



# 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. Apr. 15

7:15 pm

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

*featured presentation*

## “Iowa’s Hydrogen Potential”

by **Ryan Clark**

Iowa Geological Survey  
UI College of Engineering



Iowa is becoming a “hot bed” for hydrogen exploration.



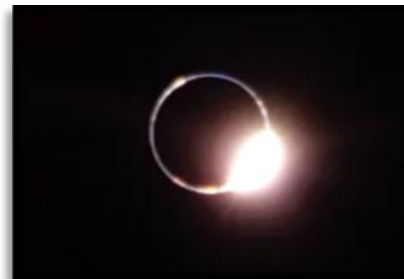
As familiar as the moon is to us, astronomers still don't quite know how old it is. Our closest celestial neighbor was likely formed when a Mars-sized planetoid slammed into Earth. Lunar rock samples put the collision at **4.35 billion years** ago, but planet formation models and zircon fragments from the moon's surface suggest it happened at least **4.51 billion years** ago. Why the big gap?

**New research:** In a new study, scientists used computer modeling and analysis of the 4.35 billion-year-old lunar samples. They believe the samples may actually have come from an event after the moon's formation when it temporarily heated up, causing its surface to melt and then crystallize. How did this happen? As the moon orbited Earth it was squeezed and stretched by Earth's gravity, resulting in “tidal heating events” that melted the surface.

**What the experts say:** “No previous study has synthesized all the available evidence comprehensively,” says Yoshinori Miyazaki, a geophysicist at the California Institute of Technology. “This paper provides a better view in resolving the discrepancies between different age estimates.”

### More on the moon:

The lunar lander Blue Ghost, which made moonfall on March 2, witnessed the total lunar eclipse on March 13 from the surface of the moon, which was technically a *solar* eclipse from its vantage point on the Mare Crisium landing site. It captured the below image around 3:30 am CDT showing the sun emerging from totality behind Earth.



<https://mail.google.com/mail/u/0/?pli=1#inbox/FMfcgzQZTgVpbdWgSnXXDXXtsMfsmPMM>

## CVRMS Meeting March 18 – Minutes –

**MINUTES ARE NOT AVAILABLE FOR THE MARCH 18, 2025 CVRMS CLUB MEETING AT THIS TIME BECAUSE SECRETARY DELL JAMES WAS INJURED IN A FALL AND TEMPORARILY HOSPITALIZED. SHE IS NOW RECOUPORATING AND WILL HOPEFULLY RETURN TO HER DUTIES SOON.**



Sue is the nickname given to FMNH PR 2081, one of the largest and best preserved specimens of *Tyrannosaurus rex* ever discovered, 90% complete (250 bones out of 380 known *T. rex* skeletons have been found to have). At over 40 feet in length and about 13 feet high, it is physically one of the largest ever discovered. What sets it apart, however, is also the curious story that brought it to light. Discovered by collector and explorer Sue Hendrickson on August 12, 1995, from which it then took its nickname, it is the result of a coincidence: after completing a project at the Cheyenne River Indian Reservation in South Dakota, Hendrickson and her team were leaving when they noticed a flat tire on their truck. While the rest of the group worked on fixing the truck, Sue Hendrickson decided to explore some nearby ridges that they hadn't looked at enough before. Walking along one, she discovered small pieces of bone at the base, and noticed that larger pieces were sticking out just above. They were later able to determine that they were from a *T. rex* by their distinctive contours, and they were also able to estimate their age at about 67 million years ago, during the Cretaceous period, and were then able to reconstruct what is now housed at the Field Museum.



## CVRMS Board Meeting Mar. 25 – Minutes –

**MEETING CALLED TO ORDER:** 7:17 pm by Marv Houg at his house. Board members present, Jay Vavra, Marv Houg, Dale Stout, Ray Anderson, Sharon Sonnleitner, Kim Kleckner, Laura Halladay, Matt Burns.

**SECRETARY MINUTES FROM LAST MEETING.** Minutes of previous meeting were reviewed. Kim made a motion to accept, second by Matt, motion passed.

**TREASURERS REPORT.** Dale reported that there was no difference from the report presented at the previous general meeting

**2025 ROCK SHOW REVIEW:** The show theme, *THE ICE AGE*, proved to be popular. The show was well attended with 4,386 attendees (3,199 adults, 1,087 kids) compared with an attendance of 4,172 last year. Talks were generally well attended, and the displays and posters were excellent. The raffle tickets (1200) sold out at \$1 each (or 6 for \$5). See page 8 for show photographs.

**2025 ROCK AUCTION SEPT. 20-21:** An ad will be placed in the Collectors' Journal and photos of lots will be posted on Facebook. **Food;** Dale will check with food truck lady for Saturday meals, and Sharon will supervise Club provision of food on Sunday.

