Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS **DECEMBER 2023** **VOL. 49, ISSUE 12**

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

Next CVRMS Meeting

Thursday December 7

2023 CVRMS HOLIDAY PARTY

Hiawatha Community Center
101 Emmons St., Hiawatha

2017 Holiday Party

Eat at 6:30 pm

More information on page 10

Dino Bones in Space!

Last year, David Willetts hit a sour note when he unveiled his vision of improving science education in Great Britain. *"The two best ways of getting young people into science"* the Minister of State for Universities and Science said, *"are space and dinosaurs. So that's what I intend to focus on."* Researchers, writers and science fans quickly jumped on the comment. And rightly so. Space and dinosaurs are popular, but they don't appeal to everyone. Not every child dreams of becoming an astronomer or paleontologist. But my favorite response to the British official's comments was the genesis of **#spacedino** on Twitter. If only spacedino were real, critics joked, we would have a perfect outreach tool. Who wouldn't love dinosaurs in space? What I didn't know at the time was that dinosaurs had already been beyond our planet. The first dinosaur to venture into space was a species that greatly influenced our understanding of dinosaur lives, the hadrosaur *Maiasaura peeblesorum*. This 76-million-year-old "*good mother lizard"* cared for its young in large nesting colonies, and small bits of bone and eggshell found at a nesting site were carried by astronaut Loren Acton during his brief mission to SpaceLab 2 in 1985. This was a glamorous time for the dinosaur; *Maiasaura* was made Montana's state dinosaur the same year. Dinosaurs didn't return to space until 1998. In January of that year, the shuttle *Endeavor* borrowed the skull of the small Triassic theropod *Coelophysis* from the Carnegie Museum of Natural History for its mission to the Mir space station. Like the remains of *Maiasaura* before it, the fossil skull was returned to earth after the mission was over. I guess I was wrong about spacedino. The simple combination of space and dinosaurs isn't very exciting at all. Dinosaurs on spacecrafts amounts to nothing more than trivia. It was not as if the dinosaurs were going to be included in some kind of time capsule—like the Golden Record on the Voyager spacecraft—to teach whoever might eventually discover it about past life on our planet. Real space dinosaurs just can't compete with their science fiction counterparts.
https://www.smithsonianmag.com/science-nature/dinosaurs-in-space-3945429/

CVRMS Annual Meeting November 13 — Minutes —

ANNUAL MEETING CALLED TO ORDER: 7:15p.m. Guests include Dave Graham, Nancy Oinger, Laura. Barbara Vobedja, and husband, Amy and Jim Christiansen *(Apologies from Secretary for not getting names right or complete).*

MINUTES FOR LAST MEETING: no corrections. Motion to approve by Lisa and seconded by Julie, approved as published.

TREASURER'S REPORT by Dale Stout. Checking balance $23,599.19. Marv explained to new members about the scholarships we provide to University of Iowa, Cornell University and VAST Center.

PROGRAM: "*Devonian Fossils from Independence, IA*" by Jim Preslicka. Interesting and super educational.

CVRMS ANNUAL MEETING: Since November is the official CVRMS Annual Neeting we elected officers for next year. One Directorship is up for election, Jay Vavra. The **Nominating Committee** reported that current officers, Marv Houg, Sharon Sonnleitner, Ray Anderson, Dell James, Dale Stout, and Kim Kleckner, already accepted nominations for reelection, as has departing Board member Jay Vavra . Marv opened the floor to new nominees and asked three times. There being none Matt made a motion that the election be closed. Marv asked if members present accepted the slate as presented. All approved.

CVRMS HOLIDAY PARTY: will be on December 7 at our normal meeting site, the Hiawatha Center. We will **eat at 6:30** but we are allowed in earlier about 5:30 to decorate. The meal is a **Pot luck** so bring your best side dishes. The club will provide meat (turkey and ham), dressing, potatoes, gravy, and hot cider and punch to drink. Anna volunteered to provide decorations. Dell will pick up the turkey and gravy from Sally's on Broadway, and Jeff will bake the ham. All are invited including spouses, significant others and kids. **Bring your own drinks and plates including silverware.**

NAME TAGS: Dale identified a supplier, and he will take names for ordering. Pin style is $5.00 and magnetic style is $5.50. Get your name and choice to Dale.

CALENDARS: Time to order your agate calendars. Give your orders to Dale. They will be here at Christmas Party.

DOOR PRIZE: Won by Linda Schlict.

MOTION TO ADJOURN by AJ, second by Sheri. Meeting adjourned at 9:20 pm.

Respectfully submitted,
Dell James, Secretary

CVRMS Board Meeting Nov. 21 — Minutes —

MEETING CALLED TO ORDER at 7:13 p.m by Marv Houg at his house. **Members present;** Kim Kleckner, Marv Houg, Jay Vavra, Ray Anderson, Sharon Sonnleitner, Matt Burns, Bill Desmarais, Dell James.

MINUTES OF PREVIOUS MEETING as published. Matt made motion to approve; seconded by Jay. All approved.

