

Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS

FEBRUARY 2023

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

Next CVRMS Meeting

Tuesday Feb. 21

Hiawatha Community Center

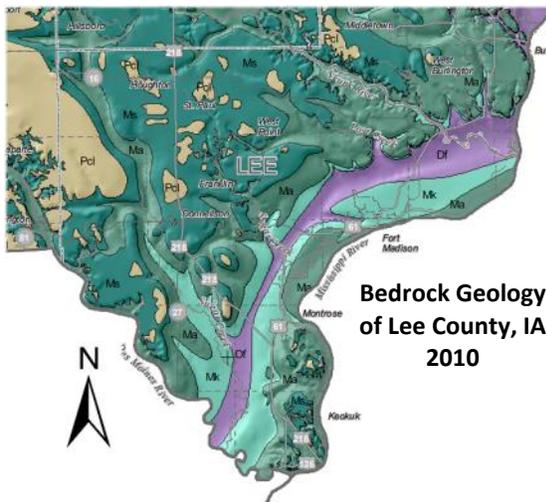
101 Emmons St., Hiawatha - 7:15 pm

featured presentation

by **Ryan Clark**

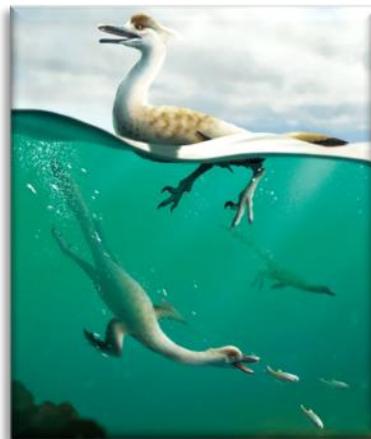
Iowa Geological Survey

***“What’s in a Map?
Behind the Scenes
Look at the Making
of the Bedrock
Geologic Map of
Lee County, Iowa”***



This Dinosaur Dove Like a Duck

It might be time for the megalodon to move over and make room for a new ancient aquatic animal. There’s a newly discovered dinosaur species that may also be a pretty good swimmer with duck-like diving abilities.



Natovenator polydontus was a theropod (a hollow-bodied dinosaur) that had three toes and claws on each limb. It lived about 145 to 66 million years ago in Mongolia, during the Upper Cretaceous period. The name *Natovenator polydontus* means “many-toothed swimming hunter.”

One of the similarities that *Natovenator* has with modern, diving birds is its streamlined ribs. Its body shape suggests that *Natovenator* was a potentially capable swimming predator, and the streamlined body evolved independently in separate lineages of theropod dinosaurs. *Natovenator* is a cousin of the famous *Velociraptor*, but has a much more streamlined look, with its long jaws and tiny teeth. The specimen was discovered at a spot in the Gobi Desert called Hermiin Tsav or (Khermen Tsav), which is a hot spot for preserving multiple dinosaur species. Future biomechanical studies will test how *Natovenator* and related water-dwelling species moved around, studies of geochemical clues in the dinosaur’s teeth and bones, will either confirm or challenge the idea that *Natovenator* was as strong a swimmer as the study suggests.

<https://www.popsci.com/science/velociraptor-dino-dive-duck>

CVRMS Meeting January 17 – Minutes –

MEETING CALLED TO ORDER by Marv Houg President at 7:22 pm. 36 members present

DALE ANNOUNCED that we collected \$750.00 for Christmas pass-the-hat donations. Thank you everyone.

NOVEMBER MINUTES approval of October's annual meeting minutes. Motion to accept made by Bill Desmarais and second by Dale Stout. Motion passed.

TREASURER'S REPORT by Dale. Checking balance \$17,760.00. Motion made to approve by Ann Kohl, seconded by Ray Anderson. Report approved.

PROGRAM by Ray Anderson on "Gold."

ROCK SHOW 2023 MARCH 25 AND 26: Sherry will donate a bucket of uncut geodes. Do with as we like. Discussion followed. **Sharon has flyers** for show. Help yourself and get them out there. **Ray is still** looking for people to make presentations about Agates. Doug Moore was a name that came up for Ray to call. **Should we have pot luck** on Friday night? Overwhelming support for us to do pot luck to welcome dealers and club members. **Saturday night** we can have the catered meal. Will discuss at next board meeting. **Dell will provide lunch** for workers paid for by the club. **Sharon says** we need egg cartons and the board will set a meeting date.

Sharon has developed an on-line sign up form for various show duties. The form is available on our website, <https://www.cedarvalleyrockclub.org/>

MISCELLANEOUS: Waterloo Rock Show is on April 16 11a.m.-5:00 p.m. **Marv received an invitation** from the Des Moines club to offer a joint wire wrap class. We need to know who is interested, in the class, the charge, and dates available. Ray will announce in the newsletter.

DIANE SELLER WON THE DOOR PRIZE.

MOTION TO ADJOURN by AJ, seconded by Karen Desmarais. 9:03 p.m. meeting adjourned.

Respectfully submitted,
Dell James, Secretary

WANT TO LEARN WIRE WRAPPING??

Wire wrapping is wrapping it around itself and/or beads and other components to create jewelry

Members of the Des Moines club have offered to teach wire wrapping to CVRMS members. If you are interested in participating in the class, please contact Marv Houg at m_houg@yahoo.com or call (319) 350-9435

CVRMS Board Meeting January 24 – Minutes –

MEETING CALLED TO ORDER at 7:05 p.m. by Marv Houg President at his house.

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

MONTHLY MINUTES REVIEWED. Motion to approve by Bill, second by Matt. Minutes approved as written.