**FIELD TRIPS:** Matt will be organizing a field trip to River Products' Riverside sand and gravel facility in near future. **Sheffield geode trip** postponed (mud). Laura said that the Haunted Ridge field trip is scheduled for May 31—June 2, and she will look into organizing a trip to Moose Lake Minnesota for the agates show.

**MOTION TO ADJOURN:** by Kim, second by Ray. Motion approved. Meeting adjourned at 9:15 pm.

Respectfully submitted

*Ray Anderson*, Acting Secretary





## Giant Dinosaur Tail Found in Mexico



Five meters of tail directly from the Cretaceous: the discovery that took place in a desert in northern Mexico on the border with Texas is not an everyday occurrence. The practically intact fossil remains of the long extremity of a dinosaur that lived 72 million years ago were unearthed a few years ago by a team of archaeologists from Mexico's National Institute for Anthropology and History. This tail, extraordinarily well preserved, is the first artefact of this type found in Mexico. The fifty vertebrae, for a total of about five meters, corresponded to half the total length of the specimen that lived about 72 million years ago. The excavations to remove the sedimentary rocks that covered the find required a lot of time and extremely delicate work. The discovery of dinosaur tails is a rather rare event, according to archaeologists, who hope that the fossils will help to better understand the hadrosaur family and the diseases that afflicted the bones of these prehistoric animals, which resemble those suffered by humans: for example, even dinosaurs could develop tumors or suffer from arthritis. During the Cretaceous, much of this part of Mexico was on the coast. The remains of terrestrial, but also marine dinosaurs, could therefore come to light in the area. <https://fantasticfossils.quora.com/The-giant-dinosaur-tail-found-in-Mexico>



## Spotlight Gemstone: Diamond



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



# What in the World?



**What in the World** is this unusual rock formation and where is it?

# February's Photo



March's **What in the World** photo was an image of **Hosta Beach** in Outer Hebrides of Scotland. The paler bands of the 2.25 billion-year-old rocks are made of quartz and feldspar crystals, while the darker bands are made of amphiboles.

## ROCK CALENDAR CVRMS EVENTS OF INTEREST

### 2025

**Apr. 6 — Black Hawk Rock Show**

Waterloo Center for the Arts  
225 Commercial Street, Waterloo, IA  
*more information on Page 9*

**Apr. 15 — CVRMS Monthly Meeting**

Hiawatha Community Center 7:15 pm  
Ryan Clark, Iowa Geological Survey  
"Iowa's Hydrogen Potential"

**May 20 — CVRMS Monthly Meeting**

Hiawatha Community Center 7:15 pm  
Program to be announced

**June 17 — CVRMS Monthly Meeting**

Thomas Park, Marion  
Pot Luck Picnic 6:30 pm  
*Rock Polishing and Show and Tell*

**July 15 — CVRMS Monthly Meeting**

Wanatee Park, Marion  
Pot Luck Picnic 6:30 pm  
*Geode Cracking and Show and Tell*

**Aug. 19 — CVRMS Monthly Meeting**

Morgan Creek Park, Cedar Rapids  
Pot Luck Picnic 6:30 pm  
*Rock Bingo and Show and Tell*

**Sept. 16 — CVRMS Monthly Meeting**

Hiawatha Community Center 7:15 pm  
Program to be announced

**Sept. 20-21 — CVRMS Rock Auction**

Amana RV Park  
*More Information in Future Newsletters*

## 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.

Since no one provided a question to "Ask a Geologist" this month again I have an opportunity to discuss an article of interest to me. Most of you know that I have studied meteor impact structures. A couple of weeks ago I read an interesting article about a newly discovered impact structure. In Australia that is apparently the oldest-known on Earth; **by a billion years**.

### Record Discovery: Impact Crater in Australia's Outback Oldest by a Billion Years

by Tim Johnson, Chris Kirkland & Jonas Kaempf

The oldest rocks on Earth formed more than 3 billion years ago, and are found in the cores of most modern continents. However, geologists still cannot agree how or why they formed. Nonetheless, there is agreement that these early continents were critical for many chemical and biological processes on Earth. Many geologists think these ancient rocks formed above hot plumes that rose from above Earth's molten metallic core, rather like wax in a lava lamp. Others maintain they formed by plate tectonic processes similar to modern Earth, where rocks collide and push each other over and under. Although these two scenarios are very different, both are driven by the loss of heat from within the interior of our planet. But we think rather differently. A few years ago, we published a paper suggesting that the energy required to make continents in the Pilbara came from outside Earth, in the form of one or more collisions with meteorites many kilometers in diameter. As the impacts blasted up enormous volumes of material and melted the rocks around them, the mantle below produced thick "blobs" of volcanic material that evolved into continental crust. Our evidence then lay in the chemical composition of tiny crystals of the mineral zircon, about the size of sand grains. But to persuade other geologists, we needed more convincing evidence, preferably something people could see without needing a microscope. So, in May 2021, we began the long drive north from Perth for two weeks of fieldwork in the Pilbara, where we would meet up with our partners from the Geological Survey of Western Australia (GSWA) to hunt for the crater. But where to start? Our first target was an unusual layer of rocks known as the Antarctic Creek Member, which crops out on the flanks of a dome some 12 miles in diameter. The Antarctic Creek Member is only 65 feet or so in thickness, and mostly comprises sedimentary rocks that are sandwiched between several kilometers of



