

# Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

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

CEDAR VALLEY GEMS

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## Next CVRMS Meeting Tues. Nov. 19

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

*featured speakers:*

### Professor Jane Gilotti

University of Iowa

Department of Earth and Environmental Sciences

### **"Eclogite – the poster child for high-pressure metamorphism"**

**Eclogite** is a striking rock composed of green sodic pyroxene called omphacite and red to pink garnet. The garnet crystals hang like glassy balls on a green background, prompting the easy to remember name, *Christmas tree rock*. Eclogite is



formed at pressures above where plagioclase is stable and all the Na is found in omphacite (greater than 15 kilobars), hence it is known as a high-pressure metamorphic rock. Basalt and gabbro are the igneous parent rock of eclogite.

Eclogite is found in two main environments: kimberlite pipes and subduction zones, and they are good evidence that a rock has come from great depths, over 40 km, to arrive at the Earth's surface. This talk will highlight some beautiful examples of eclogite from around the world and examine its formation in different tectonic environments. **Some nice specimens will be given as prizes!**

**CVRMS Members**

**Wear Your Name Badges to the Meeting!**

**Let's make guests and visitors  
welcome at our meetings**



Petra Diamonds reported on September 21 that it had recovered an extremely rare 20.08 carat gem quality Type IIb blue diamond from its flagship Cullinan mine, the world's



Newly discovered 20.08 ct blue diamond

main source of rare blue diamonds. Petra bought Cullinan in 2008, aiming to breathe new life into one of the world's most famous mines. Best known for the 1905 discovery of the World's largest rough diamond (weighing 3,106 carats) that yielded the 530 carat *Star of Africa* (mounted in the British *Sovereign's Scepter*) and the 317 carat *Second Star of Africa*. It is also the mine in which a 4.8 ct. rough blue diamond was unearthed in December 2011, which later sold for \$1.45 million dollars (at the time a record breaking uncut price of \$300,000 per carat). It is the mine which in January 2014 produced a 26.6 carat blue diamond which was polished into a 7 carat internally flawless diamond, the *Star of Josephine*, that was sold by Sotheby's for \$9.49 million dollars, then a record breaking cut-stone price of \$1.35 million per carat. The mine has produced over 750 stones weighing more than 100 carats, and 130 diamonds weighing over 200 carats. A quarter of the World's rough diamonds larger than 400 carats are from the Cullinan mine. While Petra has not given a forecast on the value of the yet-unnamed new blue diamond, blue gem quality diamonds are among the world's most valuable. <https://www.serendipitydiamonds.com/blog/cullinan-petra-blue-diamond-discovery/>

## CVRMS Oct. 15 Meeting

### Hiawatha Community Center

**Meeting called to order** by Marv Houg, President 7:15 p.m.

**Introduction of new members or guests**- Toby Jordan, welcome back, and Brian and Monica Seamann

**Minutes of last meeting reviewed.** Motion to approve by Bill 2<sup>nd</sup> by Scott. Minutes approved as written.

**Treasurer's report** by Dale checking account balance \$7900.52. Motion to approve by Lisa, 2<sup>nd</sup> by Julie. Report approved for filing. Report included proceeds from auction with handouts explaining the various sales and items sold.

**Program:** Students from University of Iowa and Professor Jane Giloti presented their various trips and projects. Thanks to the club for providing scholarships.

**Doorprize:** Winner Mary Jane Leary

**Old Business:** A general recap of the auction with goods, bids and suggestions. Marv announced that we already have 1250 lots promised for next years. The popularity has grown. We had 1535 lots this year (more than we anticipated).

Some suggestions for next year- Make the alleyway bigger between the sections so visibility is better. Also make rows wider so people can get through easier. Prevent the piling of treasures which blocks the byway.

Kim suggested that the item for auction could be projected on a screen. Lots of ideas and more to come.

Marv suggested that next year we have designated spotters on both sides of audience so we do not miss bids. The bright green shirts showed up well in the photos. Reminder that the shirts will be used again for show. Marv once again thanked everyone for their help. Could not have done it without you.

**Show:** Meteorites is the theme of the 2020 show. The club needs to have a name for the show. Ray suggested Meteorites Earth's Oldest Rocks. Julie made a motion that we name the show **Meteorites: Earth's Oldest Rocks.** 2<sup>nd</sup> by Bill. Motion passed.

Bill reported on the last bus trip to the Henry Doorly Zoo in Omaha. 36 people on bus, 4 no shows. Thanks to Bill for organizing. Next year West Bend Grotto is possible. Let Bill know with suggestions.

**Field Trips:** Marv will lead a field trip to Klein and Conklin quarries on October 27. Watch for emails for info.

Geode Fest this year was a combination of rain, mud and tornado warnings.

Holiday Party will be the FIRST TUESDAY, Dec 3, at the Hiawatha Community Center. Bill and Ray will put together a slide show. Suggestions for the party are always welcome

**Adjournment:** Motion to adjourn by AJ, 2<sup>nd</sup> by Tom. 9:10p.m. Meeting adjourned

Respectfully submitted,  
Dell James, Secretary

## CVRMS Board Minutes Oct 29

Meeting called to order by Marv Houg at his home, 7:00 p.m.

Members present Marv Houg, Dale Stout, Ray Anderson, Sharon Sonleitner, Jay Vavra, and Kim Kleckner.

### Dale announces change in Christmas Party Date:

Dale announced that the date of the 2019 CVRMS Christmas Party is changed from Dec 10 to Dec 3 because of Hiawatha Community Center availability.

### Discussion of 2020 Rock Show (Mar 28-29)

Ray has 4 speakers lined up to present programs, would like one or two more. Raffle prizes discussed: Geode Cracker, Agate Slab, Set of Specimens, Bill says there is an outside chance to obtain another Jack Neuzil wooden dinosaur sculpture. Ray will prepare mockups of 6 posters for the show for discussion at next Board Meeting. Discussion of additional dealers; liked lady who makes stone pens and could demonstrate. Wish we had a sphere maker who could demonstrate. Marv will check with a "lakers" sphere maker from Wisconsin. Dale ordered 10 plastic double-sided "Rock Show" signs.

