

Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS

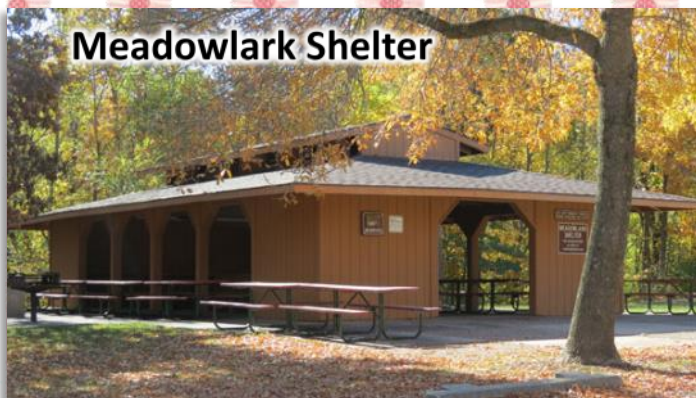
JULY 2024

VOL. 50, ISSUE 07

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

Next CVRMS Meeting
Tues. July 16
we eat at 6:30 pm
Pot-Luck Picnic!

at Wanatee Park
1600 Banner Drive, Marion



Geode Cracking
Rock Identification
Rock Show & Tell
(bring some rocks to show off)

- **Bring Your Favorite Dish to Share**
- **Bring Your Own Table Service**

Woolly Mammoths Were Still Around When the Great Pyramid Was Built

Woolly mammoths seem old-school. Hunted by Neanderthals for tens of thousands of years, these elephant-like mammals, some with tusks up to 15 feet long, evolved hair and layers of fat to withstand the frigid temperatures of the ice age tundra as they roamed the northern reaches of Asia, Europe, and North America. Although they're no longer among us, their bones, and in some cases mummified re-



mains, fill natural history museums around the world. But these ancient beasts aren't as ancient as you might think. In fact, it's estimated that the last woolly mammoth died around 1700

BCE, some 800 years *after* ancient Egyptians built the Great Pyramid of Giza. As the Earth began transitioning out of the last ice age some 12,000 years ago, a warming world altered the woolly mammoth's ecosystem. Melting glaciers created a wetter planet that destroyed the vegetation mammoths relied on for food, and this dramatic shift, along with continued human predation, led to complete extinction of the creatures in most areas around 8000 BCE. However, small pockets survived on some islands that benefited from both cold-weather vegetation and protection from human hunters. Some of the last known mammoths lived in isolation on Wrangel Island, a Russian possession in the Arctic Ocean just northwest of Alaska, and they didn't have an easy go of it. Scientists who compared a 4,300-year-old mammoth bone from Wrangel Island to mammoth specimens 10 times older and from the Siberian mainland found that these final woolly mammoths experienced what scientists call a "*genetic melt-down*" due to the limited gene pool on the island, with mutations that likely made it harder to mark territory and choose mates. As for the ancient Egyptians, they kept chugging along until the death of Cleopatra, in 30 BCE. With its transformation into a Roman province, the 3,000-year-old dynasty also went the way of the woolly mammoth.

<https://mail.google.com/mail/u/0/#inbox/FMfcgzQVxHcsFfPwcFMBWzKmWNtFZzdM>

World First: China's Chang'e-6 Lunar Probe Returns With Rocks From Moon's Far Side

Three weeks after it lifted off from the far side of the moon, China's **Chang'e-6 spacecraft** dropped off a capsule containing first-of-its-kind lunar samples for retrieval from the plains of Inner Mongolia. The gumdrop-shaped sample return capsule floated down to the ground on the end of a parachute, with the descent tracked on live television. After today's touchdown, at 2:07 p.m. local time



A Chinese flag flies near the Chang'e-6 sample return capsule after landing in Inner Mongolia.

(0607 GMT), members of the mission's recovery team checked the capsule and unfurled a Chinese flag nearby. Chang'e-6, which was launched in early May 2024 is the first robotic mission to land and lift off again from the Moon's far side, the

side that always faces away from Earth. It's also the first mission to bring dirt and rocks from the far side back to Earth. *"The Chang'e-6 lunar exploration mission achieved complete success,"* Zhang Kejian, director of the China National Space Administration, said from mission control. Chang'e-6 followed a flight plan similar to the one used for Chang'e-5, a mission that brought back samples from the moon's Earth-facing side in 2020. After entering lunar orbit, the spacecraft sent a lander down to the Moon's South Pole-Aitken Basin region. The lander used an onboard drill and robotic arm to collect and store samples on its ascent stage. It also gathered data about its surroundings with a radon detector, a negative-ion detector and a mini-rover. Data and telemetry were relayed between Chang'e-6 and Earth via China's Queqiao-2 satellite. On June 4, Chang'e-6's ascent stage lifted off for a rendezvous with the orbiting spacecraft. The samples were transferred to a re-entry capsule, and the spacecraft left lunar orbit several days ago for the trip back to Earth. The re-entry capsule was released as the spacecraft sped about 3,100 miles over the South Atlantic Ocean, CNSA said in a mission update. After an initial round of processing at the landing site in China's Inner Mongolia region, the capsule is due to be airlifted to Beijing, where the mission's precious cargo will be removed for distribution to researchers. The samples are expected to include volcanic rock and other materials that could shed fresh light on the Moon's origins and compositional differences between the near side and the far side. Scientists may also learn more about resources in the Moon's south polar region. That region is of high interest because it's thought to harbor deposits of water ice that could be used to support future lunar settlements. NASA is targeting the south polar region for a series of robotic missions, leading up to a crewed landing during the Artemis 3 mission, which is currently scheduled for 2026. China has its own lunar ambitions, including plans for sending astronauts to the lunar surface by 2030. <https://www.sciencealert.com/world-first-chinas-change-6-lunar-probe-returns-with-rocks-from-moons-far-side?>