TREASURER'S REPORT had been emailed to board members. Lots of dues coming in. Motion made to approve report by Ray, second by Matt. Report approved.

2023 ROCK SHOW: Ray had samples for posters that could be used. Discussion about them. Kim reported that door prizes were good, silent auction and pebble pit are o.k. Discussion about the possibility of making the door prize area more available without overcrowding the desk area. **Sharon** has the work sign up sheets. **Friday set-up night** we will have a pot luck. **Advertising** Dell will call Collectors Journal. Kim taking care of social media. Discussion about Penny Saver, Tidbits, Gazette and whatever we can suggest. **General discussion** regarding dealers and potential dealers. **Ray lining up speakers** for the programs. Having some difficulty getting them lined up. All suggestions welcome.

BUS TRIP: Bill is working on getting our original trip which was to Madison and Rockford. Current date will be on Sept 30. Only thing you have to do is bring your own lunch. Watch for more info.

AUCTION 2023: Review of the list of consigners with a new one with 1000-2000 lbs of lakers plus Keswicks. Can we fit her in?

TAKO (TAKE A KID OUTSIDE): May 20. Marv has a conflicting event. Matt will step up and do.

MATT WELCOMES anyone with ideas for field trips let him know.

MISCELLANEOUS: Sharon has UV filter glass left from redoing our lights for sale. Will have more info about them. **Also, Sharon** suggests that we do not need Zoom anymore. We can stop paying for it and renew it if we need it again. **Mini Miners Monthly** for kids is now available on our web page. Kim will look into making it available on Facebook. **Ray** will do a talk at Lutheran Church somewhere.

WIRE WRAP CLASS: Des Moines club approached Marv that would like to help us out with wire wrap class. We need to find out who is interested and what will the charge be? All will work out.

MOTION TO ADJOURN by Jay, second by Dale.

9:15 adjourned

Respectfully submitted,
Dell James, Secretary



Beneath Yellowstone National Park, a vast region of spectacular wilderness visited by around 3 million people annually, lurks one of the largest volcanoes in the world. The Yellowstone Caldera (the cauldron-like basin at the summit of the volcano) is so colossal that it is often called a "**supervolcano**," which, according to the Natural History Museum in London, means it has the capacity to "produce a magnitude-eight eruption on the **Volcanic Explosivity Index**, discharging more than 240 cubic miles of material." To



A hydrothermal feature at Yellowstone National Park

no Observatory. "They erupt when there is enough eruptible magma beneath the surface, and pressure to cause that magma to ascend." Neither condition is in place at Yellowstone right now," he added. "It's all about that magma supply. Cut that off, and the volcano won't erupt." Many volcanoes go through cycles of activity and inactivity, Poland said. More often than not, a volcano's activity is a direct consequence of the magma supply. "Some volcanoes do seem to have regular eruptions, but this is because the magma supply is relatively constant — think Kilauea in Hawaii or Stromboli in Italy," Poland said. So where does the idea of Yellowstone being "overdue" for an eruption come from, then? "I suspect the 'overdue' idea comes from the concept of earthquakes," Poland said. "Earthquakes happen as stress accumulates on faults, and in many places this stress accumulates at relatively constant rates due to, for example, plate motion. That being the case, you might expect earthquakes to occur at somewhat regular intervals. It is, of course, more complicated than that; there are many variables at play, but for that reason, it makes more sense to say that a fault is 'overdue' for an earthquake." Poland also noted that "supervolcanoes," a term he considers somewhat crude and sensationalist, are "no more or less temperamental" than other volcanoes. So, how do experts keep an eye on Yellowstone's subterranean activity so that, in the case of a major volcanic eruption, warnings can be given? "Yellowstone is very well monitored by a variety of techniques," Poland said. "It is covered in terms of seismicity and ground deformation. We track the temperatures of some thermal features, although this is not an indicator of volcanic activity, but rather of the behavior of specific hydrothermal areas. We look at overall thermal emissions from space, collect gas and water to assess chemistry over time, and track stream/river flow and chemistry." So what might indicate that a massive eruption is imminent? "Having thousands of earthquakes in a short period of time (a few weeks), with many felt events, would be noteworthy, as long as it was not an aftershock sequence from a tectonic event," Poland said. "That seismicity would need to be coupled with really extreme ground deformation (several inches over the same short period), park-wide changes in geyser activity, and thermal/gas emissions. The ground rises and falls normally by 0.8 to 1.2 inches every year, and there are typically ~2000 quakes annually in the area, so it would have to rise far beyond these normal background levels." While Yellowstone is relatively stable right now and has not displayed any unusual seismic activity lately, if it were to erupt, the consequences could be extreme. Volcanologists have suggested that the ramification they are most concerned about is wind-flung ash, which could end up coating a surrounding region 500 miles across in more than 4 inches of ash. This could, experts predict, result in the short-term destruction of Midwest agriculture, and would leave scores of watercourses clogged. According to the U.S. Department of the Interior, "the surrounding states of Montana, Idaho, and Wyoming that are closest to Yellowstone would be affected by pyroclastic flows, while other places in the United States would be impacted by falling ash." Poland added that the effects would also be felt beyond the United States' borders. "If there were a very large explosive eruption, it could impact the global climate by emitting ash and gas into the stratosphere, which could block sunlight and lower global temperatures by a few degrees for a few years," Poland explained. Research published in the journal *Science* in December 2022 found that the Yellowstone caldera holds more liquid molten rock than previously estimated. Given that volcanoes tend to erupt only when a vast amount of magma is readily available, should this finding be a cause for concern? "This [research] really just confirms what we already know about Yellowstone," Poland said. "Initial findings were that the magma chamber beneath Yellowstone was only 5-15% molten. The new research, which uses more advanced techniques but the same data, suggests it is closer to 16-20% molten. The take-home message is that the magma chamber is mostly solid. And that means there is far less likelihood of a consequential eruption. I find this result reassuring." <https://www.livescience.com/yellowstone-caldera-supervolcano-eruption>

What in the World?