### 2020 CVRMS Auction:

Marv reported that he has already received offers of about 1300 lots for next years auction: we are effectively full!

### Bus trip to Omaha Zoo October 6:

Bill received nothing but good comments. Sharon moved for CVRMS financing a \$100 tip to drivers on future trips, Dale second, and unanimous vote approved.

### 2020 CVRMS Bus Trip:

Trip planned to Grotto of Redemption, West Bend, discussed possible additional stop at Rockford Fossil Park, both sites weather-dependent. Discussions will continue.

### Other items:

Marv assigned Bill, Jay, and Sharon to Nominating Committee for Board Members to be chosen at November 19 club meeting. Rick's board term is expiring.

Bill and Kim have outside presentations planned in near future.

Ray will inventory remaining green CVRMS Staff t-shirts and they will be available for members agreeing to work at the 2020 Rock Show

Discussion of glass case for River Products rocks display. Rick sent note saying it would be cheaper to buy than build. Jay located a possible case on-line.

Ray will collect zoo trip photos and compile a slide show for Holiday Party. We will also have a "Show and Tell" table for members to display and discuss their favorite rocks.

**Motion to adjourn** by Bill, 2<sup>nd</sup> by Marv. Adjourned 8:51 p.m.

Respectfully submitted,  
**Ray Anderson**, acting Secretary



## Titanite aka Sphene

Before 1982, the name "*sphene*" was common usage for this mineral. Then the International Mineralogical Association adopted the name "*titanite*" and discredited "*sphene*." Geologists and mineralogists worldwide quickly switched to the name "*titanite*" and it is now in common use. The name "*sphene*" is still the dominant usage in the gem, jewelry, and lapidary industries, where a name change can cause severe disruption in marketing gemstone and jewelry products. Titanite has a chemical composition of  $\text{CaTiSiO}_5$  and sometimes contains rare earth elements such as cerium, niobium, and yttrium. It can contain other elements such as aluminum, chromium, fluorine, iron, magnesium, manganese, sodium, and zirconium. Iron has a strong influence on the color of titanite. Small amounts of iron darken the color. Yellow and green specimens have a low iron content, while brown and black specimens have a higher iron content. Titanite is rare, occurring as an accessory mineral in a few igneous rocks including granite, granodiorite, diorite, syenite, and nepheline syenite. It is sometimes present



in marble or calcium-rich gneiss and schist. It often occurs as individual grains. When abundant, its habit is usually granular to massive. The best crystals are usually found in marble. Unlike other titanium minerals, titanite is rarely found in placer deposits. Its cleavage, parting, and a low hardness make it vulnerable to the abrasion of stream transport. It is a minor gemstone that is popular with collectors because of its high dispersion, one of the few minerals with a dispersion higher than diamond. The dispersion of diamond is 0.044, while the dispersion of sphene is 0.051. Specimens of sphene with high clarity can display a strong, colorful fire when light is passed through them (see accompanying image). Sphene is not commonly seen in jewelry. Its hardness of 5 to 5.5 on the Mohs scale, along with its easy cleavage and parting, make it too fragile as a ring stone. Reliable supplies of cut stones in commercial quantities have not been developed, and the jewelry-buying public is unfamiliar with the gem. For these reasons, sphene has not become a mainstream gem that is commonly available in jewelry. <https://geology.com/minerals/titanite.shtml>

## Spotlight Gemstones: Citrine / Topaz

### November's Birth Stones



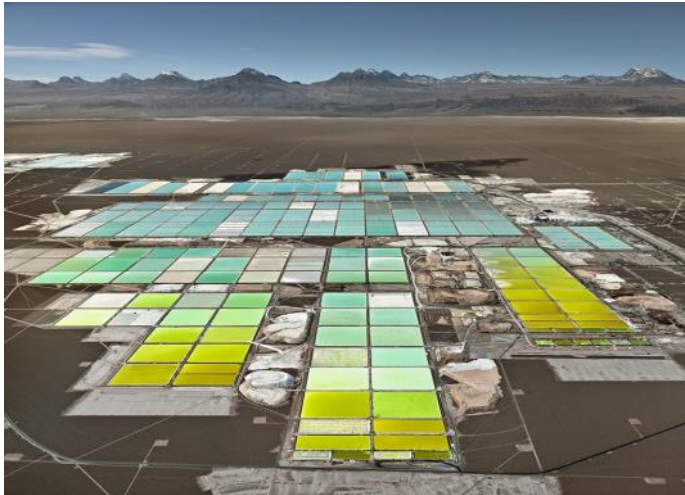
citrine

topaz

**Citrine** is a member of the large quartz family ( $\text{SiO}_2$ ), which, with its multitude of colors and structures, offers gemstone lovers almost everything their hearts desire in terms of adornment and decoration, from absolutely clear rock crystal to black onyx. The name citrine is derived from its color, the yellow of the lemon (although the most sought-after stones are a clear, radiant yellowish to brownish red). Like all crystal quartzes, the citrine has a hardness of 7 on the Mohs scale and is relatively resistant to scratches. With no cleavage it is also resistant to fracturing. Although citrine's refractive index is relatively low, the yellow stones have a mellow, warm tone that seems to have captured the last glow of autumn. Natural citrines are rare, and most good quality stones are found in Minas Gerais Brazil, Madagascar, and Hasawarka in the Ural mountains of Russia. Most commercial citrines are heat-treated amethyst or smoky quartz.