CVRMS Board Meeting June 28 — Minutes —

BOARD MEETING CANCELLED DUE TO LACK OF MEMBERS

Earth Was on the Other Side of the Galaxy When the Dinosaurs Were Alive

That dinosaurs went extinct 65 million years ago is pretty common knowledge. Not as well known, but just as fascinating, is the fact that Earth was on the other side of the galaxy when most of them were alive. It takes the sun (and thus the rest of the solar system) around 250 million years to orbit the center of the Milky Way. The first dinosaurs appeared at the dawn of the Triassic Period around 250 million years ago, and for most of their very long reign, namely the Jurassic and Cretaceous periods, our humble planet was in a completely different neighborhood of the galaxy. That means, of course, that the stars the dinosaurs saw in the sky would have looked different from the view we have today. Though not new information, this knowledge made something of a splash a few years ago when NASA astronomer Dr. Jessie Christiansen created an animation showing which part of the Milky Way our prehistoric predecessors resided in. Perhaps the most intriguing part of the video is its ending, which asks what our planet might be like the next time we complete a trip through the Milky Way. Fortunately, our solar system stays far, far away from the inhospitable galactic center (and its supermassive black hole) as it moves through space. If it didn't, there'd be no life on Earth whatsoever, human, dinosaur, or otherwise. <https://twitter.com/i/status/1166773845400801281>

Click on image below to view video of Earth's orbit through the galaxy during the age of dinosaurs.



HELP NEEDED

A volunteer who regularly attends CVRMS monthly meetings is needed to assume the duties of Club Hostess. You will be in charge of bringing refreshments to the monthly meetings beginning with our September 17 meeting.

Space Rock That Fell to Earth Reveals Ancient Traces of Early Solar System

A lot has changed in the 4.5 billion or so years since the Solar System first came together from a disk-shaped cloud of swirling dust and gas. The stuff from which everything formed has undergone some serious alterations, packed into planets, blasted by solar radiation and plasma, changed by interactions with other atoms. The basic components of that initial, early dust disk are therefore difficult to discern. But not, as it happens, entirely impossible. Preserved inside an ancient rock that fell to Earth from space and was recovered in 2018, an international team of scientists have now identified traces of material that, they say, must have originated in the protoplanetary disk, back when the Solar System was young. It's a discovery that can give us new insights into the history of the Solar System, and the basic building blocks from which everything around us, here on Earth and around the Sun, was born, so many eons ago. The Sun, like all stars, was born in a cloud of dust. A denser knot in the cloud collapsed under its own gravity, spinning, spooling the material around it into a disk that fed into the growing star. When the Sun was finished, what remained of that disk formed everything else in the Solar System: the planets, the moons, the asteroids, the comets, and the icy chunks of rock that make up the spherical Oort Cloud that is thought to encapsulate it all. That Oort Cloud is made up of icy chunks of rock that sometimes make their way into the inner Solar System, looping around the Sun, shedding gas and dust as they do so. These are the long-period comets, with orbits of hundreds to hundreds of thousands of years. The Oort Cloud, so far from the Sun, is thought to have remained relatively unaltered since the birth of the Solar System, and thus represents the most pristine example of the primordial material that made up the disk that formed the planets. But this material has been challenging to study closely. Even when cometary fragments containing that primordial material do make their long journey through the Solar System to enter Earth's atmosphere, they melt away as they fall. This brings us to meteorites. Even though space is mostly fairly empty, comets and meteorites do sometimes collide. When this happens, it's possible that some cometary material can become mixed into the meteorite, trapped inside as fragments called clasts. If that meteorite enters Earth's atmosphere, it, too, will be heated, but the cometary clasts contained inside can remain protected and reach the surface intact. This is what the team of researchers discovered in a meteorite named Northwest Africa 14250 (NWA 14250). Using a scanning electron microscope, and spectroscopic analysis, the researchers conducted a very close perusal of the contents of NWA 14250, and the isotopes of various minerals found in clasts therein. The minerals in some clasts, the researchers determined, are most likely to be cometary in origin, which means meteorites like NWA 14250 could represent a tool for studying the composition of the early Solar System. But there's more. The clasts, the team found, were very familiar: they resembled clasts found in other meteorites from the outer Solar System near Neptune, as well as samples taken from the asteroid Ryugu. This suggests, the researchers say, that not only is primordial material relatively common (if a little difficult to access), the composition of the protoplanetary disk was relatively uniform during the formation of the Solar System.

<https://www.sciencealert.com/space-rock-that-fell-to-earth-reveals-ancient-traces-of-early-solar-system>

Spotlight Gemstone:

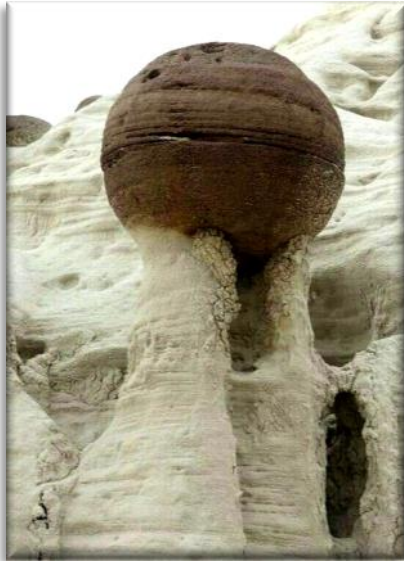
Just a few miles south of Santa Fe, New Mexico lies a vast plain covered only by low-growing veg-

