond our moon. Marking the two spots on Earth where arcing magnetic field lines converge are the magnetic North Pole and South Pole. But while these positions are relatively stable, the poles (and the magnetic field itself) aren't fixed in place. About once every 200,000 to 300,000 years, the field weakens enough to reverse polarity completely. The process can take hundreds or even thousands of years. Magnetic molecules preserved in volcanic deposits and other sediments tell scientists when past reversals happened; those molecules align with the magnetic field at the time that they were deposited, orienting towards magnetic North Pole. Recently, researchers investigated a relatively recent and brief polarity reversal called the **Laschamps Excursion**, which took place between 41,000 and 42,000 years ago and could be linked to other dramatic changes on Earth from that time. They suspected that during a time when our protective magnetic field was reversing (and thereby weaker than normal) solar and cosmic radiation exposure could have affected the atmosphere enough to impact climate. Prior studies of Greenland ice cores dating to Laschamps didn't reveal evidence of climate change. But this time, the researchers turned their attention to another potential source of climate data: bog-preserved kauri trees (*Agathis australis*) from northern New Zealand. They cut cross-sections, or "biscuits," from the preserved trunks, and looked at changes in levels of carbon 14 (a radioactive form of the element) over a period that included the Laschamps reversal. Their analysis revealed elevated levels of radioactive carbon in the atmosphere during Laschamps, when the magnetic field was weakening. "Once we worked out the exact timing from the kauri record, we could see that it coincided perfectly with records of climatic and biological change all over the world," the researchers said. For example, around this time, megafauna in Australia began to go extinct and Neanderthals in Europe were dying out; their decline may have been accelerated by climate-related changes to their ecosystems. The researchers then used computer climate models to test what may have caused widespread climate upheaval and related extinctions. They found that a weak magnetic field (operating at about 6% of its normal strength) could lead to major climate impacts "via the ionizing radiation strongly damaging the ozone layer, letting in UV [ultraviolet rays] and altering the ways in which the sun's energy was absorbed by the atmosphere. A heavily ionized atmosphere could also have generated brilliant auroras around the world and produced frequent lightning storms, making skies look like "something similar to a disaster movie," they said. Another significant shift around that time was



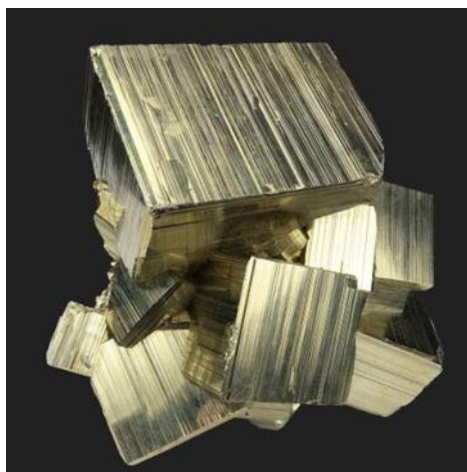
Red ochre handprints in Spain's El Castillo cave were made almost 42,000 years ago, and are suggested to represent the use of an ancient form of sunscreen. (Image credit: Paul Pettitt, Gobierno de Cantabria)

in *Homo sapiens*, with cave art beginning to appear in locations around the world. This included the first examples of red ochre hand stencils, "which we suspect is actually a sign of the application of sunscreen," a practice still seen in modern Indigenous groups in Namibia, researchers said. Higher UV levels from a weak magnetic field could have driven humans to seek shelter in caves, or forced them to protect their skin with sun-blocking minerals. Scientists can't predict precisely when the next reversal of our magnetic field might happen. However, some signs (such as the North Pole's current migration across the Bering Sea area and the magnetic field itself weakening nearly 10% over the past 170 years) suggest that a flip may be closer than we think, making it more urgent that researchers fully understand how big shifts in our magnetic field could shape environmental changes on a global scale, according to the study. "Overall, these findings raise important questions about the evolutionary impacts of geomagnetic reversals and excursions throughout the deeper geological record," the scientists wrote.