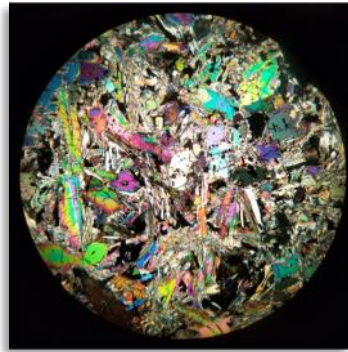
**Topaz** ( $\text{Al}_2\text{SiO}_4(\text{F},\text{OH})_2$ ) is one of the few gem minerals that contains fluorine. The gem can be found in many varieties; colorless, pink, and shades of yellow to sherry-brown are most common, but blue and green-blue stones can resemble aquamarine, and natural red and pink colors are extremely rare. Sherry colored crystals can be heat-treated before cutting, producing pink topaz, a process called "pinking." Its hardness of 8 makes it very resistant to scratching. **Orange topaz**, also known as **precious topaz**, is the traditional November birthstone (and the state gemstone of Utah), while blue topaz is the birthstone for December. Topaz is commonly associated with silicic igneous rocks (granite and rhyolite). It typically crystallizes in granitic pegmatites or in vapor cavities in rhyolite lava flows including those at Topaz Mountain in western Utah. The American Golden Topaz is the largest piece of cut yellow topaz in the world. It is sized at 22,892 carats (10 lbs) and has 172-facets (flat-faced cuts applied to gems, in order to help them reflect light.) The gem was cut from a piece of yellow topaz that was 26 lbs in size, discovered in the Minas Gerais, Brazil. It was donated to the Smithsonian Institute, and put on display in the National Museum of Natural History in Washington, D.C.

# What in the World?



What in the World is this colorful desert facility??

# October's Photo



Last month's "What in the World" image was a microscope photo of lunar mare basalt rock. This is the rock that makes up the dark patches on the moon, generated by massive basalt volcanism that filled the huge meteor craters on the Moon's surface during the Late Heavy meteorite Bombardment period (about 4.1 to 3.8 billion years ago).

Sample 12002: collected on Apollo 12

**Minerals:**

- Clinopyroxene (colorful stuff),
- Olivine (the other colorful stuff)
- Plagioclase (gray stuff),
- Ilmenite (opaque- black stuff)
- Native Iron (minor, opaque- other black stuff)
- Troilite (minor opaque- other other black stuff)

This Rock is between 3.24 and 3.36 billion years old

**HOLIDAY PARTY DATE CHANGED TO DEC 3**

## Rock Calendar CVRMS EVENTS OF INTEREST

### 2019

**Nov. 19 —CVRMS Monthly Meeting**  
Hiawatha Community Center 7:15 pm  
Featured Presentation  
*"Eclogite – the poster child for high-pressure metamorphism"*  
by Jane Gilotti —University of Iowa

**Dec. 3- CVRMS Holiday Pot Luck**  
Hiawatha Community Center  
6.30 pm



### 2020

**Jan. 21 —CVRMS Monthly Meeting**  
Hiawatha Community Center 7:15 pm  
Featured Presentation  
*"Volcanoes and Volcanic Rocks"*  
by Ray Anderson—CVRMS

**Feb. 18 —CVRMS Monthly Meeting**  
Hiawatha Community Center 7:15 pm  
Featured Presentation  
*to be announced*

**March 28-29 - CVRMS Gem, Mineral, and Fossil Show**  
*"Meteorites: Earth's Oldest Rocks"*  
Hawkeye Downs  
Cedar Rapids

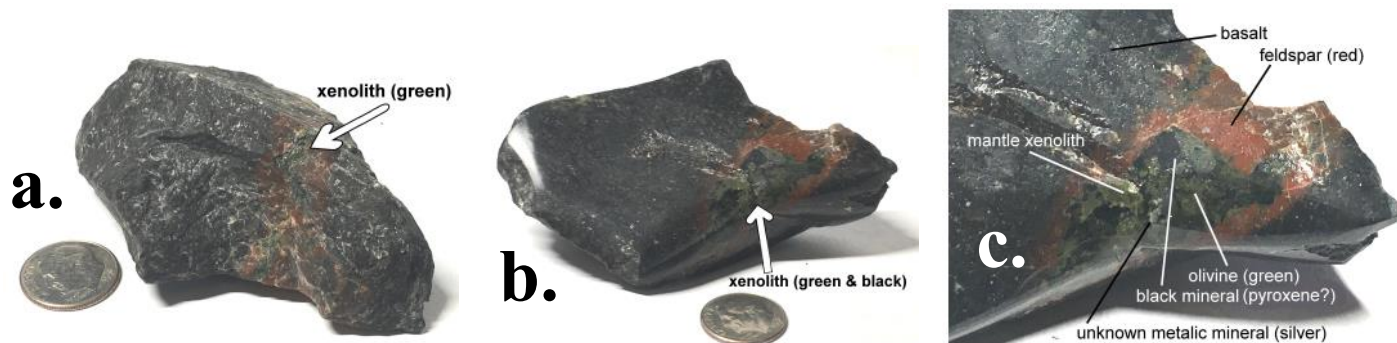


## Ask a Geologist by Ray Anderson aka "Rock Doc", CVRMS Vice President

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.

Bill Desmarais brought a sample of basalt that was quarried for railroad riprap to the October CVRMS board meeting. It turned out to include a mantle xenolith, and I thought it might be an interesting topic for this forum.

**Railroad track ballast rocks** are laid down below and around the ties that support the rails. The ballast rocks not only hold the tracks in place as the trains roll over them, they bear the load on the tracks (transferred through the railroad ties), facilitate drainage of water, and also keep down vegetation that might interfere with the track structure. Railroads usually choose ballast rocks that are durable such as granite, basalt, and quartzite, but sometimes also use more local stone such as limestone. Most of the basalt that is commonly used by railroads in this area is mined in Dresser, Wisconsin, so that was probably the origin of the rock discovered by Bill. Basalt is an extrusive igneous rock formed from the rapid cooling of magnesium-rich and iron-rich lava, usually derived from deep in the Earth's crust near the mantle. The basalts at Dresser, rocks of the Chengwatana Volcanic Group, were erupted about 1.1 billion years ago during the formation of the Midcontinent Rift System. This rifting extended entirely through the crust, so the magmas that formed these rocks had such a deep origin. Large outpourings of basalt, like those associated with the Midcontinent Rift and mined at Dresser, are called "*trap rocks*" by miners. Sometimes as the basaltic magmas are forced upward, pieces of rock through which they are moving are torn loose and incorporated into the flow. These rock fragments are called *xenoliths* (pronounced *zee'-no-liths*). The composition of the xenoliths in the basalt sample that sharp-eyed Bill found (see photos below) are primarily olivine and an unidentified black mineral (probably a pyrox-