Shatter cones formed by the impact in the Pilbara.

dark, basaltic lava. However, it also contains spherules, droplets formed from molten rock thrown up during an impact. But these drops could have travelled across the globe from a giant impact anywhere on Earth, most likely from a crater that has now been destroyed. After consulting the GSWA maps and aerial photography, we located an area in the center of the Pilbara along a dusty track to begin our search. We parked the off-road vehicles and headed our separate ways across the outcrops, more in hope than expectation, agreeing to meet an hour later to discuss what we'd found and grab a bite to eat. Remarkably, when we returned to the vehicle, we all thought we'd found the same thing: shatter cones. Shatter cones are beautiful, delicate branching structures, not dissimilar to a badminton shuttlecock. They are the only feature of shock visible to the naked eye, and in nature can only form following a meteorite impact. Little more than an hour into our search, we had found precisely what we were looking for. We had literally opened the doors of our 4WDs and stepped onto the floor of a huge, ancient impact crater. Frustratingly, after taking some photographs and grabbing a few samples, we had to move on to other sites, but we determined to return as soon as possible. Most importantly, we needed to know how old the shatter cones were. Had we discovered the oldest known crater on Earth? With some laboratory research under our belts, we returned to the site in May 2024 to spend ten days examining the evidence in more detail. Shatter cones were everywhere, developed throughout most of the Antarctic Creek Member, which we traced for several hundred meters into the rolling hills of the Pilbara. Our observations showed that above the layer with the shatter cones was a thick layer of basalt with no evidence of impact shock. This meant the impact had to be the same age as the Antarctic Member rocks, which we know are **3.5 billion years old**. We had our age, and the record for the oldest impact crater on Earth. Perhaps our ideas regarding the ultimate origin of the continents were not so mad, as many told us. Serendipity is a marvelous thing. As far as we knew, other than the Traditional Owners, the Nyamal people, no geologist had laid eyes on these stunning features since they formed. Like some others before us, we had argued that meteorite impacts played a fundamental role in the geological history of our planet, as they clearly had on our cratered Moon and on other planets, moons and asteroids. Now we and others have the chance to test these ideas based on hard evidence. Who knows how many ancient craters lay undiscovered in the ancient cores of other continents? Finding and studying them will transform our understanding of the early Earth and the role of giant impacts, not only in the formation of the landmasses on which we all live, but in the origins of life itself. <https://www.sciencealert.com/record-discovery-impact-crater-in-australias-outback-oldest-by-a-billion-years>



## Could the Flood Narrated in the Bible Have Happened?

The 'Elohim version' of the Flood narrative says that a great flood killed almost all humans. The 'Yahweh version' of the account, on the other hand, specifies that these waters were so abundant that the sea level exceeded the height of the highest mountains at that time. Genesis 7:19 says: "The waters increased to such an extent that all the highest mountains under the whole sky were covered." If the Flood was global, then these mountains that were covered by the waters must necessarily include the Himalayas, the Alps, the Rocky Mountains, and the Andes Range. The Himalaya chain has 10 peaks that are over 23,000 feet high, with the highest peak being almost 30,000 feet. This means that, for the 'Yahweh version' of the Flood to be credible, this planetary flood must have generated a tide that, in order to overtop the highest mountains on Earth, had to exceed the current sea level by about 30,000 feet (Mount Everest is about 29,029 feet above sea level, and has never significantly changed its height in the last few hundred thousand years). The "surface" of these waters would have been at the same height where modern jumbo jets fly (28,000 feet high). This is about 12 times the height of the world's tallest skyscraper, the Burj Khalifa, which is "only" 2,700 feet high. The Earth would be transformed into a water planet. To get an idea of the enormous mass of water required to achieve such a result, we would have to multiply the total surface area of the Earth, i.e. 196,951,000 mi<sup>2</sup>, by the height reached by the water, some 5.6 mi, giving a total of 1,101,400,000 cubic miles of water. To the total obtained must then be added the mass of water comprising all the oceans, which, being already below the waterline of the continents, were not touched at all by the Flood. The total volume of water of all the oceans is about 311,887,000 cubic miles, which when added to the water that was above sea level up to about 30,000 feet high, makes the stratospheric figure of 1,413,300,000 cubic miles of water. But today all the water on Earth, including glaciers and underground sources, is only 335,888,000 cubic miles of water. The amount of water in the atmosphere in the form of water vapor amounts to only 32,400 cubic miles. Where are the other approximately 1,055,600 cubic miles of water needed to cover the highest mountain peaks? They are simply not there. We do not find them in the sea, we do not find them underground, we do not find them in the atmosphere. The volume of water needed to cover the highest mountains on Earth simply does not exist. So the Flood could not have happened as recounted in Genesis. The waters of the seas could not have covered the highest mountains on Earth. Some say that when the Flood occurred the mountains were lower, and therefore less water would have been needed to cover the Earth. This is a real joke, since all geologists around the world agree that the Alps, the Rocky Mountains, the Andes, the Himalaya and all the other mountain ranges on Earth have been in that position for at least several hundred thousand years, since before Homo Sapiens appeared. Hence, "No Way." The "Flood of Waters" could not have covered the Earth. But then since all ancient mythologies speak of a disaster that nearly extinguished humanity, what really happened?