What in the World is this rock apparently crawling across the desert floor??

January's Photo



Last month's **What in the World** photo is the **Red Mountain Cinder Cone**, located on the west-central side of the San Francisco volcanic field of northern Arizona. A volcanic blast carved out an amphitheater in the cones interior. The interior cinder cone is beautifully exposed, with large xenocrysts of pyroxene abundant in the walls and floor of the crater.

ROCK CALENDAR CVRMS EVENTS OF INTEREST

2023

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

Mar. 21 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Cornell College Students

Mar. 25-26 — CVRMS Rks, Fos, & Min Show
Hawkeye Downs
Cedar Rapids, Iowa
"Wonderful World of Agates"

Apr. 16 — Black Hawk GMS Rock Show
Waterloo Center for the Arts
225 Commercial St
Waterloo, Iowa

Apr. 18 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program To Be Announced

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

June 20 — CVRMS Pot-Luck Picnic
Ellis Park Overlook Shelter 6:30 pm
Rock Polishing

July 21 — CVRMS Pot-Luck Picnic
Wanatee Park Meadowlark Shelter 6:30 pm
Geode Cracking

Aug. 15 — CVRMS Pot-Luck Picnic
Morgan Creek Park Shelter 6:30 pm
Rock Bingo

Sept. 9 -10 — CVRMS Rock Auction
Amana RV Park and Event Center
Amana, Iowa

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.

The **Younger Dryas** was a period of anomalous cooling that interrupted the global warming cycle that was melting the last Pleistocene continental glaciers. At 10,900 years ago the warming ended and the temperature suddenly plummeted back to near-glacial fridity, where it remained for ~1200 years until the warming and glacial melting resumed. Several theories have been suggested to explain the dramatic cooling event. Recently, Jack Gilmore asked me what I thought about the recently advanced idea that the event may have been caused by an explosion of energy emitted by the sun, a **Coronal Mass Ejection**. I didn't know much about it so I thought I would investigate the idea. Jack gave me the reference below to get me started, so I thought I would pass it on to you and we all could consider the possibility. Following is the article (which I modified to fit the newsletter).

modified from "Plasma, Solar Outbursts, and the End of the Last Ice Age"

by Robert M. Schoch

https://robertschoch.com/plasma_iceage.html

15,000 to 11,000 years ago Earth experienced a series of climatic fluctuations. It had been extremely cold, with continental glaciers extending much further than they do today, but the climate started to warm. However, temperatures suddenly reverted back and there was a short cold spell, known as the Younger Dryas, before the final warming and the official end of the last ice age. Based on Greenland ice core data, the Younger Dryas began and ended very abruptly. Its start dates to 10,900 BCE, and its ending (the final warming) began circa 9700 BCE, and may have occurred within an incredible three years; given our inability to resolve the finest details of something that happened so long ago, it may have literally happened overnight. How do we explain this pattern of abrupt climatic shifts? I once hypothesized that comets were responsible, however, the evidence does not support a comet hitting Earth at this time. This linked [article](#) discusses the evidence indicating that it was not a comet, but rather a massive glacial flood (which could have been caused by solar activity melting ice dams and glaciers which changed ocean circulation patterns in the Atlantic, thus initiating the Younger Dryas cooling. What about the warming event of circa 9700 BCE? Oddly, the indigenous Easter Island rongorongo script may hold the answer. But first we have to consider the concept of the fourth state of matter—plasma. Plasma consists of electrically charged particles. Familiar plasma phenomena on Earth today include lightning and auroras (the northern and southern lights) and upper atmospheric phenomena known as sprites. In the past, much more powerful plasma events sometimes took place, due to solar outbursts and coronal mass ejections (CMEs) from the Sun, or possibly emissions from other celestial objects. Powerful plasma phenomena could cause strong electrical discharges to hit Earth, burning and incinerating materials on our planet's surface. Los Alamos plasma physicist Dr. Anthony L. Peratt and his associates have established that petroglyphs found worldwide record an intense plasma event (or events) in prehistory. Dr. Peratt determined that powerful plasma phenomena observed in the skies would take on characteristic shapes resembling humanoid figures, humans with bird heads, sets of rings or donut shapes, and writhing snakes or serpents—shapes reflected in countless ancient petroglyphs. The Easter Island rongorongo script, recorded on antique wooden tablets, is composed of similar shapes as the petroglyphs. Studying them in detail (inspired by my wife, Catherine Ulisse, who first noticed the connection), I concluded that the Easter Island rongorongo tablets (the surviving tablets are copies of copies of copies) record a major plasma event in the skies thousands of years ago. This, I believe, was the event that brought a final close to the last ice age. Plasma hitting the surface of Earth could heat and fuse rock, incinerate flammable materials, melt ice caps, vaporize shallow bodies of water creating an extended deluge of rain, and send the climate into a warming spell. The release of pressure that follows the melting of thousands-of-meters-thick ice sheets can induce earthquakes and even cause hot rock under pressure to melt and erupt to the surface as volcanoes. The world was in chaos, and this is the event recorded by petroglyphs and the rongorongo texts. The plasma event of 9700 BCE eradicated advanced civilizations and high cultures of the time, and the radiation emanating from the plasma may have affected mental and psychical abilities. This could be the basis for the nearly universal myth of a Golden Age, a time when beings on Earth had mental abilities far surpassing those of later times. The 9700 BCE event may be the original basis for the Atlantis legends; the timeframe fits well with Plato's account. Plasma and electrical discharges hitting the surface of Earth may have been responsible for the vitrification (melting into crude glass) of ancient stone structures seen in some parts of the world, such as various hill forts in Scotland. People covered for their lives; they sought shelter in caves, under cliffs, in dwellings built of thick stone or carved into mountainsides. Perhaps Göbekli Tepe was intentionally buried in an attempt to protect it from on-going plasma events, as I suggest in my book [Forgotten Civilization: New Discoveries on the Solar-Induced Dark Age](#). Humankind was thrown into a dark age for thousands of years, only to reemerge (amidst megalithic monuments belonging to a much earlier period) with scattered memories and nascent abilities.