Three views of Bill's xenolith-bearing basalt sample. Image **a.** shows the sample as found with the xenolith seen as a green area surrounded by red. Image **b.** shows the back side of the sample, polished to see the xenolith more clearly. Image **c.** is a close-up view of the xenolith with the constituent minerals identified.

ene). This combination of minerals forms a rock called a peridotite that is most commonly interpreted as having formed in the upper part of the Earth's mantle, between about 30 and 250 miles below the surface. In this sample, red feldspar crystals grew around the xenoliths before the magma erupted and solidified. The solidified basalt was deeply buried by subsequent lava flows where cracks and irregularities were filled hardening the rock. Today it is known as the hardest basalt-type rock mined in America. The Dresser basalt is so hard it was used by NASA to test the drills it used on its Lunar rovers. Bill will be bringing this rock to the CVRMS monthly meeting in Hiawatha on November 19, if you want to see it personally. Also, you will have an opportunity to learn more about mantle rocks, like Bill's peridotite xenolith, from our speaker, U. of Iowa professor and geologist **Jane Gilotti**, who will be presenting a program on **eclogites**, rocks formed under the high pressure conditions in the upper part of the Earth's mantle.

## The Largest Tyrannosaurus Rex Ever Discovered

University of Alberta paleontologists have just reported the world's biggest Tyrannosaurus rex and the largest dinosaur skeleton ever found in Canada. The 42 feet-long T. rex, nicknamed "Scotty," lived in prehistoric Saskatchewan 66 million years ago. "This is the rex of rexes," said Scott Persons, lead author of the study and postdoctoral researcher in the Department of Biological Sciences. "There is considerable size



The ancient dinosaur was found in Saskatchewan and is 42 feet long.

variability among Tyrannosaurus. Some individuals were lankier than others and some were more robust. Scotty exemplifies the robust. Take careful measurements of its legs, hips, and even

shoulder, and Scotty comes out a bit heftier than other T. rex specimens." Scotty, nicknamed for a celebratory bottle of scotch the night it was discovered, has leg bones suggesting a living weight of more than 10 tons, making it bigger than all other carnivorous dinosaurs. The scientific work on Scotty has been a correspondingly massive project. The skeleton was first discovered in 1991, when paleontologists including T. rex expert and friend of the CVRMS, U. Alberta professor **Phil Currie**, were called in on the project. But the hard sandstone that encased the bones took more than a decade to remove -- only now have scientists been able to study Scotty fully-assembled and realize how unique a dinosaur it is. It is not just Scotty's size and weight that set it apart. The Canadian mega rex also lays claim to seniority. "Scotty is the oldest T. rex known," Persons explains. "By which I mean, it would have had the most candles on its last birthday cake. You can get an idea of how old a dinosaur is by cutting into its bones and studying its growth patterns. Scotty is all old growth." But age is relative, and T. rexes grew fast and died young. Scotty was estimated to have only been in its early 30s when it died. "By Tyrannosaurus standards, it had an unusually long life. And it was a violent one," Persons said. "Riddled across the skeleton are pathologies -- spots where scarred bone records large injuries." Among Scotty's injuries are broken ribs, an infected jaw, and what may be a bite from another T. rex on its tail -- battle scars from a long life. "I think there will always be bigger discoveries to be made," said Persons "But as of right now, this particular Tyrannosaurus is the largest terrestrial predator known to science."

<http://www.geologyin.com/2019/04/the-largest-tyrannosaurus-rex-ever.html>

## The Melting Arctic Ice Has Revealed 5 New Islands We Never Knew Were There

Five new islands not previously known to exist have been discovered within the remote Arctic archipelago of Novaya Zemlya, the Russian navy has confirmed. At a press conference marking the completion of a naval expedition, Vice Admiral Alexander Moiseyev of Russia's Northern Fleet explained the new islands were revealed by glaciers melting in the region. "Mainly this is of course caused by changes to the ice situation," Moiseyev told media in Moscow. "We thought they were (part of) the main glacier [called Vylki, aka Nansen]. Melting, collapse, and temperature changes led to these islands being uncovered." The finding of the islands was first announced by the Russian Ministry of Defense in August, but in truth their discovery dates back to 2016, when student engineer Marina Migunova observed unknown land masses in satellite imagery while working on a research paper. In the new expedition, naval researchers surveyed the topography of the five islands, which lie in Vize Bay at Novaya Zemlya's Severny Island, and are thought to have emerged from their icy coverings sometime around 2014. In size, the islands range from very small to very large. Two are just tiny (the smallest measuring only about 100 ft by 100 ft), but the largest is expansive, covering a region of some 590,000 square feet. As for the long-term stability of the newly revealed land masses, it's too early to say, since receding glaciers are known to destabilize the land that exists underneath them, as it loses a fortifying ice layer on top. But despite the clear land being only a few years old, life-forms have already colonized the young islands, with Kornis saying he'd observed algae, plant life, and birds, in addition to evidence of larger land animals in the fledgling ecosystem. "We've found the remains of a seal torn up by a bear," Kornis said. "So, if all of this manages to take root, the islands will survive." According to the Russian navy, these new islands are not alone, joining a list of at least a dozen new islands that have emerged in the Arctic region in the past few years -- a phenomenon so vast, even Russian schoolchildren are discovering islands. In light of the way things are in the world, we should not be shocked, scientists say. "The discovery of islands as the Nansen glacier retreats is not a surprise as a glacier is simply a river of ice transporting compacted snow and ice from the higher grounds to the sea," said oceanographer Tom Rippeth from Bangor University in Wales. "As the climate warms, the glaciers shrink and expose the land below. This is yet another symptom of the enhanced warming being experienced in the Arctic -- in this region the average temperature is some 5 to 6 degrees Celsius warmer in response to climate change."