<https://www.livescience.com/magnetic-flip-42000-years-ago.html>

## 'Fool's Gold' Not So Foolish After All

Curtin University research has found tiny amounts of gold can be trapped inside pyrite, commonly known as "fool's gold," which would make it much more valuable than its name suggests. This study, published in the journal *Geology* in collaboration with the



University of Western Australia and the China University of Geoscience, provides an in-depth analysis to better understand the mineralogical location of the trapped gold in pyrite, which may lead to more environmentally friendly gold extraction methods. Lead researcher Dr. Denis

Fougerouse from Curtin's School of Earth and Planetary Sciences said this new type of "invisible" gold has not previously been recognized and is only observable using a scientific instrument called an atom probe. "The discovery rate of new gold deposits is in decline worldwide with the quality of ore degrading, parallel to the value of precious metal increasing," Dr. Fougerouse said.

"Previously gold extractors have been able to find gold in pyrite either as nanoparticles or as a pyrite-gold alloy, but what we have discovered is that gold can also be hosted in nanoscale crystal defects, representing a new kind of "invisible" gold. "The more deformed the crystal is, the more gold there is locked up in defects. The gold is hosted in nanoscale defects called dislocations – one hundred thousand times smaller than the width of a human hair – so a special technique called atom probe tomography is needed to observe it." Dr. Fougerouse said the team also explored gold extraction methods and possible ways to obtain the trapped gold with less adverse impacts on the environment.

"Generally, gold is extracted using pressure oxidizing techniques (similar to cooking), but this process is energy hungry. We wanted to look into an eco-friendlier way of extraction," Dr. Fougerouse said. "We looked into an extraction process called selective leaching, using a fluid to selectively dissolve the gold from the pyrite. Not only do the dislocations trap the gold, but they also behave as fluid pathways that enable the gold to be "leached" without affecting the entire pyrite." The study is supported by the Australian Research Council and the Science and Industry Endowment Fund. Dr. Fougerouse is affiliated with The Institute for Geoscience Research (TIGeR), Curtin's flagship Earth Sciences research institute. <http://www.geologyin.com/2021/06/fools-gold-not-so-foolish-after-all.html>

## Did Vikings Use Crystals to Rule the Seas?

Long celebrated as master shipbuilders and seafarers, the Vikings ruled the waters of the North Atlantic from 900 to 1200 A.D., regularly sailing their longboats for hundreds of miles over open water to their colonies in Iceland and Greenland. On clear days, they used

a sundial-like instrument called a sun compass to guide their way, with great accuracy. But scientists have struggled to answer a simple question: How did the Vikings navigate when it was cloudy or foggy? Researchers used computer simulations to bolster a longstanding theory that the Vikings used chunks of crystal known as *sunstones* to find their way during inclement weather, a backup navigation method that enabled them to dominate the seas for three centuries. As New Age-y as it sounds, the



Icelandic Spar

sunstone navigation technique actually shows up in ancient Viking legends, like "*The Saga of King Olaf*," which refer to Viking mariners using a *sólársteinn*, or sunstone, on their voyages. And back in 1967, the *Washington Post* reported, a Danish archaeologist suggested that the Vikings might have followed the sun's path through the clouds using *sunstones*. *Sunstones* work thanks to a phenomenon called polarization. As sunlight passes through the atmosphere, it forms polarized rings, with the sun itself at their center. Some crystals, including calcite, cordierite and tourmaline, can reveal these rings when turned the right way, allowing a navigator to find the sun even on a cloudy day. But as no sunstones have ever been found on or near any actual Viking shipwreck, many historians dismissed the idea as more myth than reality. In their study, published in the journal *Royal Society Open Science*, the researchers simulated thousands of voyages made by a Viking ship from a single point in Norway to a single point in Greenland using sunstones for navigation, under highly varying weather conditions. After running the simulation some 36,000 times, they found that as long as a simulated Viking mariner used a **cordierite crystal** (aka iolite -  $Mg_2Al_4Si_5O_{18}$ ) to find the sun every three hours (at minimum), he could navigate between 92.2 to 100 percent accuracy. That's just the best-case scenario, and the study's results varied greatly, as its authors admit. "*Nobody knows what the Vikings' navigation practices were*," Horváth said. He suggested that they might have relied not just on sunstones but on a variety of navigation techniques, including spotting familiar islands, tracking wave patterns and observing the paths of migrating whales. In their simulations, the researchers found that if Vikings used another crystal—**calcite**—and only checked it once every four hours or more, their ship would miss Greenland completely and sail on past it, all the way to Canada. Which raises the question: Did Leif Eriksson have a chunk of Iceland spar to thank for making it to North America 500 years before Columbus?

