Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS | DECEMBER 2020 | VOL. 46, ISSUE 12

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

Next CVRMS Meeting
Tues. December 15
7:15 pm

<<VIRTUAL MEETING>>

Join the Zoom Meeting
https://us02web.zoom.us/j/82289412591

featured videos:

- **Video visit to 2019 Cayuna Rock, Gem, and Mineral Show-Brainard, MN**
- **&**
- **Lake Superior Agate Hunting Video**

also featuring:

Short Business Meeting

"Show Us Your Favorite Rocks"

"What Have You Have Been Up To?"

Dale's Email Reminders
Now come labeled: AOL Member Services
Hover, and you'll see Dale's Address

Information for CVRMS Members

Please Pay Your Dues
$15 per Family

Please mail check to:

Dale Stout, Treasurer
2237 Meadowbrook Dr. S.E.
Cedar Rapids, IA 52403

CVRMS Holiday Donations
At our Holiday Party we collect donations for the

Linn County Food Bank
and **HACAP**

If you wish to donate this year, please write a check to the above **charity of choice** or to **CVRMS** and mail it to Dale Stout at the address above by **December 11**

CVRMS Nov. 17 Virtual Meeting

7:26 p.m. The Zoom meeting was called to order by Marv Hoag, President –14 participants.

Minutes reviewed. Motion to approve by Ray, second by Glen. Approved as published.

Treasurers report by Dale Stout. Little activity. CD cashed to fund scholarships. Motion to approve by AJ, second by Bill. Report approved.

Ray presented a program: Videos on Colorado rhodochrosite mine and tourmaline mines in Brazil and Maine shown.

Old Business: Display case for River Products ordered. We will provide some display rocks and labels.

New business:-Discussion of possible programs for future meetings. Suggestions; Jim Kraai-*Minerals of Colorado,* Prof. John Hill (thru Glen), John McCartle, Jim Preslicka, Chad Heinsel, join with Des Moines club (meet last Fri. ~6:30).

Reminder of Dec. donations to HACAP and Linn Food Bank.

Marv– Doug and Carl found geodes on DM River better than Cantons. Problems with legality of collecting in Iowa rivers. Review of laws in upcoming newsletter.

Election of 2021 officers: Nominations committee: Jay to remain in open seat on Board of Directors. All others are in first year of two-year term. No additional nominations. AJ called for nominations to cease, Dale second. Unanimous vote to approve committee suggestion.

Motion to adjourn by AJ, seconded by Dale.

9:05 pm Meeting adjourned.

Respectfully submitted
Ray Anderson, Acting Secretary

Peacock ore is a pet name, referring to rocks made of the minerals *bornite* and *chalcopyrite.* The colors of peacock ore are actually tarnish upon the ore's surface. Bornite is a sulfide mineral with chemical composition Cu_5FeS_4 that crystallizes in the orthorhombic system (pseudo-cubic). It does not display the brassy color of pyrite or chalcopyrite until tarnished but is a mottled brown/black/purple to copper-red but often is mixed with chalcopyrite. It easily tarnishes upon exposure to air and results in purple/blue iridescence on some areas. Bornite is an important copper ore mineral and occurs widely in porphyry copper deposits along with the more common chalcopyrite. Bornite is also found as disseminations in mafic igneous rocks, in contact metamorphic skarn deposits, in pegmatites and in sedimentary cupriferous shales. It is important as an ore for its copper content of about 63 percent by mass.

CVRMS Board Minutes Oct. 27

Members: Ray Anderson, Sharon Sonnleitner, Marv Houg, Kim Kleckner, Dale Stout, Bill Desmarais, Dell James, Jay Vavra

7:10 p.m. The meeting called to order by Marv via Zoom.

Minutes of last meeting reviewed. Motion to approve as published by Bill, second by Dale. Minutes approved.

Treasurer's report by Dale. C.D. cashed. Checks have been written for scholarships. Display case for River Products paid for and delivered. Coffers are dwindling. Dues are due and should help.

Auction: Dale checked with Amana Campground for date availability. Discussion centered around dates available and the possible use of the Pioneer building (the smaller one). Will hold auction outside if weather permits. There is no kitchen and we primarily need refrigerator space for drinks.

We originally wanted May 22 for auction on Saturday. We do have first choice but someone has requested May 22 for a wedding. Dale will check for June and hope that the bigger building is available June 12 and 13? Back up would be May 22 smaller building. Dale will check and let the Board know. Kim will check about Terry Baty's estate.

Show: Sharon checked on Hawkeye Downs availability. Since the auction will be held in May or June suggest that we have show later. Bill made motion to hold 2021 show on November 5-6-7 (setup on the 5th) . Ray seconded motion. Discussion about shows in proximity to ours. There are none that will affect us. Motion passed. Our next show will be **held November 6-7, 2021, at Hawkeye Downs.**

Misc: Since there will be no Christmas Party this year, we will not have a passing of the hat for our annual gift to needy folks. This year the need is greater. So in keeping with our generosity, send your donation to Dale **by December 11,2020.**

Dale's address:

2237 Meadowbrook Dr. S.E. Cedar Rapids, IA 52403

Also, If anyone wants to order the beautiful agate calendars, let Dale know how many. Discussion about how to get to the people. Need to include mailing costs. Dale will find out the cost.

The club agreed to design labels for the display at River Products. Ray volunteered to design a "cool" label.

Ray had various suggestions about programs for upcoming meetings. Board agreed that we trust him to make a choice.

MAPS will have their annual **fossil** show on **October 22**. Marv has a connection with a legislator who has an interest in our crinoid project. He will keep us posted.

No further business, motion to adjourn by Dale, 2nd by Jay.

8:06 Meeting adjourned.

Respectively submitted, *Dell James*

Happy Thanksgiving.

The Membership Has Voted

The November 17 CVRMS meeting included our official ***Annual Meeting,*** which meant that members elected club officers for 2021. The nominating committee suggested that **Jay Vavra** be elected to serve another term in his Director position, which was expiring at the end of this year. All the remaining Board Members are in the first year of their two-year term. The club membership voted unanimously to accept the nominating committee's suggestion and reelect Jay .