<https://www.sciencealert.com/the-melting-arctic-has-revealed-five-new-islands-we-never-knew-were-there>



## Fossil Trove Shows Life's Fast Recovery After Big Extinction

A remarkable trove of fossils from Colorado has revealed details of how mammals grew larger and plants evolved after the cataclysm that killed the dinosaurs. The thousands of specimens let scientists trace that history over a span of 1 million years, a mere eye-blink in Earth's lifespan. Sixty-six million years ago, a large meteorite smashed into what is now the Yucatan Peninsula of southeastern Mexico. It unleashed broiling waves of heat and filled the sky with aerosols that blotted out the sun for months, killing off plants and the animals that depended on them. More than three-quarters of species on Earth died out. But life came back, and land mammals began to expand from being small creatures into the wide array of forms we see today — including us. So the new find taps into *"the origin of the modern world,"* said Tyler Lyson, who authored a paper reporting the fossil finds in the October 24 edition of the journal [Science](#). The fossils were recovered from an area of steep bluffs covering about 10 square miles near Colorado Springs, starting three years ago. Lyson, of the Denver Museum of Nature and Science, found little in that area when he followed the standard practice of



This image provided by HHMI Tangled Bank Studios in October 2019 shows a rendering of the ancient *Carsiotrychus* mammal taken from the PBS **NOVA** special, *Rise of the Mammals*.

scanning for bits of bone. But that changed when he began looking instead for rocks that can form around bone. When the rocks were broken open, skulls and other fossils within were revealed. Lyson said it's not clear how wide a geographic region the fossils' story of recovery applies to, but that he thinks they show what happened over North America. *"We just know so little about this everywhere on the globe,"* he said. *"At least now we have at one spot a fantastic record."* Experts not connected to the study were enthusiastic. It's *"an unparalleled documentary of how life on land recovered"* after the asteroid impact, said P. David Polly of Indiana University in Bloomington. *"The sheer number of fossil specimens and the quality of their preservation are exceptional"* for this time period, he said. The fossils' story certainly represents what happened in central North America and perhaps more broadly, he wrote. Stephanie Smith of the Field Museum in Chicago said the study's detailed focus on a single area can help scientists understand the complexity of recovery when combined with results from elsewhere. Scientists have previously found little evidence about what happened in the aftermath of the meteorite crash, especially on land, said Jin Meng of the American Museum of Natural History in New York. The new work, he said, appears to provide *"the best record on Earth to date."* The study reports on hundreds of mammal fossils representing 16 species and more than 6,000 plant fossils. Researchers also analyzed thousands of pollen grains to see what plants were alive at various times. Analysis of leaves indicated several warming cycles during the period. Here's the recovery story the fossils tell: The area had been a forest before the meteorite hit, home to dinosaurs like T. rex and mammals no bigger than about 17 pounds. Soon after the disaster, the environment was blanketed with ferns and the biggest mammal around was about as heavy as a rat. The world was in a warming period, as documented in previous studies. By about 100,000 years after the meteorite impact, the forest was dominated by palm trees and mammals had grown to the weight of raccoons, almost as big as before the meteorite crash. *"That's a pretty rapid recovery, or at least one aspect of recovery,"* Lyson said. By 300,000 years, the walnut tree family had diversified, and the biggest mammals were plant eaters about as heavy as a large beaver. Based on other studies of their diet, they may have evolved along with those trees, Lyson said. By 700,000 years, the fossil record shows the first known appearance of legume plants, the family that includes peas and beans. And it revealed the two largest mammals found in the study, with the larger one weighing about 100 pounds, roughly like a wolf. That is about 100 times heavier than the mammals that survived the extinction, *"which I think is pretty fast"* for growth, Lyson said. What drove mammals to get bigger? The main factor was the disappearance of the dinosaurs, leaving an ecological niche to be filled, he said. But the quality and types of food on the landscape probably also played a role, he said. The simultaneous appearance of legume plants and bigger mammals suggests the plants may have provided a *"protein bar moment,"* Lyson said. He said the mammals were creatures that evolved from animals that had survived extinction or those that immigrated from elsewhere. Zhe-Xi Luo of the University of Chicago, who did not participate in the work, said the report is remarkable for tying together records for plants, mammals and temperature, giving a *"holistic picture."* Scientists expected mammals to recover after the dinosaur extinctions, he said, and the new work *"is a huge step forward in getting a firm understanding about just how it happened."*

<https://apnews.com/320eb3652f864fd9b6cfde8309daf14d?fbclid=IwAR2UXKVXEP20aaQavbT23y9TFxlpZmlhOqHiGLrwb38X6RdMDx9PNizTs>

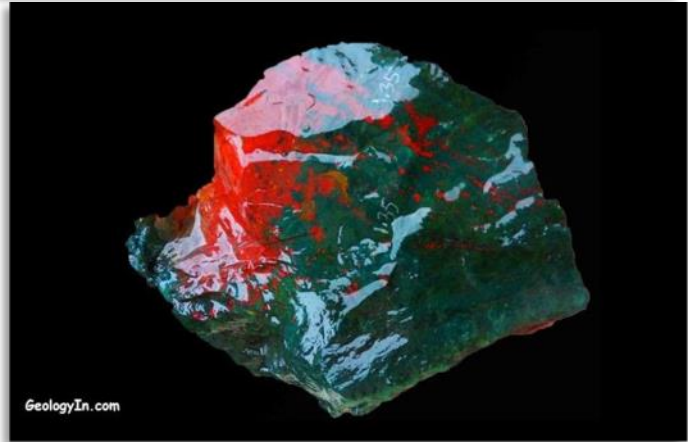
## 480-million-year-old trilobite 'traffic jams' may reveal ancient migratory behavior



For decades, scientists have been digging up groups of fossilized trilobites—tough, armored arthropods that lived in ancient oceans—only to find the creatures lined up like well-behaved kindergartners on their way to lunch. Now, researchers studying ancient fossils in Morocco think they know why. Previous theories argued that the lined-up fossils had something to do with how the trilobites died—maybe the arthropods were swept into lines by strong currents, or maybe several of them made their way into burrows one after another and then perished. But to a team of researchers in Europe and Morocco, those theories didn't quite add up. When the team examined several clusters of 480-million-year-old trilobite fossils from Morocco (above), they noticed that the queued trilobites were mostly adults or semi-adults—no babies allowed—and that the majority were facing the same direction. If the lines were the result of random currents, there would probably be a wider variety of ages, and some of the trilobites would likely be facing backward. The researchers also didn't find typical signs of burrows in the sediment surrounding the creatures. Taken together, these factors led the researchers to speculate that the trilobites had died in the midst of their ill-fated conga line. The trilobites may have lined up to trek to distant mating grounds (much like modern spiny lobsters) or to escape environmental upheavals such as storms, the researchers write in an October edition of *Scientific Reports*. In either case, the creatures may have assumed their arrangement to reduce drag, similar to geese flying in V formations. The trilobites were blind, so they couldn't have queued up by sight. That means they likely found each other and organized using touch, chemical signals, or a mix of both—a sophisticated behavior for such primitive creatures.