July's Birth Stone



Ruby is a pinkish red to blood-red colored gemstone, a variety of the mineral corundum (aluminium oxide). Ruby is one of the most popular traditional jewelry gems and is very durable. Other varieties of gem-quality corundum are called sapphires. Ruby is one of the traditional cardinal gems, alongside amethyst, sapphire, emerald, and diamond. The word *ruby* comes from *ruber*, Latin for red. The color of a ruby is due to the element chromium. The quality of a ruby is determined by its color, cut, and clarity, which, along with carat weight, affect its value. The brightest and most valuable shade of red, called *blood-red* or *pigeon blood*, commands a large premium over other rubies of similar quality. After color follows clarity: similar to diamonds, a clear stone will command a premium, but a ruby without any needle-like rutile inclusions may indicate that the stone has been treated. Ruby is the traditional birthstone for July and is usually pinker than garnet. The world's most valuable ruby, the 25.59-carat Burmese pigeon blood **Sunrise Ruby**, was auctioned by Christie's in Geneva on 10 May 2023 for **\$14.7 million**. Rubies have a hardness of 9.0 on the Mohs scale of mineral hardness; among the natural gems, only moissanite and diamond are harder. Sapphire, ruby, and pure corundum are α -alumina, the most stable form of Al_2O_3 , in which 3 electrons leave each aluminium ion to join the regular octahedral group of six nearby O^{2-} ions; in pure corundum this leaves all of the aluminium ions with a very stable configuration of no unpaired electrons or unfilled energy levels, and the crystal is perfectly colorless, and transparent except for flaws. The red coloration in rubies is produced when slightly larger chromium atoms replace some aluminum atoms in the crystal, creating distortions that lead to absorption in the ultraviolet, violet, and yellow-green regions of the spectrum, leaving red. All natural rubies have imperfections in them, including color impurities and inclusions of rutile needles known as "silk." Gemologists use these needle inclusions found in natural rubies to distinguish them from synthetics, simulants, or substitutes. Usually, the rough stone is heated before cutting. These days, almost all rubies are treated in some form, with heat treatment being the most common practice. Untreated rubies of high quality command a large premium. Some rubies show a three-point or six-point asterism or "star." These rubies are cut into cabochons to display the effect properly. Historically, rubies have been mined in Thailand and Cambodia, as well as in Afghanistan, Australia, Brazil, Colombia, India, Namibia, Japan, and Scotland. After the Second World War, ruby deposits were found in Madagascar, Mozambique, Nepal, Pakistan, Tajikistan, Tanzania, and Vietnam.

What in the World?



What in the World is this large rock sphere balanced on a sandstone pedestal ??

June's Photo



Last month's **What in the World** photograph was the **Bowder Stone**, a large andesite lava boulder near Borrowdale, Cumbria, England. The 2,000 ton stone stands at over 30ft tall, 30ft wide and over 90ft in circumference, with a giant ladder allowing you to walk to the top. It was not carried into the area by glacial ice but is a local rock that toppled into its present position about 18,000 years ago.

ROCK CALENDAR CVRMS EVENTS OF INTEREST

2024

July 16 — CVRMS Monthly Meeting

Picnic at Wanatee Park, Marion
Rock Show and Tell and Geode Cracking

July 25 — Beginning Flintknapping Class

Hiawatha Community Center 1:00-3:00 pm
Details on p. 11

Aug. 20 — CVRMS Monthly Meeting

Picnic at Morgan Creek Park, Marion
Rock Show and Tell and Rock Bingo

Sept. 17 — CVRMS Monthly Meeting

Hiawatha Community Center 7:15 pm
Program to be announced

Sept. 21-22 — CVRMS Rock Auction

Amana RV Park
Saturday Sept. 21—9:00 am—8:00 pm
Sunday Sept. 22 —9:00 am—3:30 pm

Sept. 27, 28, & 29 — Geode Fest

First Christian Church Parking Lot
3476 Main Street, Keokuk, Iowa
Keokuk Area Convention & Tourism Bureau
[Official Website \(keokukiowatourism.org\)](http://Official Website (keokukiowatourism.org))

Oct 5 — Bill's Big Bus Boogy 2024

CVRMS Bus Trip to the Grotto of the Redemption
and Calkins Nature area
Details in next month's newsletter

Oct. 15 — CVRMS Monthly Meeting

Hiawatha Community Center 7:15 pm
Program to be announced

Nov. 19 — CVRMS Monthly Meeting

Hiawatha Community Center 7:15 pm
Program to be announced

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.

Since no one posed any questions to *Ask a Geologist* last month, once again I was free to choose a topic that I thought you would find of interest. This month I chose to share an article that I noticed in one of my daily emails of science news from *Live Science*. This article showed a NASA satellite image showing an area about 20 x 40 miles that looks more like a work of modern art than a satellite image. I hope you find the article as interesting as I did.



Earth from space: Near-lifeless 'Land of Terror' looks like an alien landscape in the Sahara

The **Tanezrouft Basin** is a large region of the Sahara mainly located in southern Algeria and northern Mali. The area receives less than 0.2 inches of rain a year on average, making it "*hyperarid*." Temperatures can reach over 122 degrees Fahrenheit during summer, according to NASA's Earth Observatory. The basin is almost completely devoid of life apart from some Tuareg nomads who occasionally make the treacherous journey through the region on a caravan route that dates back more than 1,500 years. But this can be a deadly trip due to the region's lack of visible landmarks, which can cause even the most experienced travelers to get lost. As a result, the basin is colloquially known as the "*Land of Terror*." Thousands of years of sandstorms have eroded sediment and sand from parts of the basin, which has revealed ancient concentric folds in the region's undulating sandstone bedrock that date to the Paleozoic era (541 million to 252 million years ago). Flashes of green are pitted around these folded rocks, which are salt flats often located in steep canyons. When viewed from space, "*the exposed geologic features create an arresting work of abstract art*," NASA representatives wrote. The dramatic landscape also reveals that Tanezrouft Basin hasn't always been so hostile to life. Some of the salt flats in this real-color image lay in canyons up to 1,600 feet deep. The scale of these steep gullies and the shape of their smoothed sides are signs that they were carved out by flowing water, potentially from intermittent flooding over millions of years, said P. Kyle House, a researcher with the U.S. Geological Survey. This suggests the region could have once been a more luscious environment potentially capable of supporting a diverse ecosystem. Today, the salt flats and their canyons either lie within or intersect with the exposed sandstone folds, creating the shapes seen in this image. "*These patterns are striking and reminiscent of landscapes formed on folded strata in, for example, the Red Desert of southern Wyoming and even parts of the heavily forested Appalachian Mountains of the Eastern United States*," House said.