TREASURER'S REPORT: none since Dale was absent

2024 ROCK SHOW: Show still needs a **flintknapper** and space remains open. Various suggestions from members of who might have some contacts. **Decided to invite** the Afghanistan/ Pakistan rock and minerals dealer and discussed other possible dealers for show. **Raffle prizes for show**. Marv suggested a possible package including several dinosaur books, bones, and coprolite. Other possibilities include agate, coral (since corals is our show theme), amethyst cathedral, and a geode.

FIELD TRIPS: Matt Burns made some observations about the last field trip he conducted. One member showed up without required safety gear. Another member turned up late and at the wrong location. Bottom line, Matt is tired of babysitting field trippers who don't respect the rules.

FACEBOOK STATUS: We have 2,700 Facebook members. Discussion about banning people from other countries. But, the board decided that they may be legitimate and should be allowed to participate.

DISPLAY CASE FOR RIVER PRODUCTS: Ray and Marv will work on layout and rocks to be displayed.

TAKO 2024: TAKO (**T**ake **A** **K**id **O**utdoors) still set for Klein Quarry in May of 2024. The club will participate.

CVRMS HOLIDAY PARTY, THURSDAY DEC 7: We will gather at 6:00 pm and eat at 6:30 pm. The club will provide turkey and ham, mashed potatoes and dressing, mulled cider and punch. The meal is Potluck, so members should bring sides of favorite dishes. Members should also supply their own table settings and sense of humor.

BILLS BIG BUS TRIP FOR 2024: Seriously considering the Grotto of the Redemption in West Bend, but we are still open for suggestions. Anyone with good ideas should contact Bill Desmarais.

MOTION TO ADJOURNED by Kim, seconded by Bill. Meeting adjourned at 9:05 pm..

Respectfully submitted,
Dell James, Secretary

ELECTION OF CVRMS OFFICERS FOR 2024-2025

The November 21 CVRMS meeting was our official ***Annual Meeting for 2023,*** which means that it was time for members to elect club officers. The Nominations Committee submitted Jay Vavra for a new three-year term as **Director,** and all current officers to new two-year terms. The other two directors are serving staggered 3-year terms. CVRMS members present at the November 21, 2023, meeting unanimously elected those submitted by the Nominating Committee. Following are the CVRMS 2024 officers and directors:

President	Marv Houg
Vice President	Ray Anderson
Treasurer	Dale Stout
Secretary	Dell James
Editor	Ray Anderson
Liaison	Kim Kleckner
Webmaster	Sharon Sonnleitner
Immed. Past Pres.	Sharon Sonnleitner
Director '24	Bill Desmarais
Director '25	Matt Burns
Director '26	Jay Vavra

$$ TIME TO PAY $$
YOUR CLUB DUES
A BARGAIN AT ONLY
$15 PER YEAR
Pay at Meeting or Mail To:
Dale Stout, Treasurer
2237 Meadowbrook Dr. SE, Cedar Rapids, IA 52403

Spotlight Gemstones: Zircon, Tanzanite, Turquoise

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 is this beautiful rock and what minerals comprise it??

November's Photo

Last month's *What in the World* image showed a *pinch and swell dike*, features called boudins or boudinage. Boudinage is a geological term for structures formed by extension, where a rigid tabular rock layer is stretched and deformed between less competent surrounding rocks. The competent bed begins to break up, forming sausage-shaped boudins.

ROCK CALENDAR
CVRMS EVENTS OF INTEREST

2023

Dec. 7 — CVRMS Holiday Party
Hiawatha Community Center—Eat at 6:30 pm
CVRMS will provide Turkey, Ham,
Stuffing, Mashed Potatoes, Gravy and Drinks
Please Bring Pot Luck Dish or Dessert and Bring Your Own Table Service
See page 10 for more details.

2024

Jan. 16 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

Feb. 20 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

Mar. 19 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

Mar. 23-24 — CVRMS Rock Show
Hawkeye Downs, Cedar Rapids
Show Theme: FOSSIL CORALS

Apr. 16 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

May. 21 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

June. 18 — CVRMS Monthly Picnic
Elis Park, Cedar Rapids 6:30 pm
Show & Tell, Rock Polishing

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.

As most of you know I have had and interest in meteorites for many years. I have examined and worked with all of the known Iowa meteorites as well as many others from around the world. I even had an opportunity to examine meteorites from the Moon, but meteorites from Mars are exceptionally rare and I have never seen one. So I found the following article very interesting,