[https://www.sciencemag.org/news/2019/10/480-million-year-old-trilobite-traffic-jams-may-reveal-ancient-migratory-behavior?fbclid=IwAR1ap-KihuRt6\\_u2cfj\\_hwxXdSrWWTiBYvUNEC6Vcc7ID9jXEALPb2TW2geA](https://www.sciencemag.org/news/2019/10/480-million-year-old-trilobite-traffic-jams-may-reveal-ancient-migratory-behavior?fbclid=IwAR1ap-KihuRt6_u2cfj_hwxXdSrWWTiBYvUNEC6Vcc7ID9jXEALPb2TW2geA)

## Bloodstone: Interesting Facts About Heliotrope



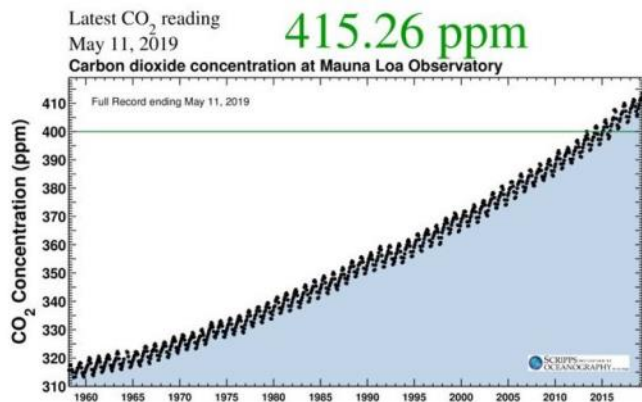
**Bloodstone** is an opaque, dark-green Chalcedony (quartz) with red spots. An old name still used in Europe is heliotrope (Greek for sun turner). Used often as seals for men's rings and for other ornamental objects, the mineral aggregate heliotrope is a variety of jasper or chalcedony (which is a cryptocrystalline quartz). The red inclusions are supposed to resemble spots of blood; hence the name "bloodstone." The name "heliotrope" derives from various ancient notions about the manner in which the mineral reflects light. Bloodstone is a **cryptocrystalline** quartz. It inherits from that a conchoidal fracture and a hardness of approximately 6.7-7 on the Mohs hardness scale. Bloodstone (**Heliotrope**) may be classified as a Jasper or Chalcedony variety of Quartz, and is usually a combination of the two. It is typically defined as a dark green Chalcedony with blood-like spots of Red Jasper or iron **oxide inclusions**. It occurs as massive formations, ranging from dark green to greenish-blue or greenish-black, and may be translucent to opaque with a waxy, resinous luster. In addition to the spots and streaks of **Red Jasper**, some formations contain inclusions that are yellow or white, while others lacking inclusions may be entirely green. Bloodstone has been referred to as Blood Jasper and specimens with only yellow inclusions have been called Plasma. In the ancient world it was considered to be a **semi-precious** stone or gem, and was used extensively as signet seals and in jewelry, as well as being carved into decorative cups, small vases and statuettes.

[https://www.geologyin.com/2018/03/bloodstone-interesting-facts-about.html?fbclid=IwAR27RLL42blaC67uEb8cbkxvfa\\_5A1wiqiM-](https://www.geologyin.com/2018/03/bloodstone-interesting-facts-about.html?fbclid=IwAR27RLL42blaC67uEb8cbkxvfa_5A1wiqiM-)



# In All of Human History, We Haven't Lived With The Kind of Atmosphere We Have Today

We humans have officially entered uncharted territory. In the roughly 2.5 million years our kind has walked the Earth, never before have we endured such an atmosphere. New research on ancient soil has now confirmed that carbon dioxide levels in the past sixty years are the highest we've experienced in all of human history. Throughout the entire



Pleistocene era - which started 2,580,000 years ago - the authors found concentrations of CO<sub>2</sub> were, on average, roughly 250 parts per million. Yet in the past sixty years or so, that consistency has appeared to rapidly unravel. Today, the findings suggest, our planet has reached 415 ppm for the first time in 2.5 million years. "According to this research, from the first *Homo erectus*, which is currently dated to 2.1 to 1.8 million years ago, until 1965, we have lived in a low-carbon dioxide environment - concentrations were less than 320 parts per million," explained geoscientist Yige

Zhang from Texas A&M University. "So this current high-carbon dioxide environment is not only an experiment for the climate and the environment - it's also an experiment for us, for ourselves." To figure out where we are going, first requires us to know where we've been. Studying past climates, Zhang says, can help provide some of that perspective and hopefully help us navigate our uncertain future. Because they trap tiny bubbles of air, ice cores are often used by climate scientists as a record of the historical CO<sub>2</sub> levels in our planet's atmosphere. But these samples only go back hundreds of thousands of years and not millions. To dive deeper into Earth's history, Zhang and his colleagues turned to soil. As a natural part of the carbon cycle on Earth, soil creates carbonates as it forms, and these tiny traces can be useful as indicators of past climates. Analyzing carbonates in fossil soils from the Loess Plateau in China, the team was therefore able to reconstruct CO<sub>2</sub> levels from millions of years ago. "The Loess Plateau is an incredible place to look at aeolian, or wind, accumulation of dust and soil," said Zhang. "The earliest identified dust on that plateau is from 22 million years ago. So, it has extremely long records." While it's true that soil carbonates are only a proxy for ancient climates, the results from the Loess Plateau appear to match other estimates, which were made using ice cores and blue ice records. Zhang and his team, however, are still not content. They plan on refining their techniques for soil analysis to improve their estimates even more, potentially using the technique on soils as old as 23 million years. "The past is the key to our future," Zhang stated. "Earth has a long history, and a lot of things from climate and life and environment have changed. .. Paleoclimate is important for us to learn about the past and maybe to predict the future." The findings were published in *Nature Communications*.