<https://ambiguousfacts.quora.com/COULD-THE-FLOOD-NARRATED-IN-THE-BIBLE-HAVE-HAPPENED>

## "Supergiant" Gold Deposit May Be Worth Over \$80 Billion

A "supergiant" deposit of high-quality gold ore containing an estimated 1,100 tons of the precious metal was discovered in central China in late 2024, according to Chinese state media. Valued at up to approximately \$83 billion, the discovery could be one of the largest and most lucrative reservoirs of gold ever uncovered, surpassing the 900 tons estimated to lie within the mother of all gold reserves, South Deep mine in South Africa. Some commentators are not yet convinced of the deposit's scale and feasibility, but if the discovery becomes verified, it will represent a major find for China. The Geological Bureau of Hunan Province announced the detection of 40 gold veins within a depth of 1.2 miles in the northeast Hunan county of Pingjiang. These alone were thought to contain 300 tons of gold, with 3D modeling suggesting additional reserves may be found to a depth of 3 kilometers. "Many drilled rock cores showed visible gold," said

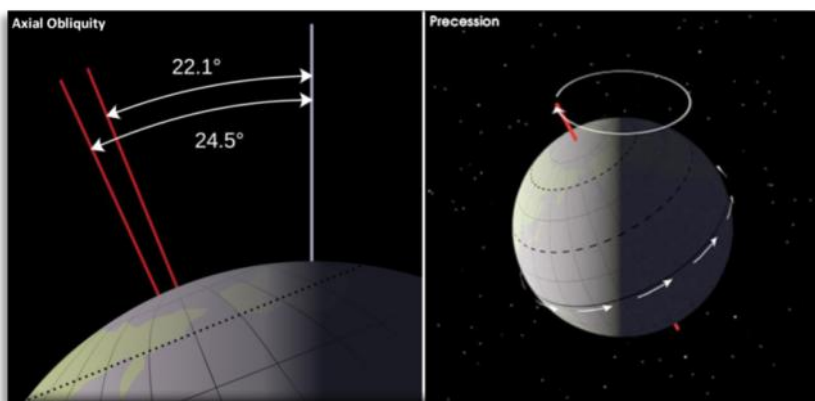


bureau prospector Chen Rulin at the time of the discovery. Core samples suggest every metric ton of ore could contain as much as 5 ounces of gold, an extraordinary level of quality considering ore excavated from underground mines is considered high grade if it contains more than 0.3 grams. China already dominates the world's gold market with reserves considered to be in excess of 2,000 tons earlier in 2024, its mining industry contributing around 10 percent of the global output. Announcements of the findings initially contributed to a further increase in the already skyrocketing gold price, with demands for the resource generally rising strongly in time of global economic uncertainty. Just how many bonanzas of the valuable ore remain yet to be discovered around the world is unclear, with experts divided on whether we've reached peak gold. Forged in the furnaces of embracing stars long before Earth was formed, our planet's glittering veins are a finite resource that take eons to precipitate into an easily mineable form. Based on these findings, we might be far from exhausting economically viable reserves. Core samples taken around the periphery of the Hunan site hint that the deposit may extend even further than initial predictions, making the reservoir beneath its soil a true dragon's haul.

<https://www.sciencealert.com/supergiant-gold-deposit-may-be-worth-over-us80-billion>

## Next Ice Age Would Hit Earth in 11,000 Years if it Weren't for Climate Change

Changes in Earth's tilt relative to the sun have governed the movements of giant ice sheets over the past 800,000 years, triggering the start and end of eight ice ages, new research suggests. The new study revealed an "amazing correlation" between Earth's tilt and ice sheet formation, said lead author Stephen Barker. Based on these findings, researchers estimated that **the next ice age would be well underway in 11,000 years, were it not for human-driven global warming.** "The prediction is that the next ice age will begin within the next 10,000 years," said Barker, a professor of Earth science at Cardiff University in the U.K. However, this result does not take into account our ballooning greenhouse gas emissions, which are heating the planet to the point of preventing ice ages, he said. Ice ages, or **glacial periods**, are extremely cold stretches of time that occur roughly every 100,000 years, covering much of the planet with enormous ice sheets for thousands of years at a time. Glacial periods are separated by warmer **interglacial periods**, when ice sheets retreat toward the poles. Earth is currently in an interglacial period, with the last glacial period having peaked around 20,000 years ago. Scientists have previously suggested that Earth's position and angle relative to the sun affect ice sheet formation.