Congratulations Jay!!

President	Marv Houg
Vice President	Ray Anderson
Treasurer	Dale Stout
Secretary	Dell James
Editor	Ray Anderson
Liaison	Kim Kleckner
Director '21	Bill Desmarais
Director '22	Toby Jordan
Director '23	Jay Vavra
Webmaster	Sharon Sonnleitner

The Gachalá Emerald is one of the largest and most valuable gem emeralds in the world, at 858 carats uncut. It was found in the mine called Vega de San Juan, located in Gachalá, a town in Colombia. The emerald was named in honor of Gachalá, the town where it was found. An emerald is a gemstone and a variety of the mineral beryl and is colored green by trace amounts of chromium and sometimes vanadium. The word "emerald" is derived esmaralda, a variant of Latin, which originated in Ancient Greek word smaragdos meaning "green gem".

Spotlight Gemstones: Zircon, Tanzanite, Turquoise

December's Birth Stones

If you were born in December you may choose from 3 birthstones, zircon, tanzanite, turquoise

Zircon is a mineral belonging to the group of nesosilicates. Its chemical name is zirconium silicate and its corresponding chemical formula is $ZrSiO_4$. A common empirical formula showing some of the range of substitution in zircon is $(Zr_{1-y}, REE_y)(SiO_4)_{1-x}(OH)_{4x-y}$. Zircon forms in silicate melts with large proportions of high field strength incompatible elements. The crystal structure of zircon is tetragonal crystal system. The natural color of zircon varies between colorless, yellow-golden, red, brown, blue, and green. Colorless specimens that show gem quality are a popular substitute for diamond and are also known as "*Matura diamond*".

Tanzanite is the blue/violet variety of the mineral zoisite (a calcium aluminium hydroxyl Sorosilicate—$Ca_2Al_3(SiO_4)_3(OH)$) belonging to the epidote group. It was discovered in Northern Tanzania in 1967, near the city of Arusha and Mount Kilimanjaro. Tanzanite is used as a relatively cheap gemstone, where it can substitute for the far more expensive sapphire after undergoing artificial heat treatment to form a deep blue coloration. Naturally formed tanzanite is extremely rare and is endemic only to the Mererani Hills. Tanzanite is noted for its remarkably strong trichroism, appearing alternately sapphire blue, violet and burgundy depending on crystal orientation. Tanzanite can also appear differently when viewed under alternate lighting conditions. The blues appear more evident when subjected to fluorescent light and the violet hues can be seen readily when viewed under incandescent illumination. Tanzanite is usually a reddish brown in its rough state, requiring heat treatment to bring out the blue violet of the stone.

Turquoise is an opaque, blue-to-green mineral that is a hydrated phosphate of copper and aluminium, with the chemical formula $CuAl_6(PO_4)_4(OH)_8{\cdot}4H_2O$. It is rare and valuable in finer grades and has been prized as a gem and ornamental stone for thousands of years owing to its unique hue. The substance has been known by many names, but the word *turquoise* dates to the 17th century and is derived from the French *turques* for "Turks" because the mineral was first brought to Europe from Turkey, from mines in the historical Khorasan Province of Persia. Pliny the Elder referred to the mineral as *callais* and the Aztecs knew it as *chalchihuitl*.

• • *information from Wikipedia*

What in the World?

What in the World? These are 2 semi-precious, trillion-cut gemstones (green and red for the holidays). Both are quartz, but they have their own names. What in the world are these gems called??

October's Photo

Last month's "*What in the World*" photo was a tough one. It's a close view of the skin of a nodosaur dinosaur. The fossil was discovered in 2011 when a heavy-machine operator accidentally found the specimen in the oil sands of an Alberta oil mine. During its burial at sea, the nodosaur settled onto its back, pressing the dinosaur's skeleton into the armor and embossing it with the outlines of some bones. One ripple in the armor traces the animal's right shoulder blade. Those of you with good memories will remember that this incredible fossil was discussed on page 9 in the September 2017 issue of *Cedar Valley Gems.*

Rock Calendar
CVRMS EVENTS OF INTEREST

2020

Dec. 15
CVRMS Monthly Meeting
<< VIRTUAL MEETING >>

- Video visit to 2019 Cayuna Rock, Gem, and Mineral Show - Brainard, MN

&

- Lake Superior Agate Hunting Video

see page 1 for details

2021

Jan. 19 — CVRMS Monthly Meeting
<< VIRTUAL MEETING >>
details to be announced

July 17 — One Day CVRMS Auction
Amana RV Park and Event Center
Amana, Iowa
more details to follow

Oct. 22 — MAPS 2021 Fossil Expo
Sharpless Auctions Building
Iowa City, Iowa

Nov. 6-7 — CVRMS Rocks, Fossil, & Minerals Show
Hawkeye Downs
Cedar Rapids
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, 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.

Rona told me last week, *"I read this article that said that the Earth's north and south pole were going to switch and that everything on Earth would be destroyed. What do you know about that?"*