[https://www.history.com/news/viking-navigation-sunstones-evidence?cmpid=email-hist-mysterious-2021-0604-06042021&om\\_rid=&campaign=hist-mysterious-2021-0604](https://www.history.com/news/viking-navigation-sunstones-evidence?cmpid=email-hist-mysterious-2021-0604-06042021&om_rid=&campaign=hist-mysterious-2021-0604)



# The Giant Megalodon Mega-Shark May Have Been Even Bigger Than We Thought

The largest shark ever to swim Earth's oceans is like a ghost in the paleontological record. Megalodon (*Otodus megalodon*) is known primarily in the fossil record by its giant teeth, surviving millions of years, long after its cartilage skeleton decays to nothing. It's from these giant teeth, as big as your hand, that scientists estimate the size of the giant beast, with a jaw you could easily stand inside, with room to spare. Gauging the size of a shark from teeth (and a few vertebrae), however, is not an exact science, especially an extinct one that may have been built differently from modern sharks, which, after all, display a range of morphologies. Estimates of the megalodon's size have ranged from around 36 to 131 feet in length, but generally settling somewhere around 50 to 60 feet. A new method of calculating the megalodon's size based on the width of its teeth suggests that these numbers are an underestimation, that the giant shark's true size hovered somewhere around 65 feet in length. And it was a chance discovery, made with the help of students, that figured it out. "I was quite surprised that indeed no one had thought of this before," said paleontologist Ronny Maik Leder of the Natural History Museum in Germany. "The simple beauty of this method must have been too obvious to be seen. Our model was much more stable than previous approaches. This collaboration was a wonderful



A megalodon tooth. (Kristen Grace/Florida Museum of Natural History)

example of why working with amateur and hobby paleontologists is so important." Although megalodon skeletons may be absent from the fossil record, teeth are plentiful. The giant beasts lived from 23 million to around 3.6 million years ago, dominating the ocean. Sharks continuously shed and regrow teeth for their entire lives - going through up to 40,000 teeth before they die. A megalodon had up to 276 teeth in its mouth at any given time. That's a lot of teeth. To estimate the size of the shark, scientists commonly use equations based on tooth length. You need to work out where in the shark's mouth the tooth would have been, then use an equation for that position. However, the donation of a nearly complete set of megalodon teeth to the Florida Museum of Natural History in 2015 removed a lot of the positioning guesswork. Paleontologist Victor Perez, formerly of the Florida Museum of Natural History and now

of the Calvert Marine Museum, was performing this task with students, using 3D-printed replicas of megalodon teeth from the set, when something wasn't working. The students' calculations ranged between 40 and 150 feet for the same shark, based on the distance from the front of the jaw. "I was going around, checking, like, did you use the wrong equation? Did you forget to convert your units?" Perez said. "But it very quickly became clear that it was not the students that had made the error. It was simply that the equations were not as accurate as we had predicted." It was French amateur paleontologist Teddy Badaut who came up with a solution. Since the width of a shark's tooth is limited by the size of a shark's jaw, and the size of the jaw may be proportional to the shark's body length, why not try basing estimates on the tooth width instead of length? So, Perez and Leder devised a new set of equations, along with a model for estimating jaw width based on the relationship between a tooth's width and the width of the jaw. They applied these to the megalodon teeth from the Florida Museum set, and to sets of teeth from several other shark species. This gave them the revised length estimate - as well as a tool for estimating a megalodon's size based on just a single tooth. It's still not perfect, though. Some sharks' teeth are closer together than other sharks', and we don't have that information for the megalodon. But the new research does, perhaps, bring us a little bit closer to gauging the true size of this fearsome, ancient predator. "Even though this potentially advances our understanding, we haven't really settled the question of how big megalodon was," Perez said. "There's still more that could be done, but that would probably require finding a complete skeleton at this point."