<https://www.livescience.com/planet-earth/geology/earth-from-space-near-lifeless-land-of-terror-looks-like-an-alien-landscape-in-the-sahara>

T. Rex Was Probably About as Intelligent as a Crocodile

New research is throwing some cold water on the idea that the fearsome Tyrannosaurus rex was as smart as a primate. These possibly scaly-lipped theropods were about as smart as living reptiles like crocodiles, but not quite as intelligent as monkeys. The findings are detailed in a study published April



26 in the journal *The Anatomical Record*. In 2023, a study from Vanderbilt University neuroscientist Suzanaerculano-Houzel set off a dinosaur-sized debate. Herculano-Houzel proposed that dinosaurs like T. rex had an exceptionally high number of neurons

(over 3 billion of them), more than a baboon. This higher number of neurons could mean that they were more intelligent than assumed. The paper theorized that these high neuron counts could inform their intelligence, metabolism, and even give them some more monkey-like habits. They could have used tools and transmitted knowledge culturally like modern day primates, according to Herculano-Houzel's study. These bold claims that such a large and powerful reptilian carnivore could have been intelligent enough to sharpen tools and transmit knowledge shook the paleontology world. In this new study, an international team of paleontologists, neuroscientists, and behavioral scientists argues that researchers should look at multiple lines of evidence when reconstructing long-extinct species. These include skeletal anatomy, bone composition, trace fossils that show movement, and the behaviors of their living relatives. The study reexamined the techniques that were used to predict both number of neurons and brain size in dinosaurs as well as decades of previous research. They found that the assumptions made about brain cavity size and corresponding neuron counts were unreliable. Despite being very similar to big birds, dinosaurs were reptiles. As reptiles, they have very different brains than birds or mammals, but brain tissue does not fossilize. To study what their brains must have been like, scientists look to their skulls for clues. Reptile brains typically don't fill up their skull cavity and they also tend to have a lot of cerebrospinal fluid taking up space. They also don't have the same kinds of connections and circuits in their brains, which would have limited the complexity of their social behaviors. The size of the animal is also a major factor. An adult male baboon can range from 30 to 88 pounds, while a T. rex could be over 15,000 pounds. Number of neurons typically scales to body size, according to the team. The team believes that the T. rex needed a huge number of neurons for just maintaining basic biological functions with such a large body and wouldn't have had any leftover for things like cultural knowledge transmission or tool usage. The study also found that their brain size had been overestimated, particularly the forebrain. The neuron counts could have also been overestimated and the neuron count estimates are not a reliable guide to intelligence. They were more like smart giant crocodiles, and that's just as fascinating.

<https://www.popsoci.com/science/t-rex-intelligence/>

Iceland's Volcanic Eruptions Could Continue For Decades, Study Finds

After almost 800 years of relative dormancy, volcanoes on Iceland's Reykjanes Peninsula are returning to life with renewed ferocity. Eight eruptions have occurred since 2021 and new research suggests the upsurge in volcanic activity stems from a shallow pool of magma just 6.2 miles wide and only 6-7 miles below the surface. Alerting authorities to this magma source is critical for the ongoing safety of residents in the region, with researchers claiming the magma pool could feed similarly-sized volcanic eruptions in the area for years or maybe decades more. "A comparison of [current] eruptions with historical events provides strong evidence that Iceland will have to prepare and be ready for this volcanic episode to continue for some time, possibly even years to decades," said geologist Valentin Troll of Uppsala University in Sweden, who led the study. Troll and his colleagues used seismic wave data from volcanic eruptions and earthquake 'swarms' to map the subsurface of the



Lava spewing from a 2024 eruption in Sundhnúkur, Iceland.

Reykjanes Peninsula in southwest Iceland, which is home to most of the country's population. They found the 2021 eruptions of the Fagradalsfjall volcanic system

were fed by a pocket of magma that then oozed along geological lines to Sundhnúkur, where volcanoes have been spewing lava since late 2023. With both eruption zones expelling lavas with similar geochemical "fingerprints," the findings suggest a "connected magma plumbing system" joins the two volcanic systems. Historical data indicates this shared magma pool likely formed sometime between 2002 and 2020, was recharged again in 2023, and continues to supply magma from shallow depths to surface fissures and vents via slightly sloped pathways. Melting rock deeper in the mantle replenishes the magma pool, so it may fuel eruptions for decades to come. Now that the magma pool has been identified, it can be mapped and monitored to prepare communities for what might eventuate. Repeated evacuations would be an obvious but very necessary disruption to ensure people's safety. Frequent eruptions may also damage key infrastructure such as geothermal power plants that supply Iceland with electricity and heat, and experimental carbon sequestration facilities, injecting carbon dioxide (CO₂) and other gaseous pollutants into porous rocks. Sitting atop the Mid-Atlantic Ridge, the tectonic plate boundary pushing North America and Eurasia apart, Iceland is no stranger to volcanic eruptions. But the past three years of eruptions have been particularly disruptive and could, potentially, mark the beginning of a lengthy period of persistent volcanic eruptions for the country. Nature is rarely predictable, however, so the researchers are calling for continued monitoring of the area. "We don't know how long and how frequently it will continue for the next ten or even hundred years," said study author Ilya Bindeman, a volcanologist at the University of Oregon. "A pattern will emerge, but nature always has exceptions and irregularities."