Rock Doc replied: "The **Earth's magnetic field** (aka **geomagnetic field**) is a magnetic field that is generated in the Earth's core and extends into space. It is generated by electric currents produced by the motion of convection currents within the molten iron-based fluids of the outer core, a natural process called a *geodynamo*. The core's heat is the product of the heat of crystallization from the solidifying inner core combined with the residual heat from the formation of the planet augmented with heat produced by the radioactive decay of potassium, uranium and thorium within both the outer and inner cores. Because these decaying elements in the outer core are being moved around by the currents, they produce multiple magnetic fields which interact to form the final magnetic field that we observe. As an approximation, the Earth's current observed magnetic field can be represented by the field of a magnetic dipole currently tilted at an angle of about 11 degrees with respect to Earth's rotational axis, as if there were an enormous bar magnet placed at that angle through the center of the Earth. But, this observable field is constantly moving and changing in intensity as the strengths of individual fields wax and wain and new fields are created. This causes the surface expression of the magnetic poles to move in a "*random*" fashion, **polar wandering** (see *figure 1* below). Periodically these fields interact in such a way that the composite field collapses and re-emerges in the opposite polarity. These **magnetic reversals** occur at intervals, as recorded within crystallizing iron minerals (especially in igneous rocks), that are statistically random. Scientists estimate reversals have happened at least hundreds of times over the past three billion years. Over the last 20 million years the Earth has settled into a pattern of a pole reversal about every 200,000 to 300,000 years, although it has been more than twice that long since the last reversal (about 780,000 years ago called the Brunhes-Matuyama reversal). Geosciences are able to identify past reversals by carefully measuring the magnetic filed that is preserved in a small sample of rock. Multiple thermal and electromagnetic treatments remove the "soft" magnetic fields imparted on the rock by tectonic or thermal stresses so that the remaining "hard" magnetic field information (strength and direction) identify the field in which the rock solidified. When this information is combined with an precise age determination on the sample, the "polarity" of the Earth's field at the time the rock solidified is determined. Additionally, the measured dip of the direction to the pole can be used to determine the approximate latitude of the sample when it cooled. By combining information from multiple samples and other information, geologists can produce **paleogeographic maps** (maps showing the distributions of the continents millions of years ago). When they occur, reversals happen over hundreds or thousands of years, and it is not exactly a clean back flip. The magnetic fields morph and push and pull at one another, with multiple poles briefly emerging at odd latitudes throughout the process. While the factors that cause polarity reversals are not entirely predictable, there is nothing in the millions of years of geologic record to suggest that any *doomsday scenarios* connected to a pole reversal should be taken seriously. A reversal might, however, be good business for magnetic compass manufacturers."

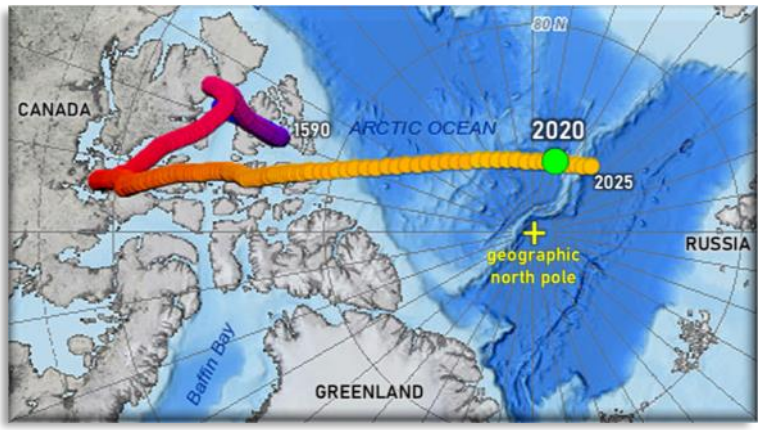


Figure 1. Modeled historical track of geomagnetic poles (1590 to 2025). Green dot identifies current pole position.

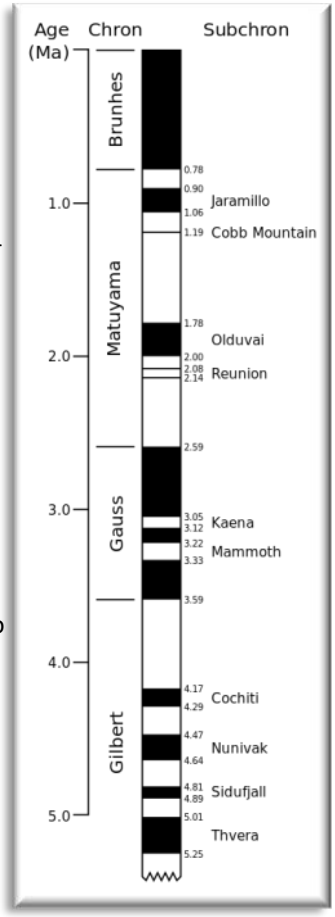


Figure 2. Geomagnetic polarity during the last 5 million years. Dark areas denote periods where the polarity matches today's normal polarity; light areas denote periods where that polarity is reversed.

Newly Discovered Volcanic Mineral Could Lead To More Efficient Batteries

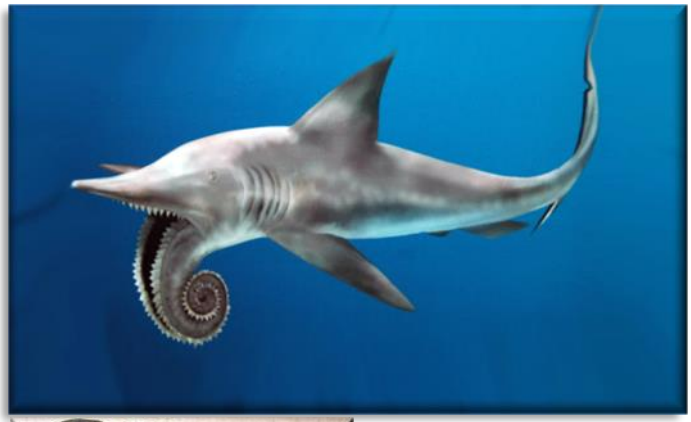
Volcanoes rank among the most destructive and awe-inspiring phenomena on the planet. But these fiery fissures do much more than just destroy. They also create. The research team headed by Stanislav Filatov, Professor at the Department of Crystallography at St Petersburg University, has discovered a new mineral species in Kamchatka – **petrovite**. The scientists named the find in honor of Tomas Petrov, an outstanding crystallographer and Professor at St Petersburg University. He, together with his students, was the first in the world to create a technology for growing jewelry malachite. For more than 40 years, He and colleagues have been studying the mineralogy of scoria cones and lava flows of fumaroles in Kamchatka. They were formed after two major eruptions of Tolbachik Volcano. This territory is unique in its mineralogical diversity. In recent years, researchers have discovered dozens of new minerals here, many of which are one-of-a-kind in the world. The recent find by the scientists from St Petersburg University, **petrovite, $Na_{10}CaCu_2(SO_4)_8$,** occurs as blue globular aggregates of tabular crystals with gaseous inclusions. The copper atom in the crystal structure of petrovite has an unusual and very rare coordination of seven oxygen atoms. Such coordination is characteristic of only a couple of compounds. The mineral consists of oxygen atoms, sodium, sulfur, and copper, which form a porous framework. The voids are connected to each other by channels through which relatively small sodium atoms can move. The scientists have therefore established that the structural type of petrovite is promising for ionic conductivity and can be used as a cathode material for sodium ion batteries. Despite the fact that most of the recent discoveries of mineralogists and crystallographers of St Petersburg University are associated with the Kamchatka Peninsula, scientists discover many new minerals in the most unusual places. More information about these discoveries can be found at the virtual exhibition of the Mineralogical Museum of St Petersburg University on the IZI.Travel platform.
http://www.geologyin.com/2020/11/newly-discovered-volcanic-mineral-could.html?