[https://www.sciencealert.com/in-all-of-human-history-we-haven-t-lived-with-the-kind-of-atmosphere-we-have-today?utm\\_source=ScienceAlert+-+Daily+Email+Updates&utm\\_campaign=b868a5a2bd-MAILCHIMP\\_EMAIL\\_CAMPAIGN&utm\\_medium=email&utm\\_term=0\\_fe5632fb09-b868a5a2bd-365948861](https://www.sciencealert.com/in-all-of-human-history-we-haven-t-lived-with-the-kind-of-atmosphere-we-have-today?utm_source=ScienceAlert+-+Daily+Email+Updates&utm_campaign=b868a5a2bd-MAILCHIMP_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_fe5632fb09-b868a5a2bd-365948861)

## T. Rex Really Could Crush a Car in Its Jaws, Without Damaging Its Own Skull

The *Tyrannosaurus rex* had the strongest bite of any known land animal – extinct or otherwise. The king of the dinosaurs was capable of biting through solid bone, but paleontologists had long been baffled as to how it accomplished this feat without breaking its own skull. In a new study published in the journal *The Anatomical Record*, researchers found that



the *T. rex* had a rigid skull, like those of modern-day crocodiles and hyenas, rather than a flexible one like birds and reptiles. That rigidity enabled the dinosaur to bite down on its hapless prey with a force upwards of 7 tons. "The highest forces we estimated in *T. rex* were just shy of 64,000 Newtons, which is about 7.1 tons of force," Ian Cost, the lead author of the new study reported. Modern-day salt-water crocodiles, which hold the chomping record for any living animal, clamp down with a force of 16,460 Newtons – only about 25 percent as strong as a *T. rex*'s bite. Previously, scientists had suggested that the *T. rex*'s roughly 6-foot-long, 4-foot-tall skull had flexible joints – a characteristic called *cranial kinesis*. Some creatures need to have parts of their skull moving different directions at once, and independently of their jaws. Snakes that swallow animals whole, or birds that have to nibble awkwardly-shaped foods, benefit from having a mobile skull. Paleontologists first hypothesized that *T. rex* might also have benefited from mobile joints, moving its skull bones around to help

bite with full force. But Cost said that thinking didn't align with what scientists observed in modern-day predators like crocodiles and hyenas, which leverage the greatest bite forces of any animals alive today. Crocs' skulls are very rigid, with little to no cranial kinesis. So Cost's group modelled how parrots' and geckos' skulls and jaws – two animals with mobile skulls – worked, and then applied those movements to a *T. rex* skull. "What we found was that the skull of *T. rex* actually does not react well to being moved around and prefers to not move," Cost said. According to Casey Holliday, a co-author of the study, there's a trade-off between movement and stability when a creature bites down with a lot of force. "Birds and lizards have more movement but less stability," he said. Less bite stability and range of motion limits the amount of bite force an animal can muster. Mark Norell, a curator at the American Museum of Natural History, has described the *T. rex* as "a head hunter," since the predator had the rare ability to bite through solid bone and digest it. Paleontologists know this from the dinosaur's fossilized poop; they have discovered *T. rex* faeces containing tiny chunks of bone eroded by stomach acid. According to Cost, a rigid skull enabled the *T. rex* to bite through bone. That's how the dinosaur was "capable of producing enough force to crush some cars, but maybe not every car." He added that funneling the *T. rex*'s 7.1 tons of bite force "through a tooth or two at impact results in incredible pounds per square inch of pressure that could puncture-crush many vehicles, Jeep tires included." In the 1993 Hollywood blockbuster, *Jurassic Park*, a *T. rex* escapes its paddock and attacks two Jeeps that have broken down nearby. The predator, hoping to nibble on two kids trapped inside the car, flips one Jeep upside down and proceeds to bite into the vehicle's undercarriage, puncturing a tire. But the *T. rex* wasn't the only Cretaceous-era dinosaur to have an immobile skull, according to Holliday. The Triceratops and Ankylosaurs also had fixed, akinetic skulls. Plus, some close relatives of the *T. rex*, including Oviraptors and Therizinosaurs, don't have the features that suggest they had flexible skulls, either. "A bulk of the evidence points to *T. rex* being a predator, not a scavenger," Gregory Erickson, a paleontologist from Florida State University, [previously told Business Insider](#). "It was a hunter, day in and day out." Cost said his study results, which indicate the *T. rex*'s skull handled prey in a similar way to a hyena's, could shed some light on the debate. "Hyenas, we know, are both hunters and scavengers," he said. "I think, if anything, that *T. rex* was both a hunter and an opportunistic scavenger."

[https://www.sciencealert.com/t-rex-really-could-have-crushed-a-car-with-its-bite-new-study-shows?utm\\_source=ScienceAlert+-Daily+Email+Updates&utm\\_campaign=84fcdee430-MAILCHIMP\\_EMAIL\\_CAMPAIGN&utm\\_medium=email&utm\\_term=0\\_fe5632fb09-84fcdee430-365948861](https://www.sciencealert.com/t-rex-really-could-have-crushed-a-car-with-its-bite-new-study-shows?utm_source=ScienceAlert+-Daily+Email+Updates&utm_campaign=84fcdee430-MAILCHIMP_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_fe5632fb09-84fcdee430-365948861)



## What Percent of Earth is Water ?

The Earth is often compared to a majestic blue marble, especially by those privileged few who have gazed upon it from orbit. This is due to the prevalence of water on the planet's surface. While water itself is not blue, water gives off blue light upon reflection. For those of us confined to living on the surface, the fact that our world is mostly covered in water is a well known fact. But how much of our planet is made up of water, exactly? Like most facts pertaining to our world, the answer is a little more complicated than you might think, and takes into account a number of different qualifications. In simplest terms, water makes up about 71% of the Earth's surface, while the other 29% consists of continents and islands. To break the numbers down, 96.5% of all the Earth's water is contained within the oceans as salt water, while the remaining 3.5% is freshwater lakes and frozen water locked up in glaciers and the polar ice caps. Of that fresh water, almost all of it takes the form of ice: 69% of it, to be exact. If you could melt all that ice, and the Earth's surface were perfectly smooth, the sea levels would rise to an altitude of 1.7 mi. Aside from the water that exists in