modified from https://robertschoch.com/plasma_iceage.html

I hope that you will read this over and see what you think of Mr. Sohoch's ideas. I will discuss my thoughts on this theory next month. Ray Anderson

Obsidian from Teotihuacan

Obsidian was one of the most important materials distributed in Mesoamerica. Teotihuacan controlled the trade in this valuable commodity from the dawn of the common-era to 600 CE. In Mesoamerica, obsidian was considered a semiprecious stone because of its physical characteristics that produced a hard sharp edge used for cutting tools, rituals, and military weapons which were centralized and manufactured in Teotihuacan for mass production. The large urban complex of Teotihuacan is located in the Basin of Mexico thirty miles outside



Mexico City. Before 600 AD Teotihuacan had an estimate population of 200,000 people. The city was a religious and pilgrimage center with the Pyramid of the Sun, Pyramid of the Moon, and over

2,000 residential compounds in an area of 20 square kilometers. Teotihuacan controlled Central Mexico and the exploitation and centralization of Obsidian production because of its close proximity to two mines of Sierra de las Navajas and Otumba. Obsidian is formed when volcanic lava is cooled down at a fast pace and forms into a crystalline volcanic glass that turns into black, gray, green, blue, and other different colors depending on the location. In Teotihuacan, skilled stone workers mined the blue and green obsidian from under the volcanic ash and rocks and selected the black and gray obsidian to then manufacture the production of sharp edged projectile points and knives. Obsidian artifacts were shaped with techniques used by skilled stone workers who developed the art of Lapidary in Mesoamerica. Artifacts such as knives and green prismatic blades were crafted by chipping with a hammer stone to make a sharp edge or by flaking with softer material such as bones or wood. Hundreds of artifacts have been excavated containing obsidian west of the Pyramid of the Moon where most of the green prismatic blades and gray obsidian for cutting tools and military weapons were being manufactured in workshops. The black obsidian ritual objects were carved and symbolically identified with the underworld as well as the night in Mesoamerican cultures. According to Spence, redistributive networks were maintained and directly managed by the priesthood to promote their products in long-distance exchange. Precinct workshops near the Pyramid of the Moon might have been under the direct control of the priest. Spence's impression that the obsidian industry was "administered" and "highly centralized" may be explained by the fact that obsidian goods were the main by-product of the redistributive circuit during the Classic period (Spence, 1987). The trading routes from Teotihuacan may have established an alliance with the Zapotec, an elevated military society from Monte Alban in Oaxaca. Including the Maya from Tikal in the Jungles of Peten in Guatemala 1,280 kilometers away because of the small amounts of green obsidian that reached Tikal which may have been traded with upper class elite group

<https://historicalmx.org/items/show/78>

This Ancient Creature Used a Trident to Joust For Sex 400 Million Years Ago

A strange example of an ancient invertebrate known as a trilobite may have used the distinctive trident-like structure on its head to 'joust' for the right to mate with females, flipping rivals over on the sea bed to put them out of action. Researchers from Bloomsburg University of Pennsylvania in the US and the Natural History Museum in the UK came to the conclusion that the head-tool has a sexual rather than a life-critical purpose after finding an adult fossil with a misshapen trident. The trilobite in question is a species of *Walliserops*, a marine arthropod that lived on the ocean floor more than 400 million years ago. Many of its kind grew all manner of spikes and protuberances for protection, but in this genus the stand-out feature was a flat, three-pronged fork jutting from the front. If it was indeed used to challenge for mates, the strange anatomy could be a new record for the earliest evidence of sexual combat in the animal kingdom. The extraordinary Devonian trilobite *Walliserops* carried a unique, giant trident on its head, the purpose of which has long been a mystery. Researchers now believe that it was used for jousting between males striving for dominance, and the evolution of sexually motivated competition in animals is hundreds of millions of years older than previously thought. The new hypothesis is based on a stunningly preserved fossil of *Walliserops trifurcatus* on show in the Houston Museum of Natural History: a



malformed specimen that has four prongs to its trident rather than the usual three, would have made the unbalanced trident less effective

at serving its purpose. If that purpose was life-critical, and the animal was born with it, every day would have been a roll of the dice for survival. That this creature survived to adulthood shows that the trident probably didn't contribute to an essential task, such as sensing sources of food or defending against attack, as have previously been suggested. In comparing the tridents of the *Walliserops* with living creatures, the team found the closest modern example of a sex-combat tool in rhinoceros beetles: they also use implements on their heads to wrestle and in some cases joust with sexual rivals. The trident projection of *Walliserops* fits best with the morphology of a weapon used in shoveling behaviors. There are many examples of sexual selection in nature, from the brightly colored feathers of the peacock to the antlers of the deer. This trident also seems to have been key in the mating process for the *Walliserops* trilobites. What's not clear yet is whether these invertebrates were sexually dimorphic (with males and females that differed in appearance). As yet, no female *Walliserops* have been conclusively identified, though they may have had smaller tridents, or none at all. Of course it's difficult to make conclusive judgments on extinct animals, because we only have their fossilized remains to work from. However, the evidence presented in this study may well have solved the mystery of the *Walliserops* trident. <https://www.sciencealert.com/this-ancient-creature-used-a-trident-to-joust-for-sex-400-million-years-ago>