Petrovite, a new mineral described from Tolbachik Volcano in Siberia, could lead to the development of more efficient batteries

$1.85 Million Meteorite

An Indonesian coffin maker almost became an instant millionaire when a meteorite worth $1.85 million crashed through the roof of his house last August. Josua Hutagalung, 33, was working on a coffin next to his house when the space rock smashed through the veranda at the edge of his living room in Kolang, North Sumatra. The single stone, weighing 4.6 lbs, left a large hole in the tin roof and ended up buried 6 inches deep in the soil beside the house. Kompas said that the sound was so loud that parts of the house were shaking When he searched, he saw that the tin roof of the house had been damaged. Local residents in the area had heard large booming sounds which shook their houses. Josua, who managed to dig the rock out, said the meteorite was still warm and partially broken when he touched it. The stone, which is estimated to be 4.5 billion years old and is classified as CM1/2 carbonaceous Chondrite (an extremely rare variety), has been officially named ***Kolang***. Although the stone is valued at about $1.85million ($857 per gram), about 30 times his annual wages, Josua sold it for only $14,000. The father of three said he would use some of the money to build a church in his community. Three further fragments of the meteorite were found, and it was estimated that the original stone had a total weight of 5.5 lbs. The interior of the meteor is dark grey and black, with small light-colored speckles.
http://www.geologyin.com/2020/11/man-becomes-overnight-millionaire-after.html?

Terrorizing the seas nearly 300 million years ago, the Helicoprion was a bizarre species of shark that sported one of the craziest sets of teeth in natural history. This unusual feature has been the subject of widespread debate in the scientific community for a century, and it's easy to see why. The only fossils that have been found of this animal contain sets of spiraled teeth, and scientists are still trying to figure out just how they would have possibly fit into the shark's mouth. Of all the vexing fossil mysteries that have confounded paleontologists, few have been as persistent as that of *Helicoprion* – the name given to petrified whorls of elongate teeth that look like 270 million year old renditions on the theme of buzzsaw. What sort of animal did this Paleozoic remnant belong to, and where did the circular blade actually fit on the animal? Today, Idaho State University paleontologist Leif Tapanila and co-authors announce the answer to a conundrum that has puzzled paleontologists for over a century. Paleontologists and ichthyologists weren't shy about proffering new ideas on the nature of *Helicoprion*. Over a century of speculation produced visions of sharks with whorls hanging off their snouts, lower jaws, dorsal fins, caudal fins, and even embedded deep in their throats. Even after paleontologists generally agreed that the teeth belonged at the tip of a long lower jaw, artists and scientists still played with what leeway they had. Was the fearsome spiral fully enclosed in the jaw, or did it hang down awkwardly in an external coil? The true anatomy of *Helicoprion* was frustratingly difficult to pin down. In 1966, paleontologist Svend Erik Bendix-Almgreen described a *Helicoprion* fossil that had been found 16 years earlier in the Waterloo Phosphate mine near Montpelier, Idaho. This specimen was special. Not only did it display a lovely tooth whorl – which Bendix-Almgreen suggested fit at the end of an elongate lower jaw – but the fossil also contained bits of cartilage from the upper jaw and skull. Despite the extra material, though, Bendix-Almgreen thought that the specimen had been disarticulated and crushed so extensively that properly reassembling *Helicoprion* was impossible. The jaws sat in the Idaho Museum of Natural History for decades, one of thirty jaws in the institution's collections, until student Jesse Pruitt started asking curator Leif Tapanila about the strange Permian fish. In particular, Tapanila recalls, Pruitt wanted to know whether the coiled tooth row was a real feature of a living animal or something that happened after death – an artifact of death rather than a representation of life. Tapanila and Pruitt concluded that the *Helicoprion* whorls really did have their buzzsaw shape in life, but they didn't stop there. Along with their colleagues and input from Ray Troll, the researchers launched a new, detailed investigation into the museum's *Helicoprion* stores. The fossil Bendix-Almgreen described, in particular, seemed to have the potential to yield new clues through CT scans that could visualize the internal secrets of the specimen. The scans, taken at the University of Texas High-Resolution X-ray CT Facility in Austin, "*came out brilliant*" Tapanila says. Not only was the fossil in better shape than expected, but the specimen elucidated two critical facets of the animal – that *Helicoprion* didn't have an elongated jaw, and that it wasn't really a shark. Contrary to the popular long-jaw restorations, the tooth whorl of *Helicoprion* totally filled the lower jaw. The jaw joint sat right behind the weapon, and the spiral dentition was buttressed by jaw cartilage on either side. And, even stranger, *Helicoprion* didn't have any upper teeth to speak of. The spiral of continually-added teeth was the creature's entire dental armament. Scraps of *Helicoprion* skull indicate that the fish wasn't really a shark, either. Of course, as Tapanila points out, the word "shark" doesn't have the simple definition we might expect. "'*Shark' doesn't have biological meaning anymore,"* Tapanila told me, confiding "*If I talk to a fish expert, and I say 'shark,' they get very angry."* Ichthyologists are rapidly rearranging the fish family tree and the definitions for different groups. All the same, the skull cartilage of *Helicoprion* included a very specific double connection that is characteristic of a group of cartilaginous fish (such as ratfish and chimeras). *Helicoprion* was not a buzzsaw predecessor to great white or tiger sharks. The fish belonged to the lineage one branch over, near the evolutionary split where the ancestors of living sharks and ratfish parted ways. *(And this pulls other weird prehistoric fish with fearsome teeth – such as the scissor-jawed Edestus – away from the shark line and into the ratfish line.)* In general form, Tapanila and Troll expect, *Helicoprion* was an archaic member of the wider ratfish group that looked quite shark-like. And these predators reached impressive sizes. Tapanila estimates that a large *Helicoprion* would have been about 20 to 25 feet long.