<https://www.sciencealert.com/prehistoric-mega-shark-megalodon-may-have-been-even-bigger-than-we-thought>

## This 'Wandering Meatloaf' Has Teeth Made from Rare Minerals

If you search around the shorelines of the North Pacific, you might get lucky and spot a "wandering meatloaf," a round reddish-brown mollusk also known as the gumboot chiton or, more



scientifically, as *Cryp-tochiton stelleri*. It trudges along coasts and scrapes algae off rocks with its small but incredibly gritty teeth. In analyzing this bizarre animal's hardy chompers, scientists found that its stylus (the long, hollow structure that connects the teeth to

the soft membrane below) actually contains tiny particles of **santabarbarite**, a rare iron-based mineral that until now had only been found in actual rocks. Santabarbarite is what gives these mollusks their bite (it makes the root of their teeth light but remarkably strong, and among the hardest materials ever found in nature). Studying how santabarbarite integrates into chiton teeth not only helps scientists understand how they feed, but the discovery could help advance 3-D printing technology. The findings were published in *Proceedings of the National Academy of Sciences*. When analyzing the animal's teeth, the researchers used a variety of advanced imaging techniques, such as microscopy and spectroscopy. While they knew these mollusks' have exceptionally strong teeth, finding the santabarbarite inside the stylus was quite unexpected. "[This mineral] *has never before been seen in a biological context*," Derk Joester, a material scientist at Northwestern University and the senior author of the paper, said in a statement. "*It has high water content, which makes it strong with low density. We think this might toughen the teeth without adding a lot of weight.*" The team also observed that the mineral's distribution within the tissues that make up the stylus affected the stiffness of the different parts of the hollow structure. They then wondered whether they could use this same principle to make more robust ink for 3-D printing. The researchers produced a synthetic santabarbarite alternative using a compound similar to chitin, as well as iron and phosphate. The ink worked well when printed immediately after mixing, and hardened as it dried. Depending on how much iron and phosphate was added to the mix, the printed material could be soft and rubbery or tough and rigid. "It should be possible to mix the ink at a ratio that you can change immediately prior to printing," Joester told *The New York Times*. "*And that would allow you to change the composition, the amount of nanoparticles, and therefore the strength of the material on the fly. Meaning that you can print materials where the strength changes very dramatically over relatively short distances.*" We look to organisms like the chiton to understand how this is done in nature, which has had a couple hundred million years of lead time to develop."

<https://www.popsci.com/animals/wandering-meatloaf-animal-rare-mineral-teeth/>

## Man Hunts for Engagement Ring Gemstone, Digs Up 2.2-carat Diamond

A Washington man made a wonderful discovery while he was mining materials for an engagement ring. It's thrilling when hard work pays off. For years, 26-year-old Christian Liden, of Poulsbo, Wash., has wanted to find the raw materials to make his own engagement ring. He started by panning for gold around his home state. After five years, he had accumulated enough for the ring. Liden recently embarked on a mining excursion that led



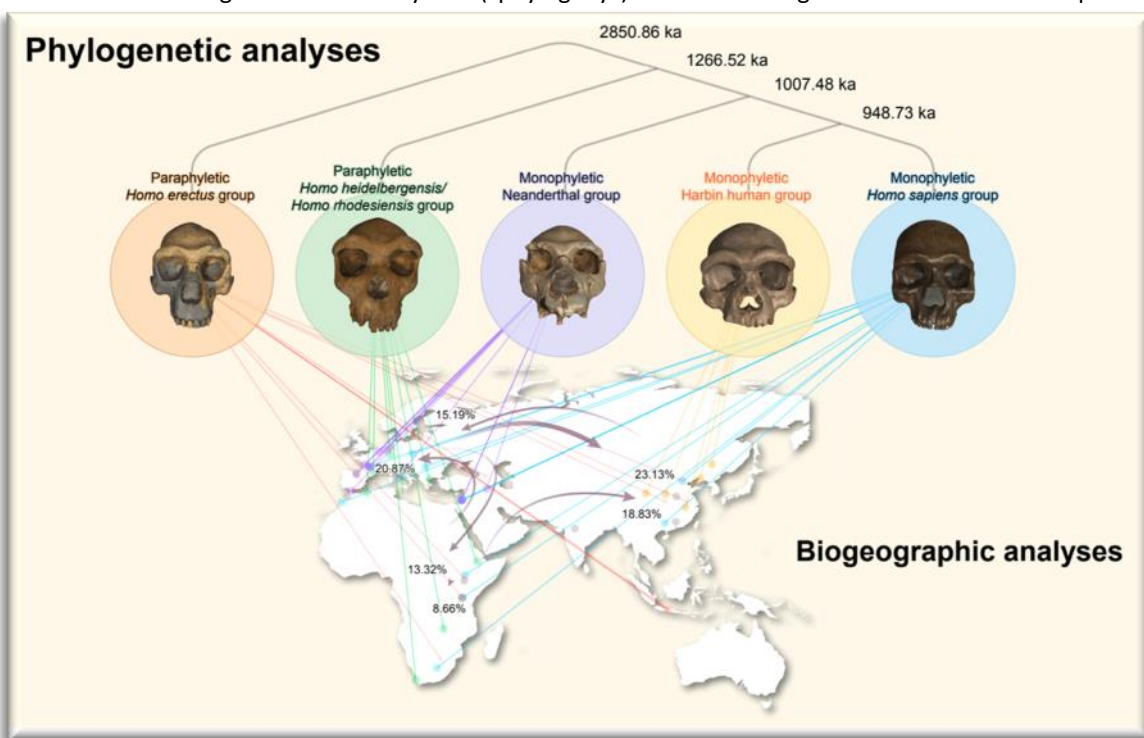
Christian Liden's Washington Sunshine Diamond