Rocks From Mars Are Hitting Earth, And Something Is Odd About Their Age

By Michelle Starr

Humans are yet to set foot on Mars, but over time, Mars has come to the humans. Chunks of Martian rock ejected from their home-world by processes such as violent impacts have wended their way through the Solar System to end up – smack! – crashing into Earth. As we collect these samples of our neighboring planet, a curious pattern has emerged. Most of the samples seem to be rocks that formed on the red planet fairly recently; a peculiarity, given most of the Martian surface is so old. It is possible the measures of age are largely wrong. Different dating techniques have returned different results, which means scientists aren't fully confident in estimates of when these rocks formed on Mars. A team of scientists from the US and UK has now found a way to resolve this problem. And, to their surprise, many of these rocks are indeed quite young, just a few hundred million years old in fact. This information could provide clues about how long the meteorites took to get here, as well as geological processes on Mars. *"We know from certain chemical characteristics that these meteorites are definitely from Mars,"* says volcanologist Ben Cohen of the University of Glasgow, who led the research. *"They've been blasted off the red planet by massive impact events, forming large craters. But there are tens of thousands of impact craters on Mars, so we don't know exactly where on the planet the meteorites are from. One of the best clues you can use to determine their source crater is the samples' age."* There are around 360 or so meteorite samples found on Earth that have been identified as having a Martian origin. Some 302 of these at time of writing (so, most of them) are classed as **shergottite**, a type of metal-rich Mars rock forged in the heat of volcanic activity. Based on how heavily cratered Mars' surface is, scientists have estimated that surface to be pretty old. If the surface was younger, refreshed by volcanic activity, many of the craters would be erased by volcanic flows. So any rocks that get ejected from the Martian surface should also be old. Not only are dating techniques on shergottite here on Earth complicated by their makeup, but what little we have been able to glean from them has suggested many are less than 200 million years old. This has led to what is known as the shergottite age paradox, and it's been bugging scientists for decades. Explanations for this surprisingly young possibility ranged from a single point of origin for all the younger shergottite, to the idea that the impact event could have heated and smushed the rock to such a degree that its age was sort of reset. But these theories didn't stack up to the evidence – the rocks themselves. The method used to determine the age of shergottite is known as argon-argon dating, which is based on the decay of radioactive potassium into argon. Since this decay rate produces a known ratio of argon isotopes, scientists can look at that ratio to determine how long the radioactive decay has been taking place, and thus date the rock sample. The problem is that, here on Earth, we can easily take into account different sources of argon that may make its way into a sample. For shergottite, which started on a whole other planet and spent goodness knows how long in space, this is more complicated. There are five potential sources of argon for shergottite, compared to just three for Earth rocks. To compensate for this, Cohen and his colleagues developed a method to correct for argon contamination from Earth and space. "Once we did that, the argon-argon ages came out as being young and matched perfectly with other methods, like Uranium-Lead," he explains. They dated seven samples of shergottite, returning ages ranging between 161 million and 540 million years ago. The researchers say that the reason for this might be the frequent bombardment of Mars has broken up the older surface, exposing the younger rock beneath, that has been replenished by volcanic activity. Eventually, it becomes more likely that that younger rock is excavated and ejected. Martian volcanic activity may still be ongoing today, and Mars is under constant bombardment. Scientists have estimated some 200 impacts every year create craters more than 4 meters in diameter. So it's probably not surprising that younger rocks occasionally get flung towards Earth, in a roundabout Solar-System-y sort of way. https://www.sciencealert.com/rocks-from-mars-are-hitting-earth-and-something-is-odd-about-their-age

A very rare 428.30 gram Martian meteorite Polymict Regolith Brecciated Shergottite currently for sale at $45,000.