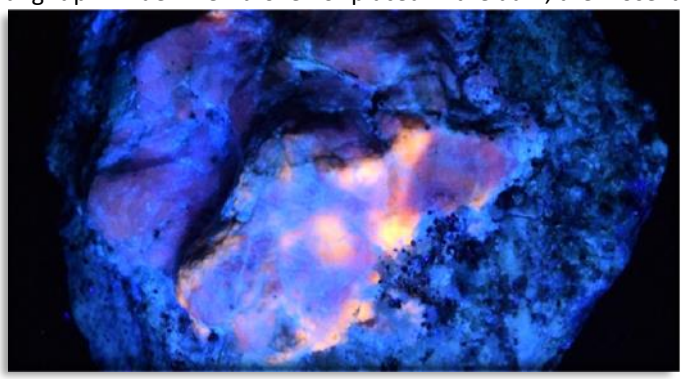
Helicoprion sp. - fossil shark tooth whorl from the Permian of Idaho

http://www.geologyin.com/2020/11/helicoprion-spiral-mouthed-killer.html?

Old Faithful, the famed geyser in Yellowstone National Park, erupts with such captivating regularity, they named the whole gushing spring after it. Phenomenal bursts of hot water and steam, fed by the geothermal activity of the Yellowstone supervolcano underneath, spurt up with such punctuality they can even be predicted. But Old Faithful wasn't always so faithful, and in times long ago, it ceased erupting entirely. In the last several decades, scientists have observed that Old Faithful's interval between eruptions (**IBEs**) has changed considerably, stretching from about 60–65 minutes in the 1950s to about 90–94 minutes since 2001. To investigate why and probe the links between Old Faithful's IBE variations and long-term drought variability in the region, a new study by researchers from the US Geological Survey (USGS) collected several remnants of mineralized wood found around the mound upon which Old Faithful sits. Today, the mound is barren and empty of trees (they do not grow on active geyser mounds, as the constant deluge and splatter of the scalding, alkaline-rich discharge would be incompatible with germination and seedling growth). Nonetheless, the wood samples recovered suggest that at least one time, the geyser's eruptions did cease and trees grew in its location. The USGS team analyzed 13 mineralized wood samples they recovered from Old Faithful's mound, and radiocarbon dating suggested that trees grew in Yellowstone several centuries ago, around 1233 to 1362 CE. To determine why and how trees were able to live at this locality , a relatively brief, (decades-long) time window during which Old Faithful apparently stopped erupting, the researchers looked for historical data that could identify drought conditions (times when reduced precipitation and lower groundwater supply would turn off the taps for the iconic geyser). Existing local tree ring data indicated pronounced megadroughts across the region during an episode known as the *Medieval Climate Anomaly*. The links the team found don't just fill in the gaps on Old Faithful's historical time-keeping. They may also point to geyser eruption variations in the future, as the world gets increasingly hotter and drier in the face of climate change. Climate models project increasingly severe droughts and large fires by mid-century, leading to a major transformation of Yellowstone's ecosystems. Periods of decreased precipitation have been shown in modern observational records to result in less frequent eruptions of Old Faithful Geyser, while the new ^{14}C dates of mineralized wood suggest that severe, long-duration drought events can lead to Old Faithful Geyser eruption cessation. http://www.geologyin.com/2020/10/800-years-ago-old-faithful-went-quiet.html

This Weird Rock Naturally Glows in The Dark, Now Scientists Have Figured Out How

The afterglow of the mineral **hackmanite** (or *tenebrescent sodalite*) is a fascinating natural phenomenon that has long been a mystery to scientists – even if we're now able to engineer synthetic materials that glow in the dark more effectively than anything in nature. Geologists that first described the mineral in the 1800s were intrigued by its tendency to softly glow a bright pink hue when broken or placed in the dark, then lose it in the light. The precise nature of the reaction has proven elusive. Now, a new study outlines exactly how certain types of hackmanite retain some of their glow as they move from bright to dark settings. The key is the delicate interplay between the mineral's natural impurities, determined by how it was formed. Getting a better understanding of how hackmanite can emit white luminescence in dark conditions will further help scientists develop synthetic materials able to glow in the dark without any source of power. Materials chemists have conducted research with synthetic hackmanites and have been able to develop a material with an afterglow distinctly longer than that of natural hackmanite. A combination of both experimental and computational data was studied to determine that the concentrations and balance of sulfur, potassium, titanium, and iron were most important to the afterglow. In particular, titanium was found to be the element actually glowing, powered by electron transfer. However, titanium concentrations alone are not enough to create luminescence; the right mix of other elements is also required. The researchers say that synthetic materials can be improved and made more efficient and reliable through these sorts of studies – even if nature isn't able to match the strength of the glows that can be engineered in the lab. Through a careful comparison of different hackmanite samples, researchers were able to determine the required mix of orange photoluminescence (turning absorbed photons into light), blue persistent luminescence (emitting light without heating), and purple photochromism (a form of chemical transformation caused by electromagnetic radiation), a complex mix of natural elements and chemical reactions. Even though nature has not, in this case, been able to form a material with a glow as effective as in synthetic materials, nature has helped significantly in the development of increasingly more effective glowing materials." https://sciencesprings.wordpress.com/2020/11/08/from-science-alert-au-this-weird-rock-naturally-glows-in-the-dark-and-now-scientists-have-figured-out-how/