<https://www.sciencelert.com/icelands-volcanic-eruptions-could-continue-for-decades-study-finds>

Turquoise Hill: a Profile of the Cerrillos Turquoise Mines

by Emily Frontiere

Just a few miles south of Santa Fe, New Mexico lies a vast plain covered only by low-growing vegetation. From this vantage point, one can see the Sangre de Cristo Mountains to the northeast and the Sandia Mountains to the south. Here, you can find a small group of unassuming mounds, including one called "**Turquoise Hill.**" It's easy to drive past this natural feature and not realize that you're in the shadow of a historic landmark, a place still considered sacred by the descendants of the Native Americans who originally inhabited the land. Turquoise Hill is, in fact, the location of the **oldest turquoise mine in North America.** Turquoise Hill sits within an 80-acre patch of land owned by Douglas Magnus. A highly respected silversmith and jeweler, he helped design and construct the official gavel of the State of New Mexico. Oddly enough, my discussions with him and his wife, Wendy, revealed an unexpected personal connection. Decades ago, to my mother's dismay, my grandfather would drop in at Douglas' showroom before heading to our home from the airport! Douglas acquired the land in the 1980s, a purchase prompted by his love of the native gemstone. Turquoise permeates this patch of land, which holds six turquoise mines, all now considered commercially mined out. However, this doesn't mean the land has no treasures left. Vibrant blue and green turquoise pieces cover the ground, and Douglas and Wendy collect them by hand. Douglas sets this turquoise in his hand-made silver items without introducing additives or treatments to the gem. He donates all extra inventory to the Native American descendants of the original miners, members of the modern-day Kewa Pueblo (previously known as the Santo Domingo Pueblo), for their jewelry designs. Wendy met me at Turquoise Hill on a brisk December day. An expert on the land and its long history, she said the most ancient of the



The original shaft of the Millennium Mine created by Native American miners.



A large piece of green turquoise with dark brown matrix

Turquoise Hill mines has known several names. Many locals call it the "**Tiffany Mine**" out of habit. In the later part of the 19th and early 20th centuries, the owners sent its beautiful blue and matrix-free turquoise to Tiffany & Co. in New York. However, the mine itself has no affiliation with Tiffany & Co. Thus, Douglas renamed it the "**Millennium Mine**" to eliminate any confusion. Wendy began our private tour by explaining the deep history of the land. The Native Americans have been mining turquoise here for at least the last thousand years and consider the ground sacred. Using only handheld hammers and chisels, they cut down into the turquoise-rich volcanic mafic rhyolite rock. It's impossible to know the exact depth of the original mine as the Native Americans filled in their shafts with tightly pressed soil, but it's at least 50 ft. Some estimates say it may have been more than twice that deep. Having personally excavated one of these repacked shafts, Douglas describes how the Native Americans clearly took great care to accomplish this. He found ancient mining tools placed around the perimeter of the shaft. They considered this place so holy that they buried some individuals here with their tools. The interred were likely affiliated with the mine. The Native American workers mined this land by cutting directly into the turquoise deposit. They created a deep pit accessible only from the top. As the mine grew deeper, they placed sturdy logs horizontally across the shaft. Unfortunately, a detailed history of mining activity through the centuries is impossible to reconstruct since Native Americans didn't leave behind any written records. However, Douglas says evidence indicates the mine was used throughout the 14th century CE. By the time the Spaniards arrived in the mid-16th century, mining had apparently ceased, and the shafts were filled. While the original shafts were blocked, the knowledge that this land held turquoise was never lost. The Spaniards made their own, albeit somewhat clumsy, attempts to extract turquoise here.

[Turquoise Hill: a Profile of the Cerrillos Turquoise Mines - IGS \(gemsociety.org\)](https://www.gemsociety.org/turquoise-hill-a-profile-of-the-cerrillos-turquoise-mines/)

New Species of Flying Dinosaur Found in Australia

Australia is famously well-served for most varieties of terrifying fauna, but at least one variety of prehistoric predator is under-represented in its fossil record: the flying carnivorous dinosaurs known as pterosaurs. However, a new paper published June 12



in *Scientific Reports* describes a fossilized skeleton found in the Australian state of Queensland that belongs to a previously unknown species of pterosaur. The new species, dubbed *Haliskia petersensi*, lived 100 million years ago, during the Albian stage of the Cretaceous period, and its discovery

suggests pterosaurs may have been more widespread down under than previously thought. The new discovery is exciting for a number of reasons. It represents a hitherto unknown species, it comes from a continent that has yielded relatively few pterosaur fossils, and it is far more complete than any other previous sample found in Australia. The skeleton includes part of the creature's skull, its entire mandible, two vertebrae, 12 ribs, two gastralia, along with multiple phalanges, metatarsals, and digits. Study co-author Adele Pentland says, "*Haliskia is 22% complete, making it more than twice as complete as the only other known partial pterosaur skeleton found in Australia.*" The relative completeness of the skeleton allowed researchers to place it into the clade *Anhangueria*, and to speculate about its feeding habits. *Haliskia's* skeleton dates to a time when much of Queensland was underwater, and the creature appears to have hunted in these waters for its prey. The paper speculates that given the shape of its teeth, it probably fed on "*soft-bodied invertebrates (likely cephalopods) and/or other slippery prey items.*" Researchers estimate its wingspan at just over 15 feet and infer from the shape of its skull and jaw that it possessed "*a strong, muscular tongue ... that aided in the immobilization of live, slippery prey items against the prominent palatal ridge.*" As with the vast majority of the other pterosaur bones that have been found in Australia, *Haliskia* comes from a region of Australia known as the Toolebuc Formation, a long stretch of Cretaceous rock that extends across Queensland, the Northern Territory, and South Australia. The skeleton was unearthed by Kevin Petersen, the curator of a local museum called Kronosaurus Korner, and has been named in his honor. During the era in which *Haliskia* lived, Australia remained part of the supercontinent Gondwana, which also encompassed modern South America, Africa, Antarctica, the Arabian Peninsula, and the Indian Subcontinent. However, the supercontinent was in the process of separating, slowly splitting apart into the continents we know today. While pterosaur fossils have been found all throughout the continents that once formed Gondwana, there is a marked difference between the parts that formed the eastern part of the supercontinent. The authors write, "Fossils of pterosaurs are rare in eastern Gondwana, in stark contrast to their relative abundance and diversity in western Gondwana." This has made it difficult to reach any conclusions about how widespread pterosaurs might have been in these regions. The paper suggests that *Haliskia's* discovery might change this.:

<https://www.popsi.com/science/new-species-flying-dinosaur/>

Third Form of Life Makes Energy in 'Remarkable' Ways, Scientists Discover

As the world turns to green hydrogen and other renewable energy sources, scientists have discovered that **archaea**, the third form of life after bacteria and eukaryotes, have been making energy using hydrogen gas and "*ultraminimal*" enzymes for billions of years. Specifically, the international team of researchers discovered that at least nine phyla of archaea, a domain of single-celled organisms lacking internal membrane-bound structures, produce hydrogen gas using enzymes thought to only exist in the other two forms of life. Archaea, they realized, not only have the smallest hydrogen-using enzymes compared to bacteria and eukaryotes, but their enzymes for consuming and producing hydrogen are also the most complex characterized so far. Small and mighty, these enzymes have seemingly allowed archaea to survive and thrive in some of Earth's most hostile environments where little to no oxygen is found. Hydrogen is the most abundant element in the Universe and is used globally to make fertilizers and other chemicals, treat metals, process foods, and refine fuels. But hydrogen's future lies in energy storage and steel-making, which could be produced with zero emissions if renewable energy is used to convert materials such as water into hydrogen gas. Microorganisms produce and release hydrogen gas (H₂) for entirely different purposes, mainly to dispose of excess electrons produced during fermentation, a process whereby organisms extract energy from carbohydrates such as sugars without oxygen. Enzymes used for consuming or producing H₂ are called hydrogenases, and they were first comprehensively surveyed across the tree of life only eight years ago. Since then, the number of known microbial species has exploded, particularly archaea, which hide out in extreme environments, such as hot springs, volcanoes, and deep-sea vents. However, most archaea are known only from chunks of their genetic code found in these environments, and many haven't been cultured in the lab because it's very difficult to do so. So researchers searched for the gene encoding part of one type of hydrogenase, fast-acting [FeFe] hydrogenases, in more than 2,300 archaeal species clusters listed in a global database. Then they tasked Google's AlphaFold2 with predicting the structure of the encoded enzymes, and expressed those enzymes in *E. coli* bacteria, to check those genes were actually functional and produced hydrogenases capable of catalyzing hydrogen reactions in their surrogate host. Eukaryotes are organisms whose cells contain a nucleus and membrane-bound organelles, such as mitochondria and other useful cellular factories. All eukaryotes are thought to have emerged from the union of an anaerobic archaea and a bacterium it gobbled up billions of years ago. A second, much later endosymbiosis then gave rise to the ancestor of plants, with chloroplasts. Greening, Leung, and their colleagues found the genetic instructions for [FeFe] hydrogenases in nine archaeal phyla and confirmed they are indeed active in those microorganisms, making it three from three domains of life that use these kinds of enzymes to make hydrogen. But unlike bacteria and eukaryotes, further analyses showed that archaea assemble "*remarkable hybrid complexes*" for their hydrogen production needs, fusing two types of hydrogenases together. Many of the cataloged archaea genomes analyzed in this study are, however, incomplete, and who knows how many more species are yet to be discovered. It's more than likely that archaea harbor other ingenious ways of making energy that we are yet to find.

<https://www.sciencealert.com/third-form-of-life-makes-energy-in-remarkable-ways-scientists-discover>

Cosmic Shrapnel That Killed The Mammoth Is Buried Deep, Scientists Claim

For hundreds of thousands of years, the woolly mammoth thrived on Earth, measuring its stately tread across the frozen reaches. Then, something happened. Earth changed. And in a remarkably short time, the mammoths (*Mammuthus primigenius*) were gone, the last of them dying out 4,000 years ago, on remote Wrangel Island in the cold Arctic north. Though it's theorized humans contributed greatly to their eventual decline, it's not clear what factors may triggered the change in climate that put them in peril. One idea is that Earth was hit by a cosmic event nearly 13,000 years ago, warming the world beyond what was tolerable for mammoths and paving the way for other species to thrive. This is called the **Younger Dryas impact hypothesis** (YDIH), and to call it highly controversial would perhaps be putting it mildly. Nevertheless, some scientists believe the idea has legs, and have been looking for evidence to support it. One of those is archaeologist Christopher Moore of the University of South Carolina. *"Some of our critics have said, 'Where's the crater?'"* Moore says. *"As of now, we don't have a crater or craters."* Nevertheless, Moore and