him across the country to **Arkansas's Crater of Diamonds State Park** to collect gemstones for his creation. Liden and a longtime friend left Washington on May 1. They built their own mining equipment to search with and tested it at a Montana sapphire mine along the way. The friends arrived at Arkansas's diamond site late on Friday, May 7. "*We spent about an hour in the field that afternoon and returned early the next*

*morning to mine all day,*" Liden said. On his third day at the Crater of Diamonds, Liden was wet sifting when he finally spotted what he had traveled more than 2,000 miles in search of. "*I saw it shining as soon as I turned the screen over and immediately knew it was a diamond. I was shaking so bad, I asked my buddy to grab it out of the gravel for me!*" Liden placed the gem in a plastic bag and carried it to the park's Diamond Discovery Center, where staff confirmed he had found a large, yellow diamond. **Weighing 2.20 carats**, Liden's diamond is the largest found at the park since last October, when a visitor from Fayetteville, Ark. discovered a 4.49-carat yellow diamond. He found it in dirt from the West Drain of the park's 37.5-acre diamond search area, the surface of an ancient, diamond-bearing volcanic pipe. "*As beautiful as this diamond is, I think the best part is the story behind it,*" Edmonds continued. "*Since the eighth grade, Mr. Liden has dreamed of creating a special ring for his future wife, with stones and gold he mined, himself. And now he can make that dream come true!*" Though he's found other gemstones, Liden was surprised by his success at the Crater of Diamonds. "*I was just hoping to find a couple smaller stones and had planned to buy a center stone later, but that won't be needed now!*" After leaving the Crater of Diamonds, Liden plans to mine for opals in Nevada before returning home. Once he proposes, Liden says he wants to design an engagement ring with his bride-to-be using his diamond and other gemstones collected along his cross-country mining quest. Finders of large Crater diamonds often choose to name their gems. Liden has named his diamond the Washington Sunshine, "*because it's got a nice, light yellow color, just like sunlight in Washington.*" As of this publication, 121 diamonds have been registered at Crater of Diamonds State Park in 2021, weighing more than 20 carats. An average of one to two diamonds are found by park visitors each day. <http://www.geologyin.com/2021/06/man-hunts-for-engagement-ring-gemstone.html>