Amethyst, One of the Most Sought After Gemstones in the Jewelry Industry

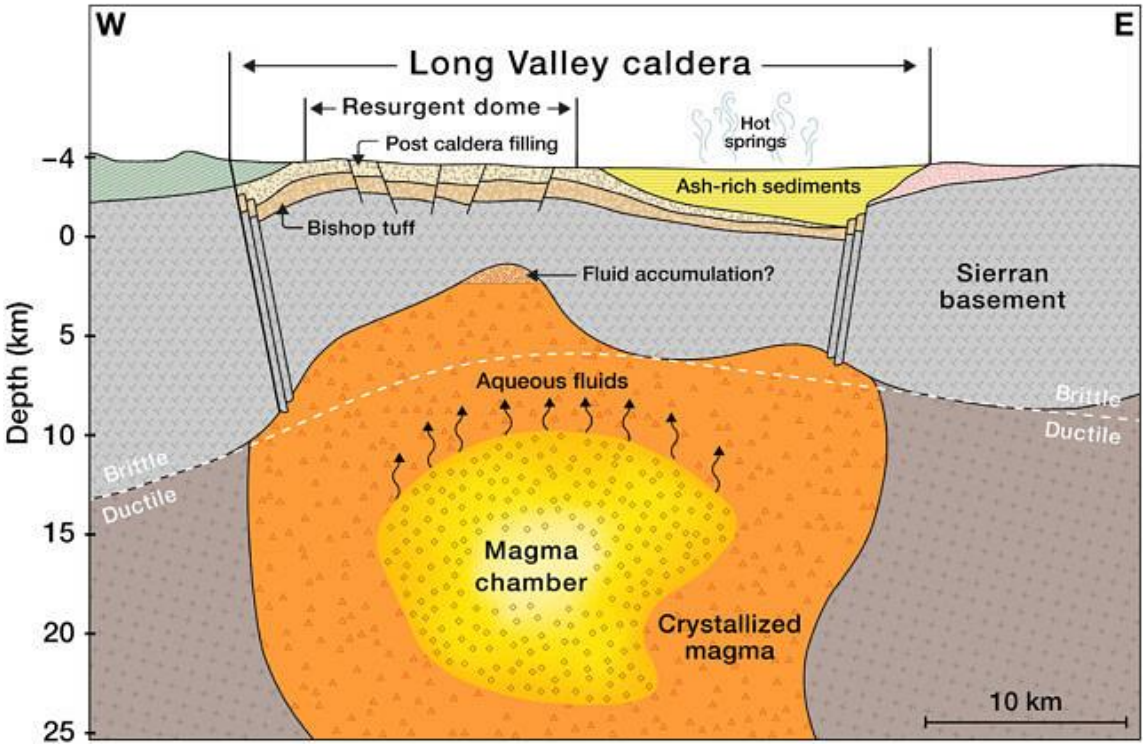
Once considered the gem of royalty and insignia of power, the Amethyst is an example of a gemstone that kept it's popularity over the passing of the years. Fine amethysts have been set in many royal collections from the Egyptian pharaoh Cleopatra's to the European houses. Although it's rarity decreased significantly in the last century, the stone has never gone out of fashion. Once upon a time, Amethyst was more valuable than Sapphires or Rubies and valued equally with diamonds. The gem was coveted by many royals, like the Russian empress, Catherine the Great and worn on Bishops' rings. After the great finds in South America in the nineteenth century, especially in Brazil, its rarity decreased, so did its price and the gem became more affordable. As a great example; the amethyst bracelet of Queen Charlotte of England - very famous jewelry at the beginning of the 18th century - was valued at 2000 pounds sterling at that time and worth only 100 pounds 200 years later. Amethyst is the violet-purple variety of the Quartz family (SiO2) and it is the most precious and valuable stone from it Amethysts are likely to be discovered in lining agate almonds and druses in igneous rocks. In 1900, the largest almond was discovered in the Brazilian state of Rio Grande do Sul and South America became the main producer of this gem in the world. It is known that a great number of Agates in Brazil and Uruguay contain Amethyst crystals. Amethysts are also found in abundance in the state of Minas Gerais. The third most important exporter in the world is Madagascar following by South Korea, Austria, Russia (famous for it's magnificent colors), South India, Zambia, United States (Arizona, Colorado, Texas, Pennsylvania, North Carolina, Maine, Minnesota, Wisconsin and Michigan) and in the Canadian provinces of Ontario (largest amethyst mine in North America) and Nova Scotia. Amethyst name comes from the Greek **améthystos**, *not intoxicated*; a belief that the gem would protect its owner from drunkenness. It is known that Amethysts were used as a gemstone by the Egyptians, the Greeks, medieval European soldiers (as amulets to protection in battle), Anglo-Saxon graves in England and by the Christian bishops (who wore an episcopal ring often set with the purple gemstone). Pliny used a gem of Amethyst as a protection against snakebites. The most important feature to determine the Amethyst value is the color. The desired color in an amethyst gemstone is a great reddish purple; a strong and saturated hue, not too dark, not too light.... Brownish and zoning shades are often avoided. The most common amethyst occurs in light violet and deep purple. Additionally, it can occur with a red or blue hue. The color of amethyst, once attributed to the presence of manganese, is now known as a result of iron and aluminum impurities, connected to a natural radiation. Without those elements, amethyst would be transparent, a colorless quartz. We can find a substantial number of amethysts eye-clean (the finest quality of these gems) in the market nowadays. Brazilian amethysts are in general more clear than African ones. However, the saturated color of the African amethysts makes it more accepted in the jewelry industry. Amethysts with Inclusions are often used to produce cabochons and beads. https://gemstonesbrazil.com/en-us/blogs/news/24176001-the-gem-in-spotlight-this-month-is-the-amethyst-one-of-the-most-sought-after-gemstone-in-the-jewellery-industry