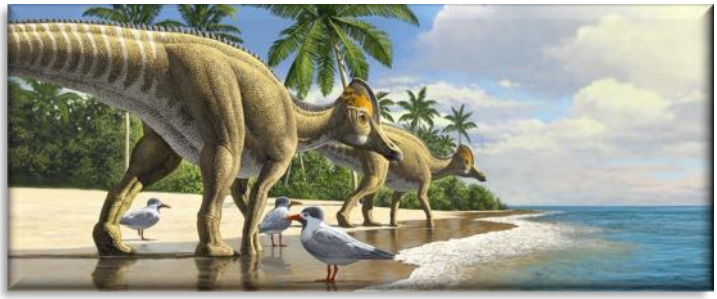


The World's Oldest Evidence of Animals Might Be From a Very Different Organism

The origins of life, a few billion years ago, were humble. Single-celled organisms squirming in the ooze, over millions and billions of years developing into multi-celled plants and, eventually, animals. But when and how these evolutionary spurts occurred has been difficult to puzzle out. Organic material doesn't necessarily preserve well, and when it does, we don't always identify it correctly. New research, however, brings us a little closer to the truth. Fossils from 635 million years ago that had previously been identified as animal in origin could actually have been made by a very different organism - algae. "*It brings the oldest evidence for animals nearly 100 million years closer to the present day,*" said paleobiogeochemist Lennart van Maldegem of the Australian National University in Australia. *"We were able to demonstrate that certain molecules from common algae can be altered by geological processes - leading to molecules which are indistinguishable from those produced by sponge-like animals."* According to molecular clock studies - a technique that uses the mutation rates of biomolecules to back-date genetic divergence - animal life emerged relatively late in the evolutionary timeline. Our earliest evidence of life is from around 3.4 to 3.5 billion years ago: ancient records of single-celled organisms. Plants emerged a fair bit later, around 1.6 billion years ago. And it took as much as another billion years for animals to emerge; between around 900 and 635 million years ago, according to those molecular clock studies. But the fossil record seemed absolutely bereft of evidence of animals in that timeframe—until 2009, when scientists revealed that they had found abundant quantities of 24-isopropylcholestanes in Neoproterozoic rock, dating back to more than 635 million years ago. These are thought to originate almost exclusively in demosponges, which produce a type of lipid with 30 carbon atoms and unusual side chains, called C30 sterols. The fossil products of these sterols are C30 steranes, like the 24-isopropylcholestane interpreted as evidence of Neoproterozoic animal life. In two new papers in *Nature Ecology & Evolution*, however, teams of researchers show that we cannot conclusively interpret C30 steranes as faunal in origin, and this would neatly resolve another mystery surrounding that interpretation. *"Ten years ago, scientists discovered the molecular fossils of an animal steroid in rocks that were once at the bottom of an ancient sea in the Middle East,"* said geobiologist Jochen Brocks of the Australian National University. *"The big question was, how could these sponges have been so abundant, covering much of the seafloor across the world, but leave no body fossils?"* Demosponges produce other sterols, of which no sign has been found in the same fossil record. And C30 steranes have been found ubiquitously in the fossil record - including places without oxygen (anoxic environments). Since it is well known that demosponges are unable to survive in completely anoxic waters, this posed a challenge to the demosponge interpretation. So, the two teams set out to see if there might be another organism that could produce C30 steranes. The dominant eukaryotes at the time were chlorophyte algaes, which produce high abundances of C29 sterols, so that's where the two teams started looking. The ANU-led team carefully analyzed fossils to study the biomarkers therein, and found they looked very similar to steranes that are derived through diagenetic processes. So, they conducted lab experiments in which they subjected modern sterols to geological alteration processes to mimic diagenesis. These experiments produced both kinds of steranes. The second team, led by paleontologist Ilya Bobrovskiy of Caltech, worked on sterols extracted from modern algae. They, too, subjected these sterols to geological alteration processes. And they found that diagenesis can result in the methylation of algal C29 sterols, ultimately producing C30 steranes. That doesn't mean there were no sponges. But, according to the evidence produced by both teams, the presence of C30 steranes in the fossil record can no longer be considered diagnostic sponge markers. *"While it holds true sponges are the only living organism which can produce these steroids, chemical processes can mimic biology and transform common and abundant algae sterols into 'animal' sterols,"* Bobrovskiy said. *"These molecules can be generated in the lab when simulating geological time and temperatures, but we also showed such processes did happen in ancient rocks."* https://www.sciencealert.com/the-world-s-oldest-evidence-of-animals-might-actually-be-algae

The modern demosponge *Rhabdastrella globostellata* makes the same 26-mes steroids found in ancient rocks