We Finally Know How Ancient Roman Concrete Was So Durable

The ancient Romans were masters of building and engineering, perhaps most famously represented by the aqueducts. And those still functional marvels rely on a unique construction material: **pozzolanic concrete**, a spectacularly durable concrete that gave Roman structures their incredible strength. Even today, one of their structures – the Pantheon, still intact and nearly 2,000 years old – holds the record for the world's largest dome of unreinforced concrete. The properties of this concrete have generally been attributed to its ingredients: pozzolana, a mix of volcanic ash – named after the Italian city of Pozzuoli, where a significant deposit of it can be found – and lime. When mixed with

water, the two materials can react to produce strong concrete. But that, as it turns out, is not the whole story. An international team of researchers led by the Massachusetts Institute of Technology (MIT) found that not only are the materials slightly different from what we may have thought, but the techniques used to mix them were also different. The smoking guns were small, white chunks of lime that can be found in what



The dome of the Pantheon, the world's largest unreinforced concrete dome, was constructed 126 AD.

seems to be otherwise well-mixed concrete. The presence of these chunks had previously been attributed to poor mixing of materials, but that did not make sense to materials scientist Admir Masic of MIT. *"The idea that the presence of these lime clasts was simply attributed to low quality control always bothered me, Masic says. "If the Romans put so much effort into making an outstanding construction material, following all of the detailed recipes that had been optimized over the course of many centuries, why would they put so little effort into ensuring the production of a well-mixed final product? There has to be more to this story."* Masic and the team, led by MIT civil engineer Linda Seymour, carefully studied 2,000-year-old samples of Roman concrete from the archaeological site of Privernum in Italy. These samples were subjected to large-area scanning electron microscopy and energy-dispersive x-ray spectroscopy, powder X-ray diffraction, and confocal Raman imaging to gain a better understanding of the lime clasts. One of the questions in mind was the nature of the lime used. The standard understanding of pozzolanic concrete is that it uses **slaked lime**. First, limestone is heated at high temperatures to produce a highly reactive caustic powder called **quicklime**, or calcium oxide. Mixing quicklime with water produces slaked lime, or calcium hydroxide: a slightly less reactive, less caustic paste. According to theory, it was this slaked lime that ancient Romans mixed with the pozzolana. Based on the team's analysis, the lime clasts in their samples are not consistent with this method. Rather, Roman concrete was probably made by mixing the quicklime directly with the pozzolana and water at extremely high temperatures, by itself or in addition to slaked lime, a process the team calls "hot mixing that results in the lime clasts." *"The benefits of hot mixing are twofold," Masic says. "First, when the overall concrete is heated to high temperatures, it allows chemistries that are not possible if you only used slaked lime, producing high-temperature-associated compounds that would not otherwise form. Second, this increased temperature significantly reduces curing and setting times since all the reactions are accelerated, allowing for much faster construction."* And it has another benefit: The lime clasts give the concrete remarkable self-healing abilities. When cracks form in the concrete, they preferentially travel to the lime clasts, which have a higher surface area than other particles in the matrix. When water gets into the crack, it reacts with the lime to form a solution rich in calcium that dries and hardens as calcium carbonate, gluing the crack back together and preventing it from spreading further. This has been observed in concrete from another 2,000-year-old site, the Tomb of Caecilia Metella, where cracks in the concrete have been filled with calcite. It could also explain why Roman concrete from seawalls built 2,000 years ago has survived intact for millennia despite the ocean's constant battering. So, the team tested their findings by making pozzolanic concrete from ancient and modern recipes using quicklime. They also made a control concrete without quicklime and performed crack tests. Sure enough, the cracked quicklime concrete was fully healed within two weeks, but the control concrete stayed cracked. The team is now working on commercializing their concrete as a more environmentally friendly alternative to current concretes. *"It's exciting to think about how these more durable concrete formulations could expand not only the service life of these materials, but also how it could improve the durability of 3D-printed concrete formulations", Masic says.*

<https://www.sciencealert.com/we-finally-know-how-ancient-roman-concrete-was-so-durable>