Ancient 'Black Box' Hints at What Really Killed the Dinosaurs

Fine dust suspended in the atmosphere may have played a significant role in the extinction of dinosaurs after all. It's largely accepted that around 66 million years ago, a space rock larger than Mount Everest smashed into what is today the coast of Mexico, setting off a cascade of catastrophes that ultimately killed three-quarters of life on Earth, most famously the non-avian dinosaurs. But the finer details of how this all unfolded are still up for debate. Now, scientists have cracked open a geological ***'black box'*** that suggests the asteroid impact created a plume of fine dust which blocked sunlight, cooled the Earth, shut down photosynthesis, and destroyed the food chain. Originally proposed as a mechanism in 1980 by the geologists who uncovered the first signs of the mighty impact, the hypothesis was ruled out in the early 2000s because rock samples from this era didn't contain enough fine dust to cause a global winter. However, most previous studies were based on ½ inch-thick layers of sediment from the Cretaceous-Paleogene period. This new study analyzed 40 samples of sediment taken from a much richer, 3.3-foot-deep deposit in Tanis, North Dakota. This site is about 1,900 miles north of the Chicxulub asteroid crater, but it provides a unique snapshot of how plumes of dust, soot, and particles spread in the years post-impact. Larger particles scatter light at smaller angles than finer particles, so using a laser, the researchers were able to determine how much of each sample was made up of fine silicate dust in the 0.8 to 8 micrometer range. They identified a larger contribution of fine dust than previously appreciated. Using computer modeling, the researchers discovered that this fine dust, created when the asteroid hit the Earth and pulverized the rock underneath, was **"the most lethal"** of the particles released when the 6 to 9 mile-wide meteorite collided with Earth. They found that high levels of dust in the atmosphere would have created a global darkness lasting almost two years, which would have made it impossible for plants to photosynthesize. Without plants, the entire food chain would have collapsed. This dust could have stayed suspended in the air for up to 15 years, causing a 15°C fall in global temperatures and inducing **a photosynthetic shut-down for almost two years post-impact** by blocking sunlight. The shock of the collision also would have vaporized rock and produced sulfur-bearing gasses that form into small particles high in the atmosphere. And the intense heat produced by the asteroid's impact would have sparked large-scale wildfires, sending large amounts of soot and ash into the sky. Yet according to the researcher's results, it was the fine silicates rather than material like sulfur particles that were primarily responsible for the extended planetary winter. They found that the global darkness and prolonged loss in the planet's photosynthetic activity occur only in the silicate dust scenario, up to nearly **1.7 years (620 days)** after impact. Those animals and plants that were not adapted or could not adapt to live in the dark and cold would have met their demise. Flora and fauna with flexible diets, habitats, and lifestyles would have had a greater chance of survival. The Chicxulub asteroid impact also unleashed a **mega-tsunami 5,000 feet tall** that hit every continent on Earth, and set off **seismic activity 50,000 times** more powerful than the 2004 Sumatra earthquake. https://www.sciencealert.com/ancient-black-box-hints-at-what-really-killed-the-dinosaurs

Giant Supervolcano in California Is Sleepy, But Scientists Say It's Restless

A new study from researchers at the California Institute of Technology (CIT) suggests the Long Valley Caldera in eastern California is restlessly tossing and turning as its deep magma chamber cools down for a big, long sleep. The last time the volcano blew was roughly 100,000 years ago. Long before that, it spewed up enough ash to bury the modern city of Los Angeles beneath a kilometer of sediment. Today, the Long Valley volcano exists in a relatively sluggish state. But all is not quiet on California's eastern front. In the late 1970s, a swarm of earthquakes began to emanate from the caldera – a depression that sits atop the buried volcano. For decades thereafter, the volcano produced regular periods of "pronounced unrest", which inflated and deflated the ground. Thankfully, that isn't necessarily a sign of impending doom. Researchers at CIT have now found evidence that all this fussy activity is due to the supervolcano cooling down, not heating up. "We don't think the region is gearing up for another supervolcanic eruption, but the cooling process may release enough gas and liquid to cause earthquakes and small eruptions," says geophysicist Zhongwen Zhan. "For example, in May 1980, there were four magnitude 6 earthquakes in the region alone." The team's findings are based on data collected from a 100-kilometer stretch of fiber optic cable, using distributed acoustic sensing. Over the course of a year and a half, researchers at Caltech used this interconnected system – which is equivalent to 10,000 individual seismometers – to catalog more than 2,000 seismic events, many of which would not have been felt by humans on the ground. This data was then plugged into a machine learning algorithm, which turned the measurements into a high-resolution map of the caldera and the volcano that lies beneath. Ettore Biondi, a seismologist from Caltech and first author on the study, says this is the first time that a network of deeply distributed acoustic sensors has revealed Earth's interior dynamics. The images produced are of "exceptional lateral resolution" in depths up to 8 kilometers, the team says. Even images of deeper portions, up to 30 kilometers down, were achieved with a "remarkable level of detail." The findings show a definite separation between the large magma chamber of the volcano, sitting 12 kilometers below the surface, and the shallow hydrothermal system that sits above. It seems that as the deeper chamber cools off, gasses and liquids bubble up toward the surface, possibly causing the quakes and inflated ground. This boiling effect could "induce the observed surface deformation and seismicity," researchers write. This is different and far less hazardous than what happens during an active volcanic eruption when magma in the chamber of the volcano forces itself up into the upper crust and out into the world. The way seismic activity travels through these layers suggests the top of the magma chamber has a hardened lid of crystallized rock, which has cooled over time. As the supervolcano's activity winds down, researchers say its "beating heart" is gradually slowing. The team plans to measure those last beats at 20 kilometers deep with a 200-kilometer-long cable of seismic sensors.