Obliquity primarily determines how much sunlight hits the poles, while precession governs the intensity of sunlight in equatorial regions.

vertical as it rotates around the sun, affecting how much solar energy hits each of the poles, in particular. But the tilt of Earth's axis naturally gets bigger and smaller in a cycle that lasts about 41,000 years. The axis also wobbles around itself like an off-center spinning top, affecting how much solar energy reaches equatorial regions during the summer within time periods of about 21,000 years. For the study, the researchers plotted known changes in obliquity and precession over the past 800,000 years. They also plotted the expansion and retreat of ice sheets during this period using existing data from microscopic shells, called forams, in ocean sediment cores. The relative abundance of certain types of oxygen in forams reveals how far ice sheets extended when the organisms were alive, Barker explained. The results from combining these plots were a "fall off the chair moment," Barker said. "We found this amazing correlation [...] that says there's a direct relationship between the phasing of obliquity and precession, and then the resulting duration of how long it takes the ice sheets to decay," he said. Put simply, ice sheet expansion from the poles toward the equator appears to be directly governed by obliquity. The retreat of ice sheets from the equator back to the poles, on the other hand, is more dependent on precession. The researchers revealed their findings in a study published Thursday (Feb. 27) in the journal *Science*. The results are perhaps unsurprising, given that obliquity and precession affect how much sunlight reaches polar and equatorial regions, respectively, Barker said. "Depending on where you are on Earth, you'll find more influence from precession or obliquity," he said. The plots were so neat that the scientists extrapolated the data and estimated when the next glacial period would occur if the climate was changing only according to natural cycles, Barker said. More research is needed to pin the timings down, but ice sheets would likely start expanding in around 10,000 to 11,000 years and reach their maximum extent within the following 80,000 to 90,000 years. They would then take another 10,000 years to retreat to the poles. There is much debate around the timing of the next glaciation, but most experts agree that humans are disrupting these cycles through global warming. "If CO<sub>2</sub> stays high, you won't get a new glaciation," Barker said. That's not to say that cooking the planet is a good idea, Barker cautioned. "What we don't want is for people who want to emit more CO<sub>2</sub> into the atmosphere to jump on this," he said. Rather, the point of this study and future research is to build a picture of what the climate would do over the next 10,000 to 20,000 years without the impact of human activity, Barker said. The goal is then to provide a long-term estimate of humanity's impact on the planet, he said. <https://www.livescience.com/planet-earth/next-ice-age-would-hit-earth-in-11-000-years-if-it-werent-for-climate-change-scientists-say?>



# 2025 CVRMS ROCK SHOW A GREAT SUCCESS !

Total Attendance 4,386 Here are some photos from the show



Nice supply of rock goodies.



Dinosaur fans at Bill's display.



Beautiful cut and polished agate.



Crock head at Dreaming Down Under.



Young rock hound at pebble pit.



Nice fossils in matrix.



Billie's happy with her raffle amethyst.



Salt lamps and t-shirts, it's all here.



Geodes and crystals and minerals.

*thanks to Laura Halladay for the photos*





# 2025



## Black Hawk Gem & Mineral Society

# GEM, MINERAL & FOSSIL SHOW

## APRIL 6<sup>th</sup>

### 10 am to 5 pm

Featuring

Dr. Ray Anderson

*Not of This World:*

*9 Meteorites in Iowa's History*

### Activities

#### Silent Auctions

Minerals, crystals, agates, fossils, geodes & more

#### Plaster Fossil Painting

Color one to keep and take home!

#### Kids' Pebble Pit

Find fossils, agates & crystals to add to your collection!

#### Mystery Rock Identification

Have a rock, mineral, or fossil you are unsure about? Bring it for the experts to identify.

### Demonstrations

Flintknapping

UV Fluorescent Rocks

Geode Cracking

Silversmithing

Gold Panning

Rock Polishing/Lapidary

### Waterloo Center for the Arts

225 Commercial Street • Waterloo, IA



Check out our Facebook Group!

For additional information

Email the club: [info@bhgmsrockclub.org](mailto:info@bhgmsrockclub.org)

Show Chairman: Dave Malm | 319-266-6433

Becky Stansbery | 319-961-5792.