Asteroid Findings from Specks of Space Dust Could Save the Planet

Curtin University-led research into the durability and age of an ancient asteroid made of rocky rubble and dust, revealed significant findings that could contribute to potentially saving the planet if one ever hurtled toward Earth. The international team studied three tiny dust particles collected from the surface of ancient 1500 foot-long rubble pile asteroid, **Itokawa**, returned to Earth by the Japanese Space Agency's **Hayabusa 1** probe. The study's results showed asteroid Itokawa, which is 1¼ million miles from Earth and around the size of Sydney Harbour Bridge, was hard to destroy and resistant to collision. Lead author Professor Fred Jourdan, Director of the Western Australian Argon Isotope Facility, part of the John de Laeter Center and the School of Earth and Planetary Sciences at Curtin, said the team also found Itokawa is almost as old as the solar system itself. "Unlike monolithic asteroids, *Itokawa* is not a single lump of rock, but belongs to the rubble pile family which means it's entirely made of loose boulders and rocks, with almost half of it being empty space," Professor Jourdan said. "The survival time of monolithic asteroids the size of *Itokawa* is predicted to be only several hundreds of thousands of years in the asteroid belt." The huge impact that destroyed Itokawa's monolithic parent asteroid and formed Itokawa happened at least 4.2 billion years ago. Such an astonishingly long survival time for an asteroid the size of Itokawa is attributed to the shock-absorbent nature of rubble pile material. "In short, we found that *Itokawa* is like a giant space cushion, and very hard to destroy." The Curtin-led team used two complementary techniques to analyze the three dust particles. The first one is called **Electron Backscattered Diffraction** and can measure if a rock has been shocked by any meteor impact. The second method - argon-argon dating - is used to date asteroid impacts. Co-author Associate Professor Nick Timms, also from Curtin's School of Earth and Planetary Sciences, said the durability of rubble pile asteroids was previously unknown, jeopardizing the ability to design defense strategies in case one was hurtling toward Earth. "We set out to answer whether rubble pile asteroids are resistant to being shocked or whether they fragment at the slightest knock," Associate Professor Timms said. "Now that we have found they can survive in the solar system for almost its entire history, they must be more abundant in the asteroid belt than previously thought, so there is more chance that if a big asteroid is hurtling toward Earth, it will be a rubble pile. "The good news is that we can also use this information to our advantage; if an asteroid is detected too late for a kinetic push, we can then potentially use a more aggressive approach like using the shockwave of a close-by nuclear blast to push a rubble-pile asteroid off course without destroying it." Curtin University co-authors include Associate Professor William Rickard, Celia Mayers, Professor Steven Reddy, Dr David Saxey and John Curtin Distinguished Professor Phil Bland, all from the School of Earth and Planetary Sciences.

<https://www.sciencedaily.com/releases/2023/01/230123151524.htm>

Extinct Giant Tortoise Was the "Mammoth" of Madagascar 1,000 Years Ago

At least a millennium ago, a giant tortoise crept through Madagascar, grazing on plants by the boatload, a bountiful diet that made it the ecosystem equivalent of mammoths and other big herbivores. And like the mammoth, this previously unknown giant tortoise is extinct, a new study finds. The scientists discovered the species while studying the mysterious lineage of giant tortoises living on Madagascar and other islands in the western Indian Ocean. After stumbling across a single tibia (lower leg bone) of the extinct tortoise, they analyzed its nuclear and mitochondrial DNA and determined that the animal was a newfound species, which they named ***Astrochelys rogerbouri***. It's unclear when the newfound species went extinct, but the specimen studied appears to be about **1,000 years old**. Volcanic islands



and coralline atolls across the western Indian Ocean were once teeming with giant tortoises. Weighing up to **600 pounds**, these ponderous megafauna heavily influenced their ecosystems, if only through their voracious appetites. The 100,000 giant tortoises still living today on Aldabra, a verdant atoll northwest of Madagascar,

consume 26 million pounds of plant matter each year. Most species native to that region are now extinct due to human activities, and paleontologists are still struggling to piece together the story of these bygone tortoises. But analyzing these giants' ancient DNA is providing a path forward, which, in turn, sheds light on prehistoric island life. "If we want to know what these island ecosystems were like originally, we need to include giant tortoises, large, extinct members of the ecosystem which took on the role often occupied by large grazing mammals," Samonds said. "And in order to understand the key role they played, we need to understand how many tortoises there were, where they lived, and how they got there." The tricky task of reconstructing their history would fall to modern paleontologists. "Tortoise remains are notoriously fragmented, and it's a real challenge to figure out what a tortoise looked like just from part of a shell," Samonds said. Scientists also struggled to make sense of a fossil record muddled by the tortoise trade. Had a particular specimen found in the Mascarene originated there, or was its carcass dropped off by a ship inbound from the Granitic Seychelles? For the study, Samonds and colleagues generated nearly complete mitochondrial genomes from several tortoise fossils, some of which were hundreds of years old. By combining these sequences with prior data on tortoise lineage and radiocarbon dating, the team was able to describe how giant tortoises migrated to various Indian Ocean islands. "Including ancient DNA allowed us to examine how many tortoise species there were and what their relationships were to each other. It also helped us appreciate the original diversity of tortoises on these islands," Samonds said. "We couldn't have explored these topics before."

<https://www.livescience.com/extinct-giant-tortoise-madagascar>

This Ancient Creature Is a Bizarre Hybrid of Dinosaur And Bird

.We can confidently say that birds are dinosaur descendants, though paleontologists are still puzzled as to how this incredible evolutionary event occurred. Now a complete fossilized skeleton of a bird that lived in what is today China around 120 million years ago might help clarify key steps in the transformation process, presenting with a more archaic, dinosaur-like head atop a body that has more in common with



modern birds. The transition from dinosaur to bird includes some of the most dramatic changes in shape, function, and environment, which ultimately led to the body plan that is typical of today's birds. Some of those shifting features can still be seen in the way modern birds develop. But the order in which these changes occurred, and the nature of the evolutionary pressures that gave rise to strictly avian characteristics, is still open for debate. The fascinating, newly found fossil, named *Cratonavis zhui*, may provide important insights into the evolution of modern birds. Researchers discovered the body print of *Cratonavis*, the bird with a dinosaur head, during excavations conducted in northern China. Body prints of feathered dinosaurs and early birds, including *Confuciusornis sanctus*, have been discovered in this region, in sedimentary rocks formed about 120 million years ago, during the Cretaceous period. Led by paleontologist Zhou Zhonghe from the Chinese Academy of Sciences (CAS), the scientists began their investigation of the fossil skull with high-resolution computed tomography (CT) scanning. Using the digital versions of the mineralized bones, the team reconstructed the shape and function of the skull as it was during the bird's life. The result shows that the shape of the *Cratonavis* skull is almost the same as that of dinosaurs like *Tyrannosaurus rex*, and not like a bird's. "The primitive cranial features speak to the fact that most Cretaceous birds such as *Cratonavis* could not move their upper bill independently with respect to the braincase and lower jaw, a functional innovation widely distributed among living birds that contributes to their enormous ecological diversity," says CAS paleontologist Zhiheng Li. The unusual combination of a dinosaur's akinetic skull with a bird's skeleton adds to previous studies on the importance of evolutionary mosaicism in the