A diagram depicting the magma chamber beneath the Long Valley Caldera. The diagram was developed from tomographic imaging using seismic waves.

https://www.sciencealert.com/giant-supervolcano-in-california-is-sleepy-but-scientists-say-its-restless

'Impossible' Crystal Was Forged in World's First Nuclear Bomb Test

At 5:29 am on the morning of 16 July 1945, in the state of New Mexico, a dreadful slice of history was made. The dawn calm was torn asunder as the United States Army detonated a plutonium implosion device known as the Gadget, the world's very first test of a nuclear bomb, known as the Trinity test. This moment would change warfare forever. The energy release, equivalent to 21 kilotons of TNT, vaporized the 98-foot test tower and miles of copper wires connecting it to recording equipment. The resulting fireball fused the tower and copper with the asphalt and desert sand below into green glass, a new mineral called **trinitite.** Decades later, scientists discovered a secret hidden in a piece of that trinitite (a rare form of matter known as a quasicrystal, once thought to be impossible). Quasicrystals require a traumatic event with extreme shock, temperature, and pressure. We don't typically see that, except in something as dramatic as a nuclear explosion. Most crystals, from the humble table salt to the toughest diamonds, obey the same rule: their atoms are arranged in a lattice structure that repeats in three-dimensional space. Quasicrystals break this rule, the pattern in which their atoms are arranged does not repeat. When the concept first emerged in the scientific world in 1984, this was thought to be impossible: crystals were either ordered or disordered, with no in-between. Then they were actually found, both created in laboratory settings and in the wild – deep inside meteorites, forged by thermodynamic shock from events like a hypervelocity impact. Knowing that extreme conditions are required to produce quasicrystals, a team of scientists led by geologist Luca Bindi of the University of Florence in Italy decided to take a closer look at trinitite. But not the green stuff. Although they're uncommon, we have seen enough quasicrystals to know that they tend to incorporate metals, so the team went looking for a much rarer form of the mineral, red trinitite, given its hue by the vaporized copper wires incorporated therein. Using techniques such as scanning electron microscopy and X-ray diffraction, they analyzed six small samples of red trinitite. Finally, they got a hit in one of the samples, a tiny, 20-sided grain of silicon, copper, calcium and iron, with a five-fold rotational symmetry impossible in conventional crystals – an "unintended consequence" of warmongering. The quasicrystal is magnificent in its complexity, but nobody knows why it was formed in this way. This discovery represents the oldest known anthropogenic quasicrystal, and it suggests that there may be other natural pathways for the formation of quasicrystals. For example, the fulgurites of molten sand forged by lightning strikes, and material from meteor impact sites, could both be a source of quasicrystals in the wild. The research could also help us better understand illicit nuclear tests, with the eventual aim of curbing the proliferation of nuclear armaments. Studying the minerals forged at other nuclear testing sites could uncover more quasicrystals, the thermodynamic properties of which could be a tool for nuclear forensics. . A quasicrystal that is formed at the site of a nuclear blast can potentially tell us new types of information, and they'll exist forever. https://www.sciencealert.com/impossible-crystal-was-forged-in-worlds-first-nuclear-bomb-test

Man Keeps Rock For Years Thinking It's Gold. It Turned Out to Be Far More Valuable

In 2015, David Hole was prospecting in Maryborough Regional Park near Melbourne, Australia. Armed with a metal detector, he discovered something out of the ordinary, a very heavy, reddish rock resting in some yellow clay. He took it home and tried everything to open it, sure that there was a gold nugget inside the rock, after all, Maryborough is in the Goldfields region, where the Australian gold rush peaked in the 19th century. To break open his find, Hole tried a rock saw, an angle grinder, a drill, even dousing the thing in acid. However, not even a sledgehammer could make a crack. That's because what he was trying so hard to open was no gold nugget. As he found out years later, it was a rare meteorite. Unable to open the 'rock', but still intrigued, Hole took the nugget to the Melbourne Museum for identification. There it was identified and researchers published a scientific paper describing the 4.6 billion-year-old meteorite, which they called Maryborough after the town near where it was found. It weighs a whopping 37.5 pounds, and after using a diamond saw to cut off a small slice, the researchers discovered its composition had a high percentage of iron, making it an H5 ordinary chondrite. Once open, you can also see the tiny crystallized droplets of metallic minerals throughout it, called chondrules. Although the researchers don't yet know where the meteorite came from and how long it may have been on Earth, they do have some guesses. The believe that it probably originated in the asteroid belt between Mars and Jupiter, and was nudged out of the belt by asteroid collisions, eventually crashing to Earth. Carbon dating suggests the meteorite has been on Earth between 100 and 1,000 years, and a number of meteor sightings between 1889 and 1951 that could correspond to its arrival on our planet. The researchers argue that the Maryborough meteorite is much rarer than gold, making it far more valuable to science. It's one of only 17 meteorites ever recorded in the Australian state of Victoria, and this is the second largest chondritic mass, after a huge 121 pound specimen identified in 2003. It is only the 17th meteorite found in Victoria, whereas there's been thousands of gold nuggets found. Looking at the chain of events, it's quite, you might say, astronomical it being discovered at all. It's not even the first meteorite to take a few years to make it to a museum. In a particularly amazing story *ScienceAlert* covered in 2018, one space rock took 80 years, two owners, and a stint as a doorstop before finally being revealed for what it truly was. Now is probably as good a time as any to check your backyard for particularly heavy and hard-to-break rocks, you might be sitting on a metaphorical gold mine.