### Speakers & Presentations

Dr. Ray Anderson

*Not of this World! 9 Meteorites in Iowa's History*

Dr. Joshua Sebree

*Astrobiology of the Underground. Exploration & Research of Caves in Iowa and South Dakota*

James Preslicka, Geologist & Amateur Paleontologist

*Rockford Iowa vs Amana Iowa Fossil Beds,*

*Nearshore vs Offshore in the Lime Creek Formation*

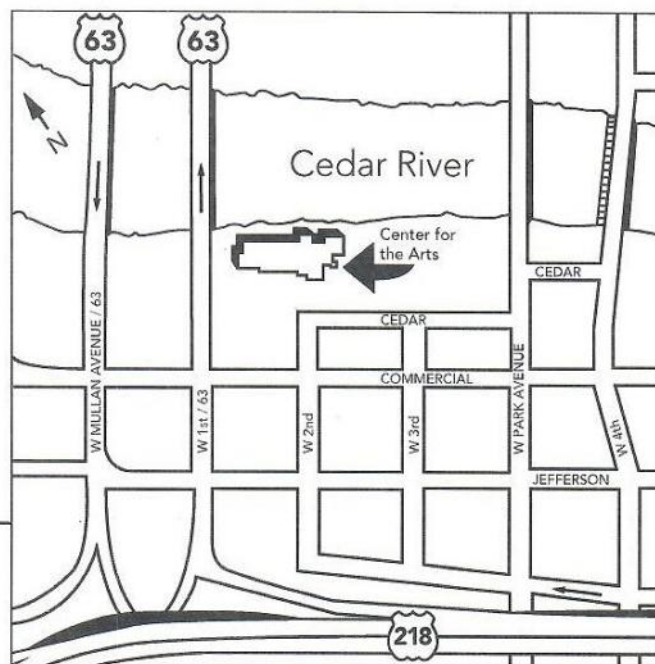
### Dealers & Special Displays

Rocks  
Fossils

Minerals  
Agates

Crystals  
Geodes

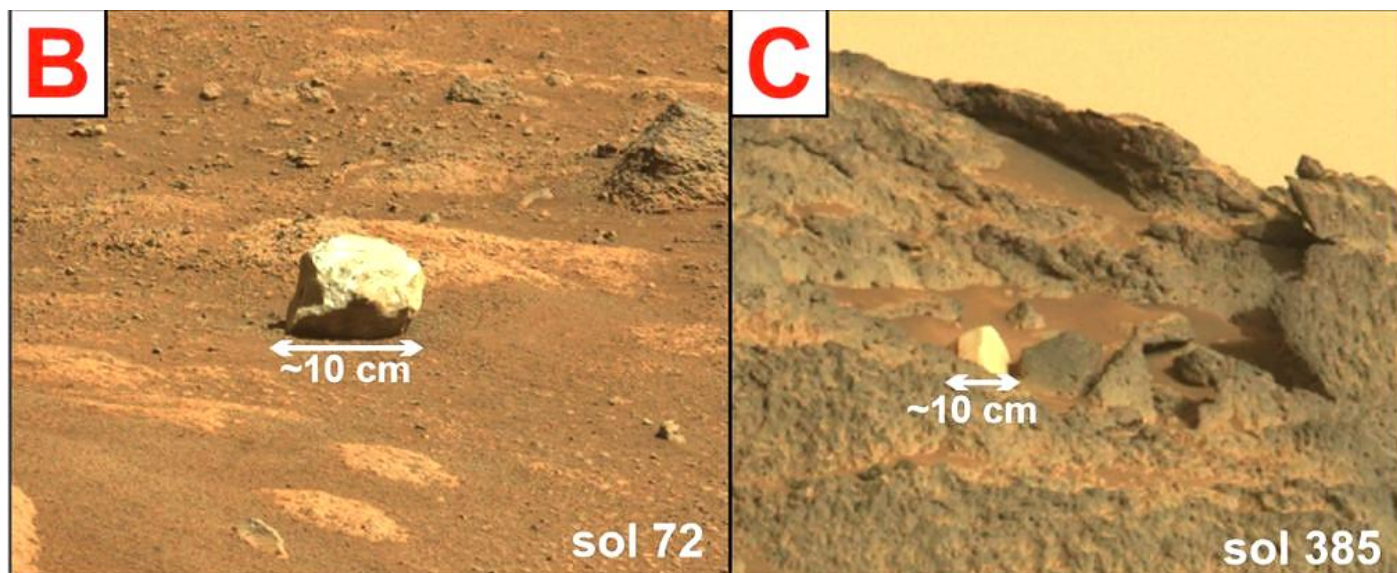
Jewelry  
Apparel



Free Admission • Donations Accepted  
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## NASA Rover Shoots Laser at Martian Rock and Reveals Ancient Secret