# Move Over, Neanderthals. This Could Actually Be Our Closest Human Relative

In 1933 a mysterious fossil skull was discovered near Harbin City in the Heilongjiang province of north-eastern China. Despite being nearly perfectly preserved – with square eye sockets, thick brow ridges and large teeth – nobody could work out exactly what it was. The skull is much bigger than that of *Homo sapiens* and other human species – and its brain size is similar to that of our own species. Historical events left it without a secure place of origin or date, until today. Now a team of Chinese, Australian and British researchers has finally solved the puzzle – the skull represents a previously unknown extinct human species. The research, published as three studies in the journal *Innovation*, suggests this is our closest relative in the human family tree. Dubbed *Homo longi*, which can be translated as "dragon river," it is named after the province in which it was found. The identification of the skull, thought to have come from a 50-year-old male, was partly based on chemical analysis of sediments trapped inside it. This confirmed it comes from the upper part of the Huangshan rock formation near Harbin City. The formation was reliably dated to the Middle Pleistocene – 125,000 to 800,000 years ago. Uranium series dating, which involves using the known rate of decay of radioactive uranium atoms in a sample to work out its age, showed that the fossil itself is at least 146,000 years old. *Homo longi* can now take its place among an ever increasing number of hominin species across Africa, Europe and Asia. The research team generated a family tree ("phylogeny") of human lineages to work out how the species relates to modern humans, based on morphological data from 95 largely complete fossil specimens of different hominin species living during the Middle Pleistocene (including *Homo erectus*, *Homo neanderthalensis*, *Homo heidelbergensis* and *Homo sapiens*) along with their known ages. Their tree also suggested that five previously unidentified fossils from northeastern China are also from *Homo longi*.



Human family tree. (Ni et al. *Innovation*, 2021)

It predicts that the common ancestor of *Homo longi* and *Homo sapiens* lived approximately 950,000 years ago. Furthermore, it suggests that both species shared a common ancestor with Neanderthals a bit more than 1 million years ago, meaning we may have split from Neanderthals 400,000 years earlier than previously thought (we used to think it was 600,000 years ago). Until now, the Neanderthals were considered our closest relative. But the new discovery pushes Neanderthals one step further away from ourselves and makes simple comparisons between two species much less important to understanding what ultimately makes us who we are. While the shape of the family tree presented here is likely to stand the test of time, it is still too early to accept these predicted divergence dates as definitive. That said, the research also sheds important light on how human species occurred and spread through the Middle Pleistocene – into all areas of our planet. Crucially, many of these species may have interbred. In this study of the Harbin cranium, the application of new techniques of analysis has brought old specimens back into active use. Asia is now in the driving seat of the study of human evolution. <https://www.sciencealert.com/newly-discovered-human-species-may-replace-neanderthals-as-a-closest-relative>

## 2021 Officers, Directors, and Committee Chairs

President .....	Marv Houg ( <a href="mailto:m_houg@yahoo.com">m_houg@yahoo.com</a> ).....	(319)364-2868
Vice President. ...	Ray Anderson ( <a href="mailto:rockdoc.anderson@gmail.com">rockdoc.anderson@gmail.com</a> ) .....	337-2798
Treasurer .....	Dale Stout ( <a href="mailto:dhstout55@aol.com">dhstout55@aol.com</a> ).....	365-7798
Secretary .....	Dell James ( <a href="mailto:cycladelics@msn.com">cycladelics@msn.com</a> ) .....	446-7591
Editor.....	Ray Anderson ( <a href="mailto:rockdoc.anderson@gmail.com">rockdoc.anderson@gmail.com</a> ) .....	337-2798
Liaison .....	Kim Kleckner ( <a href="mailto:ibjeepn2@gmail.com">ibjeepn2@gmail.com</a> ) .....	560-5185
Imm. Past Pres. ..	Sharon Sonnleitner ( <a href="mailto:sonnb@aol.com">sonnb@aol.com</a> ) .....	396-4016
Director '21 .....	Bill Desmarais ( <a href="mailto:desmarais_3@msn.com">desmarais_3@msn.com</a> ) .....	365-0612
Director '22.....	Toby Jordan ( <a href="mailto:rejordan79@msn.com">rejordan79@msn.com</a> ) .....	360-2762
Director '23 .....	Jay Vavra ( <a href="mailto:vavrjij@gmail.com">vavrjij@gmail.com</a> ).....	447-9288
Sunshine.....	Dolores Slade ( <a href="mailto:doloresdslade@aol.com">doloresdslade@aol.com</a> ) .....	351-5559
Hospitality .....	Karen Desmarais ( <a href="mailto:desmarais_3@msn.com">desmarais_3@msn.com</a> ) .....	365-0612
Webmaster.....	Sharon Sonnleitner ( <a href="mailto:sonnb@aol.com">sonnb@aol.com</a> ) .....	396-4016

Club meetings are held the 3rd Tuesday of each month from September through November and from January through May at 7:15 p.m. During the COVID emergency meetings will be via ZOOM. When the emergency is over, meetings will return to 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:**

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

CVRMS website:  
[cedarvalleyrockclub.org](http://cedarvalleyrockclub.org)



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