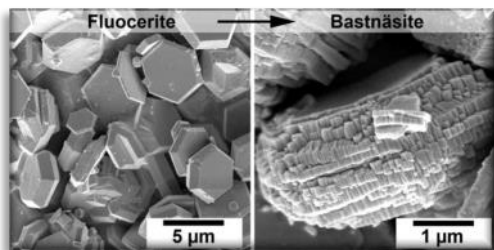


his colleagues believe that the evidence can be found, if you conduct more than a surface investigation of Earth. And they also believe that they have found some of it, in the form of minerals with properties, they say, best explained by a cometary impact. In their most recent paper, they describe several of these lines of evidence that in aggregate, they say, tell a compelling story. These different pieces of evidence come from layers of sediment dug from sites around the

world, all dated using radiocarbon analysis to around 12,800 years ago, the period in which the impact is thought to have taken place. From roughly 50 sites around the world, including North and South America, Europe, Asia, and the Greenland ice sheet, clues have emerged that could be indicative of Earth meeting a comet. In ice cores dug out of permanently frozen regions of Greenland, microparticles associated with widespread fires, so-called combustion aerosols that propagate throughout the atmosphere when matter burns, have been uncovered. In samples take from other parts of the world, such as Syria, and three widely separated sites in North America, unusually high abundances of platinum can be found. Platinum, Moore explains, is rare in Earth's crust, but relatively common in comets. In the same sedimentary layer is an elevated concentration of tiny, microscopic balls of iron called microspherules. These form when molten material sprays through the air, as occurs when a meteorite either impacts the surface or melts and explodes in the atmosphere. And lastly, researchers report for the first time the presence of grains of shock-fractured quartz in the Younger Dryas boundary layer across a range of well-separated sites across North America. This is quartz that exhibits microscopic fractures as the result of a significant, well, shock. *"It's like putting 75 elephants on a quarter,"* Moore says. *"It's a tremendous amount of pressure that creates what we're seeing."* The bigger picture that could emerge from these puzzle pieces is a comet that struck Earth around 12,800 years ago in an impact that may not have left a crater. If the comet exploded in the atmosphere, the resulting shockwave could have washed over the surface to produce all the observed elements, similar to the way the Tunguska event created a giant hubbub without leaving a deep scar in the planet's surface. It is very far from a smoking gun, however. In a paper published in December of last year, a team led by anthropologist Vance Holliday of the University of Arizona noted, *"Evidence and arguments purported to support the YDIH involve flawed methodologies, inappropriate assumptions, questionable conclusions, misstatements of fact, misleading information, unsupported claims, irreproducible observations, logical fallacies, and selected omission of contrary information."* So we're probably going to need a lot more data before the scientific establishment is even close to being convinced. Even still, other scientists point out that in the past many scientific theories that were once rejected or dismissed later received widespread consensus, so while it's important to remain skeptical, it can pay to keep an open mind. What cannot be denied is that asteroid and comet impacts are absolutely worth investigating in connection with large scale environmental changes, if not to understand history then to help guide our decisions for tomorrow. These events have altered the course of all life on Earth before, and although the Solar System is a lot more calm than it once was, the possibility of another occurring in the future is not zero. <https://www.sciencealert.com/cosmic-shrapnel-that-killed-the-mammoth-is-buried-deep-scientists-claim>

New Study Unveils Formation Secrets of Tiny Rare Earth Elements

Researchers from Trinity College Dublin's School of Natural Sciences have revealed a novel route to the formation of **bastnäsite**, a crucial mineral for the extraction of rare earth elements (REEs). Their work offers promise in one day making the extraction of these REEs more efficient. The study, published today in the journal *Nanoscale*, uncovers for the first time how fluocerite, a rare mineral, quickly forms and transforms into bastnäsite. The occurrence and origin of fluocerite in natural

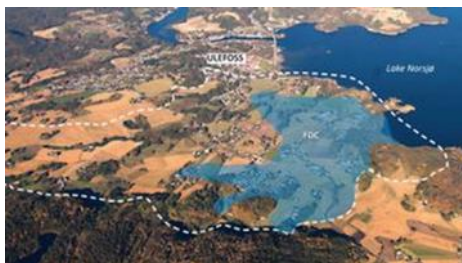


Microscopic images of fluocerite and bastnasite.

deposits has not been fully understood, and it has been very difficult for earth scientists to study this mineral in natural samples. Now, the Trinity team has revealed a new crystallization route that produces extremely tiny, nanometric-sized minerals. Some of these elusive minerals are incredibly small, just a few billionths of a meter in size, making them very difficult to observe in natural samples. Their research has essentially found that fluocerite can act as a "seed" to promote the rapid formation of bastnäsite. This new knowledge not only advances scientific understanding, but also has practical implications, potentially leading to more efficient and cost-effective methods for extracting REEs, which are vital for a wide range of technologies, from smartphones to renewable energy solutions. They are also crucial for researchers who have struggled to understand the intricate factors and pathways involved in the formation of these tiny, nanometric minerals. First author of the research, Dr. Luca Terribili of Trinity, said, "Earth science researchers working with natural samples have found it extremely challenging to understand all the factors controlling the formation of bastnäsite, which is the main industrial source of rare earth elements, as well as the various potential pathways of its formation. Here, we have shown for the first time that fluocerite can turn into bastnäsite. This discovery has been made by following a completely different approach, we built synthetic bastnäsite rocks in the laboratory, to mimic the same processes occurring in nature, and studied them with powerful spectroscopic and microscopic techniques. This approach not only helped to clarify the complex natural processes at play but also paves the way for more efficient extraction of rare earth elements." Principal Investigator, Prof. Juan Diego Rodriguez-Blanc of Trinity, added, "Our study highlights how these transformations can occur at relatively low temperatures, and very quickly. These insights are crucial for developing better industrial methods for extracting rare earth elements. The reaction that turns fluocerite to bastnäsite may seem a slower process, taking between five hours and a month depending on temperature, but it is very rapid in geological timescales." <https://phys.org/news/2024-06-unveils-formation-secrets-tiny-rare.html>

Enormous Deposit of Rare Earth Elements Discovered in Heart of Ancient Norwegian Volcano

The heart of an ancient volcano in Norway hosts Europe's largest deposit of rare earth elements, according to the mining company Rare Earths Norway. On June 6, the company released a report on the deposit, which found that there is an estimated 8.8 megatons of rare earth oxides available in the outcrop. About 1.5 megatons of that is expected to be rare earth magnets, which are used in wind turbines and electric vehicles. "The resource estimate underscores the potential of the deposit to be a truly transformative asset that can underpin a secure rare earths value chain for Europe," Rare Earths Norway CEO Alf Reistad said in a statement. The deposit, known as the **Fen Carbonatite Complex**, sits southwest of Oslo near Lake Norsjø. Some 580 million years ago, the complex was the pipe of an active volcano. Now long dead, the upper part of the volcano has eroded away, exposing this magma-filled pipe, which is about 1.2 miles in diameter, to the surface.