Rocks loafing about on the surface of Mars have been harboring secrets about the red planet's mysterious past. The mineral content of oddly pale rocks found in **Jezero Crater** can only have formed under very warm, very soggy conditions, suggesting that, long ago, Mars may have been a lot more peculiar than we ever suspected. "On Earth, these minerals form where there is intense rainfall and a warm climate or in hydrothermal systems such as hot springs. Both environments are ideal conditions for life as we know it," says planetary scientist Roger Wiens of Purdue University. "These minerals are what's left behind when rock has been in flowing water for eons. Over time, the warm water leaches away all the elements except those that are really insoluble, leaving behind what we found on Mars. It's fascinating. It's unexpected on a cold, dry planet like Mars." What Mars looked like in the early eons after its formation, and how it has changed over



Two unusual rocks scanned by Perseverance.

the years, are mysteries planetary scientists are intent on solving, not least because the answers could tell us whether the red planet has ever been hospitable to the emergence of life as we know it. The history of Mars is written in its rocks, and Earth has taught us the language to understand it. The trick is to identify salient Mars rocks, and find the information to decode, no small task from millions of miles away. NASA's Mars rovers, *Curiosity* and *Perseverance*, are designed to perform this function as our proxy, with human scientists here on Earth operating the robots remotely. The rocks in this discovery were found by Perseverance in Jezero Crater, standing out as oddly pale, just sitting on the surface of Mars, incongruous with their surroundings. Rocks like these are known as *float rocks* because they "float" above the bedrock, having been transported from their original location by processes such as weathering, erosion, or water to somewhere new. Scientists had spotted these float rocks hanging around in Jezero Crater from Perseverance's very first day of operations, but hadn't taken the time to really look at them... until they did. They directed Perseverance to use its **Laser Induced Breakdown Spectroscopy** instrument. This is a tool that fires a laser pulse at a mineral. That laser pulse vaporizes a small amount of the mineral, and excites it; the spectroscopy instrument then studies the light emitted by the atoms and ions in the mineral vapor as they return to their ground state, to see what elements those atoms and ions are. The results were a huge surprise. "These rocks are very different from anything we've seen on Mars before," Wiens says. "They're enigmas." The main composition of the rocks is a mineral called **kaolinite**, a soft, white silicate clay mineral. The Martian kaolinite is slightly different from terrestrial kaolinite; it's significantly harder, perhaps as a result of different weathering conditions on Mars. Kaolinite requires temperate, wet conditions to form; conditions that are hospitable to some forms of microbial life. With over 4,000 of the rocks spotted in Jezero Crater, this makes the discovery particularly exciting. The researchers also identified a mineral called **spinel**. Here on Earth, spinel is a magnesium aluminum gemstone. How the spinel got into the kaolinite rocks is unknown, but the researchers believe it is an aluminum-rich type that can form in both igneous and metamorphic environments. It's also unclear where the kaolinite came from. Satellite images show kaolinite-rich rocks in the rim of Jezero Crater. If scientists can work out where the rocks formed, they can get a better idea of *how* they formed. That information may also reveal vital clues about the water history of Mars, and its past habitability. "The big questions about Mars are about water," Wiens says. "How much water was there? How long was there water? Given how cold and dry Mars is now, where did all that water go? As a mineral, kaolinite has a lot of water bound up in its structure. It's possible that a lot of the water is still there, on Mars, bound up in the minerals." <https://www.sciencelert.com/nasa-rover-shoots-laser-at-martian-rock-and-reveals-ancient-secret>



## “Exquisitely Preserved” Ginormous Claws from Mongolia Reveal Strange Evolution in Dinosaurs

A new species of dinosaur with strange claws has been unearthed in Mongolia by paleontologists. This new genus and species is a therizinosaur, plant-eating, two-legged giants with long claws, and was discovered buried in the Gobi Desert, according to a new study published on March 25 in the journal *Science*. Unlike other therizosaurs, which have three fingers on their hands equipped with long, sharp claws, this new species only has two fingers. This unique anatomy inspired its scientific name, *Duonychus tsogtbaatari*, which is Greek for "two digits" and honors the Mongolian paleontologist Khishigjav Tsogtbaatar. Therizosaurs are a group of dinosaurs that lived across what is now Asia and North America during the Late Cretaceous Period (100 million to 66 million years ago). Despite being part of the theropod group of dinosaurs, typically associated with carnivorous dinosaurs like *Tyrannosaurus rex*, therizosaurs were herbivorous. These dinosaurs are known for their enormous, sickle-shaped claws, with some species growing talons as long as 20 inches. All other therizosaurs that have previously been discovered, including *Therizinosaurus* and *Beipiaosaurus*, have three clawed fingers on their hands, making the discovery of two-clawed *D. tsogtbaatari* unusual. This newly discovered species from Mongolia breaks the mold with just two fingers instead of the typical three, offering a rare glimpse into how theropod hands evolved and adapted. The new fossil was unearthed during the construction of a water pipeline in the Bayanshiree Formation in Ömnögovi Province, southern Mongolia. The specimen had excellently preserved hands, with a 3D sheath where the claw, made out of keratin, like our fingernails, would have been. Parts of the arms, spine and hips were also preserved. The hands, a hallmark of therizosaurs, are exquisitely preserved with all the finger and wrist bones intact in this specimen. Other species of dinosaur, such as *T. rex*, had two fingers, but this marks the first time a therizinosaur has been found with fewer than three digits. This species likely evolved to lose one of the three fingers of its ancestors, the study authors suggested. The researchers think that *D. tsogtbaatari* may have evolved this unique hand in order to better grip vegetation, allowing for more efficient feeding. Based on the shape of its well-preserved claw and how it curved, *Duonychus* was likely using its hands to grab onto branches and pull vegetation closer, kind of like how chameleons do today. Many therizosaurs may have used their hands for foraging in a “hook-and-pull” motion, but *Duonychus* takes this to another level with its extreme claw structure. Additionally, the claws may have played other roles, such as in defense, courtship, or even play. This discovery, not only reveals unexpected diversity within therizosaurs, but also marks the fifth time that a theropod dinosaur group has evolved to lose their third finger.