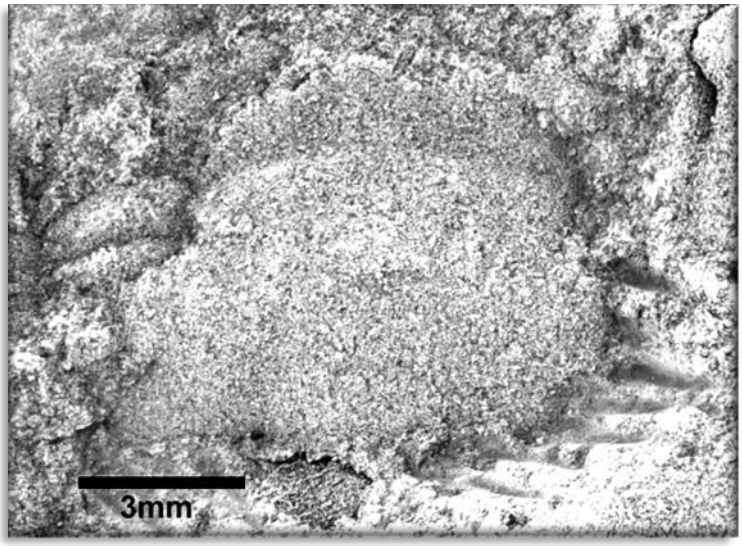
Maryborough meteorite, with a slab cut from the mass.

https://www.sciencealert.com/man-keeps-rock-for-years-thinking-its-gold-

490-Million-Year-Old Trilobites Encased In Volcanic Rock Could Solve Ancient Geography Puzzle

Trilobites like this one were smushed down by layers of volcanic ash-turned-rock, millions of years ago.

The humble trilobite may be long-extinct, but even as fossils, there's much they can teach us about the history of our planet. In fact, ancient arthropods – including 10 newly discovered species – that lived nearly half a billion years ago could provide the missing pieces to the puzzle of where Thailand fitted in the ancient supercontinent of Gondwana. The fossils were discovered in a little-studied region of **Thailand, Ko Tarutao**, in a green layer of rock called a tuff – coincidentally, this type of rock is, in fact, tough. It's formed when ash from volcanic eruptions settles on the seafloor and is gradually compressed into solid rock. Within the fossil-containing tuff were crystals of zircon, a chemically stable, resilient mineral containing atoms of uranium, which gradually decay and transform into lead atoms. As a result, researchers could use radio isotope techniques to date the zircon, and thus the age of the eruption that led to the tuff and the trilobites within it. They discovered that the trilobites dated back to around 490 million years ago, during the late Cambrian period, making the tuff a rare find. *"Not many places around the world have this. It is one of the worst-dated intervals of time in Earth's history,"* said co-author Nigel Hughes in a statement. As well as discovering **10 new trilobite species** within the tuff, the researchers found **12 types of trilobite that had never been discovered in Thailand**, but had been found in other places. Together with the dating of the tuff, this could provide clues as to where the region would have been in relation to other countries when they were all part of Gondwana, the ancient supercontinent. *"We can now connect Thailand to parts of Australia, a really exciting discovery,"* explained first author Shelly Wernette. This suggests that the region that went on to become modern-day Thailand was on the outer margins of Gondwana. It's hoped this discovery could help provide further insight into the geographical history of the other areas where the trilobites have been found, but where rock has been difficult to date. *"The tuffs will allow us to not only determine the age of the fossils we found in Thailand, but to better understand parts of the world like China, Australia, and even North America where similar fossils have been found in rocks that cannot be dated,"* said Wernette. The researchers also believe that the study is of use to the present, too. "What we have here is a chronicle of evolutionary change accompanied by extinctions. The Earth has written this record for us, and we're fortunate to have it," said Hughes. *"The more we learn from it the better prepared we are for the challenges we're engineering on the planet for ourselves today."*



One of the newly discovered species, *Tsinania sirindhornae*, was named after Thailand's Royal Princess.

https://www.iflscience.com/490-million-year-old-trilobites-encased-in-volcanic-rock-could-solve-ancient-geography-puzzle-71673

2024 CVRMS Holiday Party—Dec 7

Paul Stults and Dell James dressed for the season at the 2017 Holiday Party

will be held at our regular meeting site,
Hiawatha Community Center
101 Emmons St., Hiawatha
on Thursday December 7, 2024

Games were played at the 2015 Holiday Party

doors open at 6:00 pm
eat at 6:30 pm

CVRMS will provide
Turkey, Baked Ham (thanks Jeff)
Stuffing, Mashed Potatoes, Gravy,
Hot Apple Cider, and Punch