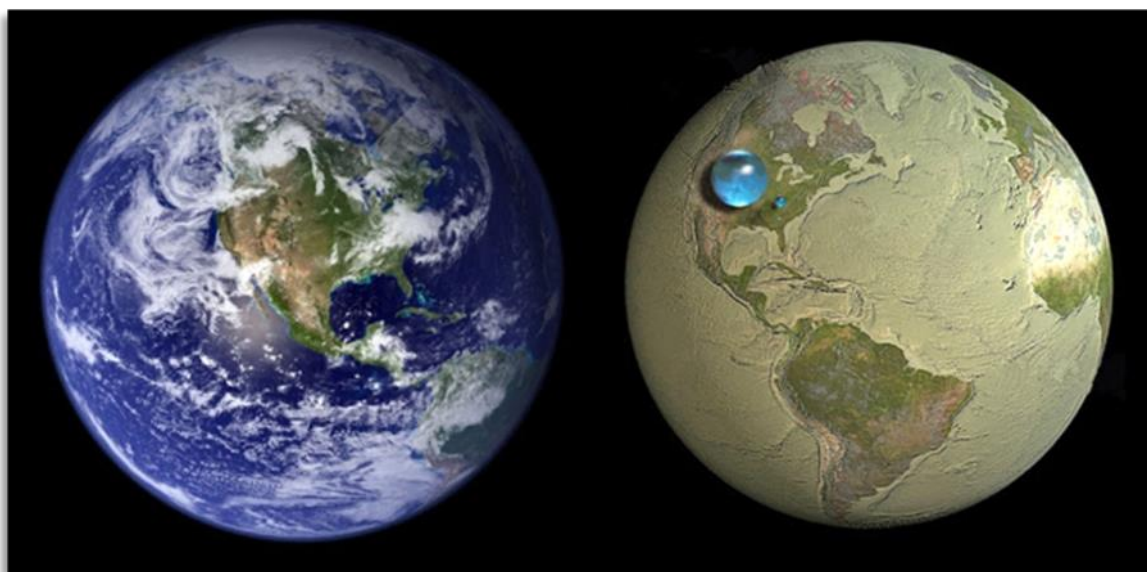


Illustration showing all of Earth's water, liquid fresh water, and water in lakes and rivers.

Credit: Howard Perlman, USGS/illustration by Jack Cook, WHOI

ice form, there is also the staggering amount of water that exists beneath the Earth's surface. If you were to gather all the Earth's fresh water together as a single mass (as shown in the image at left) it is estimated that it would measure some 333 million cubic miles (mi<sup>3</sup>) in volume. Meanwhile, the amount of water that exists as groundwater, rivers, lakes, and streams would constitute just over 2.5 million mi<sup>3</sup>, which works out to a little over 0.7%. Seen in this con-

text, the limited and precious nature of freshwater becomes truly clear. But how much of Earth is water—how much water contributes to the actual mass of the planet? This includes not just the surface of the Earth, but inside as well. Scientists calculate that the total mass of the oceans on Earth is  $1.50 \times 10^{18}$  tons, which is 1/4400 the total mass of the Earth. In other words, while the oceans cover 71% of the Earth's surface, they only account for 0.02% of our planet's total mass. The origin of water on the Earth's surface, as well as the fact that it has more water than any other rocky planet in the Solar System, are two of long-standing mysteries concerning our planet. Not that long ago, it was believed that our planet formed dry some 4.6 billion years ago, with high-energy impacts creating a molten surface on the infant Earth. According to this theory, water was brought to the world's oceans thanks to icy comets, trans-Neptunian objects, or water-rich meteoroids from the outer reaches of the main asteroid belt colliding with the Earth. However, more recent research conducted by the Woods Hole Oceanographic Institution, has pushed the date of these origins back further. According to this new study, the world's oceans also date back 4.6 billion years, when all the worlds of the inner Solar System were still forming. This conclusion was reached by examining meteorites thought to have formed at different times in the history of the Solar System. Carbonaceous chondrite, the oldest meteorites that have been dated to the very earliest days of the Solar System, were found to have the same chemistry as those originating from protoplanets like Vesta. This includes a significant presence of water. These meteorites are dated to the same epoch in which water was believed to have formed on Earth – some 11 million years after the formation of the Solar System. In short, it now appears that meteorites were depositing water on Earth in its earliest days. While not ruling out the possibility that some of the water that covers 71 percent of Earth today may have arrived later, these findings suggest that there was enough already here for life to have begun earlier than thought.

<http://www.geologyin.com/2019/09/what-percent-of-earth-is-water.html>

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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](http://101EmmonsSt.HiawathaIA). 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.

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 and can be sent to: Dale Stout, 2237 Meadowbrook Dr. SE, Cedar Rapids, IA 52403**

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



# CVRMS

## ELECTION OF CVRMS 2020 OFFICERS AT NOVEMBER ANNUAL MEETING

The November 19 CVRMS meeting is our official **Annual Meeting**, which includes election of officers. Terms are 2 years, except for Directors, which are 3 years. All officers are up for election except Jay and Bill. Marv appointed a Nominating Committee of Sharon Sonnleitner, Bill Desmarais and Jay Vavra, who present the following slate of nominees:

<b>President</b>	Marv Houg
<b>Vice President</b>	Ray Anderson
<b>Treasurer</b>	Dale Stout
<b>Secretary</b>	Dell James
<b>Editor</b>	Ray Anderson
<b>Liaison</b>	Kim Kleckner
<b>Director '19</b>	Jay Vavra
<b>Director '20*</b>	Bill Desmarais
<b>Director '21*</b>	Toby Jordan
<b>Webmaster</b>	Sharon Sonnleitner

Anyone else interested in serving as an officer, please nominate yourself, or have someone nominate you, from the floor at the November 19 meeting.



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