early diversification of birds. Among the avian branches of the dinosaur's family tree, *Cratonavis* is between the long-tailed *Archaeopteryx*, which was more like a reptile, and the *Ornithothoraces*, which had already developed many of the traits of modern birds. Also of interest is the fact the *Cratonavis* fossil has a surprisingly long scapula and first metatarsal (foot bone) – features which are rarely seen in the fossils of other dino-ancestors to birds, and altogether absent in modern birds. Evolutionary trends show reduced length in the first metatarsal as birds developed. The study authors propose that during the change from dinosaurs to birds, the first metatarsal went through a process of natural selection that made it shorter. Once it reached its optimal size, which was less than a quarter of the length of the second metatarsal, it lost its earlier functions. The unique feature of an enlarged metatarsal in *Cratonavis* is more comparable to the Late Cretaceous *Balaur*, a member of a group of feathered carnivores known as dromaeosaurids. The elongated scapula has been observed previously in Cretaceous birds such as *Yixianornis* and *Apsaravis*. The fact that *Cratonavis* had a very long scapula probably made up for the fact that it didn't have a breastbone adapted to provide the meaty pectoral muscles a larger surface to attach to. This extinct species may have contributed to a biological experiment in flying behavior. One of the lead authors, paleontologist Min Wang, explains "the elongate scapula could augment the mechanical advantage of muscle for humerus retraction/rotation, which compensates for the overall underdeveloped flight apparatus in this early bird, and these differences represent morphological experimentation in volant behavior early in bird diversification." The authors mention the abnormal morphologies of the scapula and metatarsals preserved in *Cratonavis* highlight the breadth of skeletal plasticity in early birds. *Cratonavis zhui*'s unique mix of anatomy is less a stepping stone between two majestic categories of animals, but a sign of how all living things represent increments of change, and the evolution of birds of all feather occurred simultaneously along a wide variety of divergent paths. <https://www.sciencealert.com/this-ancient-creature-is-a-bizarre-hybrid-of-dinosaur-and-bird>

Monster Space Rock in Antarctica Is Among The Largest Found in 100 Years

Antarctica has a lot going for it when it comes to meteorite hunting. The dark rocks stand out against the icy landscape. Its dry climate keeps weathering to a minimum. And even when meteorites sink into the ice they are often returned to the surface by the churning of the glaciers. In spite of these ideal conditions, finding sizeable chunks of space rock is rare. A group of researchers have just returned from the ice-covered continent with five new meteorites that include an unusually large specimen. The big find in this haul weighs in at **16.8 pounds**, placing it in the top 100 in terms of size



for meteorites recovered in Antarctica over the past century. Considering some 45,000 have been recovered in that time, that's saying something. This monster of a space rock is now being taken back to the **Royal Belgian Institute of Natural Sciences**, where it will be studied closely along with the smaller

rocks. Scientists can learn a lot from the journeys that meteorites have had to our planet. *"Size doesn't necessarily matter when it comes to meteorites, and even tiny micrometeorites can be incredibly scientifically valuable,"* says cosmochemist Maria Valdes, from the Field Museum in Illinois. *"But of course, finding a big meteorite like this one is rare, and really exciting."* While meteorites might be easier to spot in Antarctica, the continent isn't exactly easy to travel across, with its freezing cold conditions and remote location. The team involved in this find spent several days camping out in the wilderness, moving by foot and snowmobile. It also helps to know where meteorites are likely to be found. Here the researchers used a 'treasure map' that was published last year, which uses clues found in satellite imagery (such as ice flow, temperature, and surface slope measurements) to make educated guesses with the help of AI as to where new rocks might be found. *"Going on an adventure exploring unknown areas is exciting,"* says geoscientist Vinciane Debaillie, from the Université Libre de Bruxelles in Belgium. *"But we also had to deal with the fact that the reality on the ground is much more difficult than the beauty of satellite images."* The map used by the researchers is thought to be around 80 percent accurate in terms of the directions it gives, and its makers have calculated that more than **300,000 meteorites** are out there in Antarctica, waiting to be found. Despite the favorable conditions in Antarctica for meteorite discovery, scientists think we're still missing out on finding a lot of them, particularly those high in iron. Part of the reason might be these types of meteorites heat up in the sunlight, melting the surrounding ice and sinking out of sight below the surface. However, there's now an exciting new haul of these rocks ready and waiting to be looked at more closely – and somewhere in the newly recovered meteorites should be traces of the history of the Solar System that we exist in. *"The bigger a sample size we have of meteorites, the better we can understand our Solar System, and the better we can understand ourselves,"* says Valdes.