Potluck for side dishes and desserts
(bring your best dishes)

and bring your own table service

bring rocks for show and tell

Bill's Big Bus Boogy Trip 2024
Museum Slide Show

DONATIONS WILL BE COLLECTED FOR
Linn County Food Bank
& HACAP

Members and guests ***chow down*** at the 2017 Holiday Party

Strange Yellow Glass in African Desert Traced Back to Extraterrestrial Impact

The Great Sand Sea Desert stretches over an area of 28,000 mi² linking Egypt and Libya. If you find yourself in a particular part of the desert in south-east Libya and south-western parts of Egypt, you'll spot pieces of yellow glass scattered across the sandy landscape. It was first described in a scientific paper in 1933 and is known as Libyan desert glass. Mineral collectors value it for its beauty, its relative rarity – and its mystery. A pendant found in Egyptian pharaoh Tutankhamun's tomb contains a piece of the glass. Natural glasses are found elsewhere in the world; examples include **moldavites** from the **Ries crater** in Europe and **tektites** from the **Ivory Coast**. But none are as rich in silica as Libyan desert glass, nor are they found in such large lumps and quantities. The origin of the glass has been the subject of debate among scientists for almost a century. Some suggested it might be from volcanoes on the moon. Others propose it's the product of lightning strikes (**"fulgurites"** – glass that forms from fusion of sand and soil where they are hit by lightning). Other theories suggest it's the result of sedimentary or hydrothermal processes; caused by a massive explosion of a meteor in the air; or that it came from a nearby meteorite crater. Now, thanks to advanced microscopy technology, we believe we have the answer. Along with colleagues from universities and science centers in Germany, Egypt and Morocco, I have identified **Libyan desert glass** as originating from the impact of a meteorite on the Earth's surface. Space collisions are a primary process in the solar system, as planets and their natural satellites accreted via the asteroids and planet embryos (also called planetesimals) colliding with each other. These impacts helped our planet to assemble, too. In 1996 scientists determined that the glass was close to 29 million years old. A later study suggested the source material was composed of quartz grains, coated with mixed clay minerals and iron and titanium oxides. This latter finding raised more questions, since the proposed age is older than the matching source material in the relevant area of the Great Sand Sea desert. To put it simply: those source materials didn't exist in that location 29 million years ago. For our recent study, a co-author obtained two pieces of the glass from a local who had collected them in the Al Jaouf region in south-eastern Libya. We studied the samples with a state-of-the-art transmission electron microscopy (TEM) technique, which allows us to see tiny particles of material, 20,000 times smaller than the thickness of a paper sheet. Using this super-high magnification technique, we found small minerals in this glass: different types of zirconium oxide (ZrO_2). Minerals are composed of chemical elements, atoms of which form regular three-dimensional packaging. Imagine putting eggs or soda bottles on the shelf of a supermarket: layers on top of layers to ensure the most efficient storage. Similarly, atoms assemble into a crystal lattice that is unique for each mineral. Minerals that have the same chemical composition but different atomic structure (different ways of atom packaging into the crystal lattice) are called polymorphs. One polymorph of ZrO_2 that we observed in Libyan desert glass is called **cubic zirconia**, the kind seen in some jewelry as a synthetic replacement for diamonds. This mineral can only form at a high temperature between 2,250°C and 2,700°C. Another polymorph of ZrO_2 that we observed was a very rare one called **ortho-II or OII.** It forms at very high pressure, about 130,000 atmospheres (a unit of pressure). Such pressure and temperature conditions provided us with the proof for the meteorite impact origin of the glass. That's because such conditions can only be obtained in the Earth's crust by a meteorite impact or the explosion of an atomic bomb. If our finding is correct (and we believe it is), the parental crater, where the meteorite hit the Earth's surface, should be somewhere nearby. The nearest known meteorite craters, named GP and Oasis, are 1.2 mi and 11 mi in diameter respectively, and quite far away from where the glass we tested was found. They are too far and too small to be considered the parental craters for such massive amounts of impact glass, all concentrated in one spot. So, while we've solved part of the mystery, more questions remain. Where is the parental crater? How big is it, and where is it? Could it have been eroded, deformed or covered by sand? More investigations will be required, likely in the form of remote sensing studies coupled with geophysics.

The pieces of Libyan desert glass that formed the basis of the study.

https://www.sciencealert.com/strange-yellow-glass-in-african-desert-traced-back-to-extraterrestrial-impact

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Next Meeting:
THURSDAY DECEMBER 7
Hiawatha Community Center
2023 CVRMS Holiday Party
Dues are Due

CEDAR VALLEY GEMS DECEMBER 2023 VOL. 49, ISSUE 12

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Club meetings are held the 3rd Tuesday of each month from September through November and from January through May at 7:15 p.m. Meetings are held at the Hiawatha Community Center in the Hiawatha City Hall, 101 Emmons St., Hiawatha IA. The December meeting is a potluck dinner held on the 1st Tuesday at 6:30. June, July, and August meetings are potlucks held at 6:30 p.m. at area parks on the 3rd Tuesday of each month

CEDAR VALLEY ROCKS & MINERAL SOCIETY

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

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

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

CVRMS website:
cedarvalleyrockclub.org