<https://www.livescience.com/animals/dinosaurs/exquisitely-preserved-ginormous-claws-from-mongolia-reveal-strange-evolution-in-dinosaurs>

## Extinct Tree-Dwelling Mammal May be Among Humans’ Closer Relatives

The planet’s earliest mammals are an important part of our evolutionary history, yet remain shrouded in mystery. One of them, *Mixodectes pungens* lived in western North America during the early Paleocene (about 66 to 56 million years ago). It was first discovered over 140 years ago by paleontologist Edward Drinker Cope. But most of what we know about them came from tiny jawbone fragments and fossilized teeth collected in the years since. Now, we may have some answers, thanks to a well-



preserved 62-million-year-old skeleton. This particular *Mixodectes pungens* specimen represents a mature adult that weighed about three pounds, lived in trees, feasted on leaves, and may be among our closer evolutionary relatives. “A 62-million-year-old skeleton of this quality and completeness offers novel insights into mixodectids, including a much clearer picture of their evolutionary relationships,” stated a co-author. “Our findings show that they are close relatives of primates and colugos—flying lemurs native to Southeast Asia — making them fairly close relatives of humans.” *Mixodectes*

belonged to an extinct family known as mixodectids and lived during the Paleocene epoch. This geological epoch followed the Cretaceous-Paleogene extinction event that killed off non-avian dinosaurs about 66 million years ago. Many scientists believe that this mass extinction paved the way for the rise of mammals. This skeleton was collected in New Mexico’s San Juan Basin by study co-author Thomas Williamson. The specimen includes a partial skull with teeth, spinal column, rib cage, forelimbs, and hind limbs. By the anatomy of its limbs and claws, the team believes that it lived in trees and could vertically cling to tree trunks and branches. Its molar teeth had crests that are used to break down abrasive material, which suggests an omnivorous diet heavy on the leaves. Characteristics of this fossil skeleton such as a larger body mass and an increased reliance on leaves allowed *Mixodectes* to thrive in the same trees likely shared with other early primate relatives. According to the team, *Mixodectes* was rather large for a tree-dwelling mammal in North America during the early Paleocene. For example, the *Mixodectes* skeleton in this study is significantly larger than a partial skeleton of *Torrejonia wilsoni*, a small arboreal mammal from an extinct group of primates called plesiadapiforms that was discovered alongside it. While *Mixodectes* primarily ate leaves, *Torrejonia* mostly ate fruit. The authors believe that these distinctions in both size and diet suggest that mixodectids likely occupied a unique ecological niche in the early Paleocene that set them apart from their tree-dwelling contemporaries. One analysis supported that they were archaic primates. <https://www.popsci.com/environment/early-mammal-human-relative/>

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**Next Meeting:**  
**TUESDAY APR. 15**  
**Hiawatha Community Center**  
**“Hydrogen Exploration in Iowa”**  
by **Ryan Clark**  
Iowa Geological Survey  
UI Department of Engineering

**CEDAR VALLEY GEMS**

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Club meetings are held the 3rd Tuesday of each month from September through November and from January through May at 7:15 p.m. Meetings are held at the Hiawatha Community Center in the Hiawatha City Hall, **101 Emmons St., Hiawatha IA**. The December meeting is a potluck dinner held on the 2nd Tuesday at 6:30. June, July, and August meetings are potlucks held at 6:30 p.m. at area parks on the 3rd Tuesday of each month

### CEDAR VALLEY ROCKS & MINERAL SOCIETY

CVRMS was organized for the purpose of studying the sciences of mineralogy, geology, and paleontology and the arts of lapidary and gemology. We are members of the Midwest (MWF) and American (AFMS) Federations. Membership is open to anyone who professes an interest in rocks and minerals.

**Annual dues are \$15.00 per family per calendar year. Dues can be sent to:**

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