<https://www.sciencealert.com/monster-space-rock-in-antarctica-is-among-the-largest-found-in-100-years>

Crystal Quartz With a Hidden Surprise

Almost everyone who sees the photo below initially thinks that these interesting-shaped black specks found inside the crystal clear quartz are mini spiders trapped in their forever doom inside a rock, fossilized into a unique and spooky shape. However, looks can be deceiving. The rock is not infested with small black spiders, but rather **Mannardite phantoms**. This is what causes the somewhat stunning black spots hidden inside the quartz. Mannardite is **Ba(Ti⁴⁺₆V³⁺₂)O₁₆** (a barium, titanium, vanadium oxide) that is found in late-stage quartz-carbonate veins that cut shale and siltstones in the Rough Claims area of Sifton pass,



Kechica River, in British Columbia, Canada, and in the Shiti Mine, Hanbin District, Ankang, Shaanxi, China. The mannardite phantoms come in many different shapes and sizes. Sometimes they are small and plentiful, like in this crystal quartz, and other times they appear to be larger and more unified. They look so creepy though!

MEMBERSHIP DIRECTORY BEING UPDATED

We are updating the CVRMS Membership Directory for 2023. **If you have changed your Address, Phone Number, or Email Address or if the current entries are not correct**, please send corrections to:

Dale Stout at dhstout55@aol.com,

or text or phone him at **319-365-7798**

We need these corrections by March 1 in order to get them in the next CVRMS Directory

T. Rex Was a Lot Brainier Than We Thought, Researcher Claims

A new study suggests *Tyrannosaurus rex* had the brains to match its brawn. According to neuroanatomist Suzana Herculano-Houzel, the predatory dinosaurs with tiny arms that are often described as dim-witted dopes might have been as **brainy as modern monkeys**, or at least had a comparable number of brain cells. Not all paleontologists are convinced, however. These bold claims are "*far-fetched*" and based on some questionable interpretations of outdated data, they say. But there's nothing quite like a scientific controversy to ponder a few big questions about intelligent beings and the electrochemical constellations inside our own heads that we still don't fully understand. Herculano-Houzel, the author of the paper, used data on living birds and modern reptiles to infer how the number of neurons scales with



increasing brain mass. She then extrapolated to predict how many brain cells *T. rex* might have had in its telencephalon (the more highly developed part of the brain also commonly known as the cerebrum). Consisting of two hemispheres, this chunk of neural anatomy is responsible for the animal's cognition (amongst other stuff). Herculano-Houzel estimated that *T. rex* had roughly **3 billion cerebral neurons** packed into its 12-ounce brain; more than the number found in baboons. By her calculations, another theropod dinosaur, *Alioramus*, notched up about 1 billion cerebral neurons in its 2.5-ounce brain, which is on par with a capuchin monkey's. If those numbers reflected braininess, this "*would make these animals not only giant but also long-lived and endowed with flexible cognition, and thus even more magnificent predators than previously thought,*" Herculano-

Houzel, of Vanderbilt University in Nashville, writes in her published paper. "*An elephant-sized but agile carnivoran biped endowed with macaque- or baboon-like cognition must have been an extremely competent predator indeed,*" she adds. That's pretty wild, to suggest *Tyrannosaurus* and other theropod dinosaurs were "**the primates of their times,**" and it involves making a few assumptions to get there. But it's where Herculano-Houzel goes next that has arguably caused even more of an uproar amongst paleontologists, biologists, and neuroscientists. Based on her findings and previous studies, Herculano-Houzel predicts *T. rex* would have matured fast, lived long enough (over 40 years) and had brains capable of using tools and passing that knowledge on to kin. Their neuron count places *Tyrannosaurus* and possibly other theropod dinosaurs "*in the cognitive realm of tool-using and culture-building modern birds and primates,*" Herculano-Houzel writes. Cue much skepticism. "*Intelligence itself is already a difficult thing to study, let alone study the intelligence of an extinct taxon that is incapable of having its behavior observed,*" wrote University of Bristol paleobiologist Tess Gallagher. "*Don't get me wrong. T. rex was probably smarter than we give it credit for, but tool use capabilities? That's a very big claim to make.*" Another gripe amongst biologists is that skull size does not necessarily equate to brain volume or mass. Herculano-Houzel used brain size estimates based on CT scans of fossilized skulls. While Herculano-Houzel argues theropod brains filled their cranial cavity, other studies have suggested that the brain of *T. rex* only occupied between a third to a half of its endocranial space. Either way, brain folds, wrinkles, and synaptic connections are often considered to be better indicators of intelligence than total brain size or even the number of cells it contains. Crows, for example, are remarkably intelligent animals with relatively small brains; they have fewer cerebral neurons than baboons yet outperform them on cognitive tasks, says Kai Caspar, a zoologist at the University of Duisburg-Essen in Germany. "*Maybe neuron counts do not make an animal's mind and the connectome also matters?*" Caspar tweeted, referring to the web of connections in a given brain. But bony skulls are preserved, and squishy brains are not, so that's all scientists really have to go by when trying to imagine what dinosaurs were like. Herculano-Houzel argues that estimating neuron counts from brain mass is a method that has been applied to hundreds of mammal, bird, and non-avian dinosaur species, so it is robust. But she also notes that doing so turns animal brains "*into a homogeneous soup*" of floating brain cells that in reality, are structured in layers of tissue. *Tyrannosaurus* continues to surprise us, with recent discoveries painting them as social animals with elegant, swishing tails that tended to hunt in packs, not alone, and warred for love. However many neurons their brains had, the tyrant lizards love to keep us thinking.

<https://www.sciencealert.com/t-rex-was-a-lot-brainier-than-we-thought-researcher-claims>

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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

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

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

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**Next Meeting:
FEBRUARY 21
Hiawatha Community Center
"What's in a Map?
Behind the Scenes Look
at the Making of Map of
Lee County, Iowa"
by Ryan Clark
Iowa Geological Survey**



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