The Fossil of a Duckbill Dinosaur Has Been Found on The 'Wrong' Continent



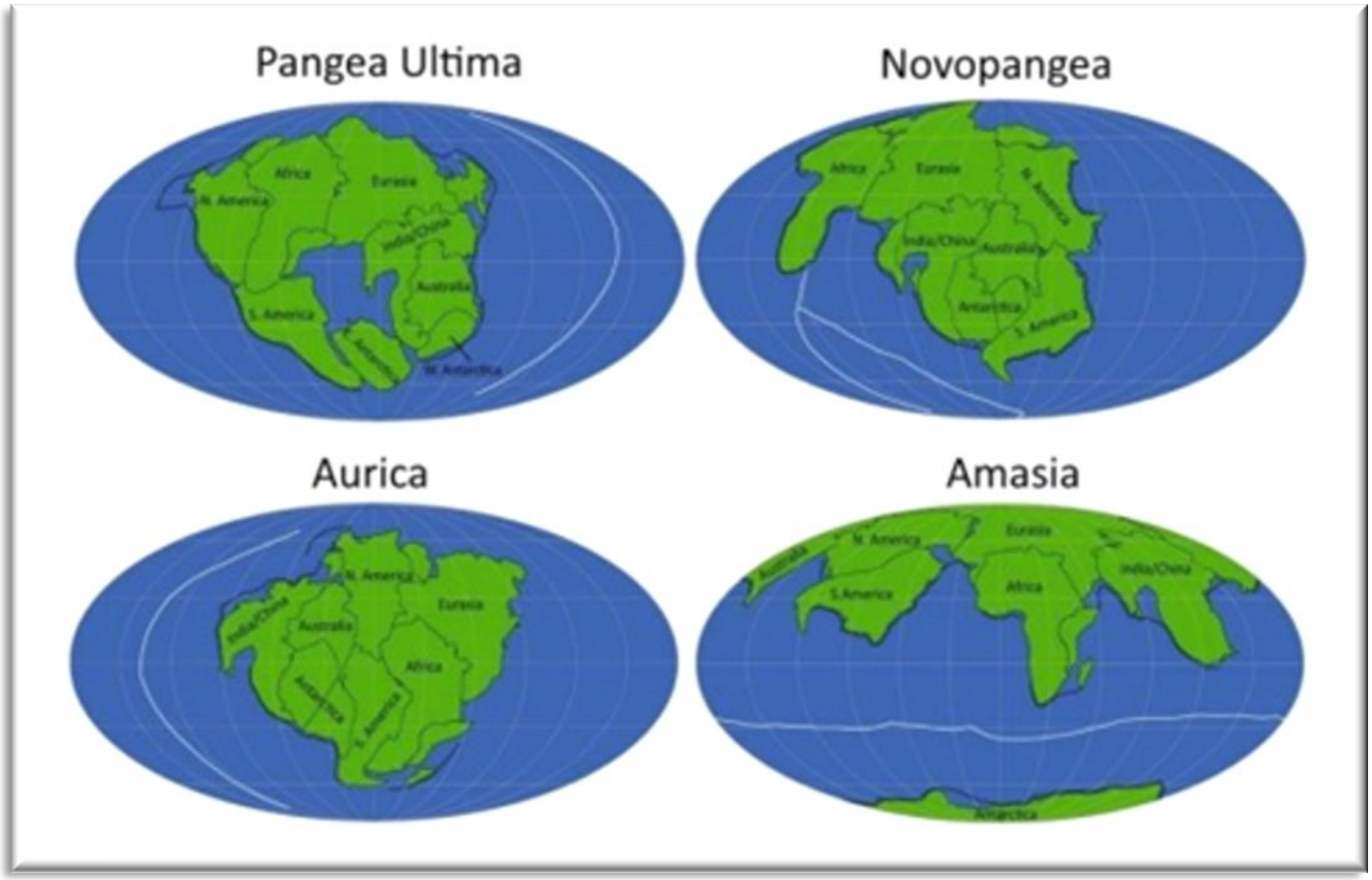
The final chapter of dinosaur history is a tale stretching across two very different worlds, each a vast supercontinent dominated by its own unique mix of predators and herbivores. Fossilized remains of a plant eater common to one of the two major land masses have been unexpectedly unearthed in rocks belonging to the other, prompting paleontologists to ask just how it managed to make such a leap. "*It was completely out of place, like finding a kangaroo in Scotland*," said University of Bath paleontologist Nicholas Longrich, who led a study on the recent discovery. This out-of-place 'kangaroo' was in fact a newly categorized type of crested duckbilled browser known as a *hadrosaurid* (of a *lambeosaurine* variety to be precise). Some 66 million years ago, as the Cretaceous period was drawing to a cataclysmic close, hadrosaurs of many different varieties were among the most common of herbivorous dinosaurs. At least, that was the case on the supercontinent Laurasia – a mass that would later split to give us today's continents of North America, Europe, and much of Asia. Far across the ocean, a separate land mass known as Gondwana was instead ruled by a diversity of long-necked, lumbering sauropods. The remains of these giants are commonly found in places such as Africa, India, Australia, and South America. Where Hollywood might see fit to mix the two groups together, broad stretches of water between the continents and long periods of isolation meant by the late Cretaceous, duckbills and long-necks would only have potentially mingled in distinct regions, such as in what is today Europe. This newest member of the *hadrosaurid* family just might be a new exception. Based on little more than some jaw pieces and a handful of teeth pulled out of a phosphate mine in Morocco, the find is evidence that at least one of these animals must have wandered farther out of Laurasia than ever suspected possible. Well, maybe not wandered, so much as paddled.

"*It was impossible to walk to Africa*," said Longrich. "*These dinosaurs evolved long after continental drift split the continents, and we have no evidence of land bridges. The geology tells us Africa was isolated by oceans. If so, the only way to get there is by water*." https://www.sciencealert.com/pony-sized-duckbill-dinosaur-fossil-found-in-the-last-place-anybody-would-suspect