580 million years ago, the Fen Carbonatite Complex was the pipe of an active volcano

The magma solidified into carbonatite, which is rock chock-full of minerals that bear certain forms of carbonate molecules. According to Rare Earths Norway, this once-molten magma

now holds economically important rare earth elements such as neodymium, a metallic element used to make magnets, and praseodymium, also used in magnets as well as in other applications like aircraft engines. The mining company estimate focuses on the upper portion of the ancient volcano's guts, down to 1,535 feet below sea level. According to the company statement, there are likely deposits down to about 3,300 feet below sea level. The company plans to continue exploratory drilling and will also build a pilot plant near the outcrop for processing the ore into pure rare earth elements. According to a 2023 report from The Oxford Institute for Energy Studies, about 70% of the world's supply of rare earth elements are mined in China, and 90% of all rare earth elements are processed there. However, these 17 elements, which are crucial for technologies such as touch screens and batteries, are actually distributed widely. Countries around the globe are aiming to secure their own domestic supply chains for these minerals. In the U.S., for example, researchers are looking in coal mines, where mining activity is already occurring, to see if rare earth metals might become the next product of these mines.

<https://www.livescience.com/planet-earth/geology/enormous-deposit-of-rare-earth-elements-discovered-in-heart-of-ancient-norwegian-volcano>



Cedar Valley Rocks & Minerals Society holds an annual 1- or 2-day consignment auction in September at the Amana RV Park. **The 2024 Auction will be held Saturday and Sunday, Sep 21-22.** The purpose of the auction is to help collectors or families of collectors dispose of their collections. Knowledgeable club members act as auctioneers. Since the auctioneers are also collectors, they bid openly on material that interests them. Auctions typically attract about 100 bidders and are limited to 800 lots for a 1-day auction and 1200 lots for a 2-day auction. Viewing is from 5:00-7:30 Friday night, at 7:30 Saturday morning and 8:00 Sunday morning. The 1st day runs from 9:00 a.m. to about 8:00 p.m. with hot food available during the day and a dinner offered from 5:30 to 6:00 p.m. The 2nd day runs from 9:00 a.m. to about 3:30 p.m., again with hot food available. Cash, credit card (with small service fee) or good check is accepted for payment. Iowa sales tax of 7% is also added to all items. Bidders who provide Iowa tax permits are exempt from paying it. If you can't stay for those special lots you want, you can leave a maximum bid, and a club member will bid for you up to your maximum. Motel rooms are available in Amana, but they are sometimes sold out. Motels are also available in Little Amana (15 minutes away), Cedar Rapids, & Iowa City (each about 25 minutes away, although motel rooms are scarce in Iowa City on home football weekends). Since each sale has multiple consigners, the sale rotates among the consigners. All lots are numbered, and an order of sale is available at viewing on Saturday morning. Equipment sells at 2:00 on Saturday. If you have a collection to dispose of, please contact Marv Houg (m_houg@yahoo.com) or Sharon Sonnleitner (sonnb@aol.com). The club does all the advertising and sets up the Friday before the auction. A 25% commission is charged for non-members, and 20% is charged for members or families of members who have belonged to the club for at least 2 years. As the date of the auction draws closer, images of many of the items to be auctioned will be featured on the CVRMS website and Facebook page (<https://www.facebook.com/groups/Cedarvalleyrocks/>).



Flintknapping Class July 25 from 1-3

A flintknapping class for beginners is scheduled for July 25 with Terry Carter, who was the flintknapper at our March Show. The class will be held at the Hiawatha Community Center, where our regular meetings are held. It will run from 1:00-3:00. Terry will supply all the necessary tools for use during the class. The class will be capped at a maximum of 25 participants.

Cost: \$10. Registration required. To register, contact Dale: DHStout55@aol.com. The club is paying the balance of Terry's fee, which is \$20/person. If you sign up but cannot attend, you are required to notify Dale.

Images from previous CVRMS Auctions

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



Next Meeting:
JULY 16
Wanatee Park—Marion
Pot-Luck Picnic
Meadowlark Shelter

CEDAR VALLEY GEMS

JULY 2024

VOL. 50, ISSUE 7

2022 & 2023 Officers, Directors, and Committee Chairs

President	Marv Houg (m_houg@yahoo.com).....	(319)350-9435
Vice President. ...	Ray Anderson (rockdoc.anderson@gmail.com)	530-2419
Treasurer	Dale Stout (dhstout55@aol.com)	365-7798
Secretary	Dell James (cycladelics@msn.com)	270-6854
Editor.....	Ray Anderson (rockdoc.anderson@gmail.com)	530-2419
Liaison	Kim Kleckner (ibjeepn2@gmail.com)	560-5185
Imm. Past Pres. ...	Sharon Sonnleitner (sonnb@aol.com)	310-0085
Director '24	Bill Desmarais (desmarais_3@msn.com)	365-0612
Director '25.....	Matt Burns (mlburnsmars@gmail.com)	329-4046
Director '26	Jay Vavra (vavraj@gmail.com).....	538-3689
Sunshine.....	Dolores Slade (doloresdslade@aol.com)	351-5559
Hospitality	Karen Desmarais (desmarais_3@msn.com)	365-0612
Webmaster.....	Sharon Sonnleitner (sonnb@aol.com)	310-0085

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