Why Scientists Are So Worried About Antarctica's Doomsday Glacier

Officially called the Thwaites Glacier, this mass of ice nestled into the western edge of Antarctica is melting at an alarming rate. The rate at which Thwaites is slipping away and contributing to sea level rise is only half the reason researchers are concerned about its loss. Behind the glacier lies an even larger body of ice that, for as long as Thwaites is intact, is protected from contact with too-warm waters. If Thwaites melts away, that much-larger ice block will add water to our oceans as well, further driving up sea level rise. If and when this might happen, however, is what researchers are trying to learn. We do know that Thwaites Glacier is quite important. But still, how much and how fast that is going to increase into the decades and centuries is still uncertain. Getting answers to these critical questions about Thwaites is driving a multiyear, international research expedition. Called the International **Thwaites Glacier Collaboration**, the mission brings scientists down to the glacier to inspect how it's changing through a barrage of studies. The concern over the fate of this particular patch of ice dates to the 1970s, when scientists published some of the first papers explaining how the very shape of Thwaites and the continent it connects to makes for precarious melting conditions. Like other glaciers, Thwaites has a long, thin tongue of ice that sticks out into seawater. If you were to dive into the water beneath the protruding, visible ice and swim downward, you'd eventually see that Thwaites makes contact with rock. This interface is called the grounding line. As the ice disappears, the grounding line retreats and less of Thwaites sits on the rock. So long as Thwaites connects with the earth beneath it, the glacier will block warm waters from creeping up to the broader, thicker ice of the Western Antarctic Ice Sheet sitting behind it. But if Thwaites melts enough that it lifts off, the ice sheet will be exposed, too. And unlike the currently melting glacier, the ice sheet extends into a pit in the Earth's crust that gets as deep as 1.5 miles below sea level in some places. When exposed ice sits lower than the water, there's no stopping the melt and then the whole thing that's been stable and sitting on a continent for thousands of years will go away. If completely melted Thwaites would raise sea levels by 1.5 to 3 feet. But researchers still don't know exactly how much of the glacier will melt or when, which makes it difficult to know if the ice sheet sitting beyond Thwaites will wash away, too. Researchers are keeping close tabs on what's happening to the glacier, which will give them a much better shot at providing specific indications about where the situation is headed. https://www.discovermagazine.com/environment/why-scientists-are-so-worried-about-antarcticas-doomsday-glacier?

What will the next Pangea look like? It's hard to tell. The human-observable effects of plate tectonics are minuscule — an annual displacement of around 4 centimeters, the width of a honeybee's wingspan — so good luck tracking *that* with a calendar and a ruler. Nevertheless, researchers have theorized a number of possible outcomes. In 1982, American geologist Christopher Scotese posited **Pangea Proxima** — literally "the next Pangea." (Scotese originally called his hypothesis Pangea Ultima, meaning "the final Pangea," before, finally, hedging his bets.) From his study of the formation of previous supercontinents, Scotese



imagines a ring-shaped landmass. In his scenario, the Americas butt against Africa, which tilts eastward to dock with Eurasia; the latter has flipped perpendicular. South America and India form the coastline of an inland sea.

The next decade saw American and South African researchers proposing an alternative arrangement called **Amasia**. Extrapolating from the gradual widening of the Atlantic, they envision the Pacific Ocean "closing" as the Americas drift westward, fusing with Australia, then pivot clockwise around to Siberia; Eurasia and Africa retain their current longitudinal position, but shift northward, with the whole mass circling around the North Pole. Antarctica remains a separate landmass.

In the late 1990s, British geophysicist Roy Livermore postulated a configuration that he dubbed **Novopangaea**. Here, the Americas form its eastern edge, their western coastlines swinging together like pincers to embrace the docked mass of Antarctica and Australia at the hub. Africa legs off to the northwest.

A recent projection, **Aurica,** proposed in 2016, builds on research from **the American Geophysical Union** correlating ocean tides with the supercontinent cycle. Aurica is roughly similar to Novopangaea, but posits a rift separating China and India from the rest of Eurasia, causing the former to collide with Australia from the west while the latter circles the globe eastward before docking with the new supercontinent.

https://www.discovermagazine.com/planet-earth/the-next-pangea-what-earths-future-supercontinent-will-look-like

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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., 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

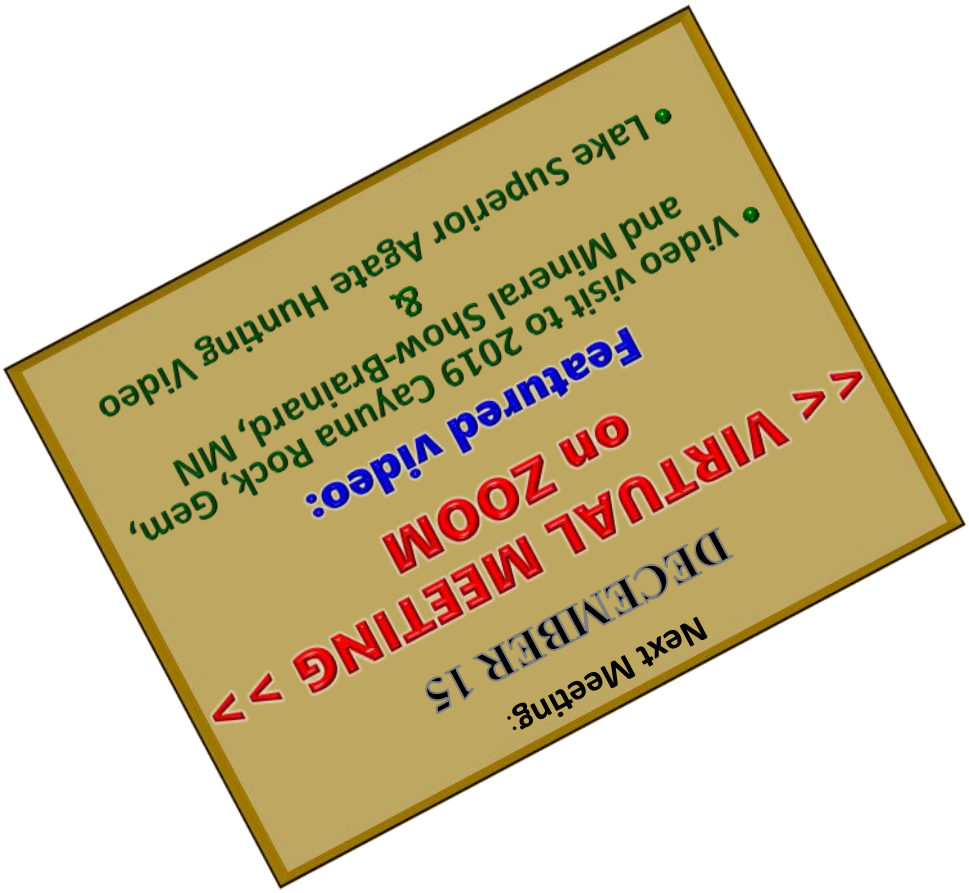
CEDAR VALLEY ROCKS & MINERAL SOCIETY

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:

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

CVRMS website:
cedarvalleyrockclub.org



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