

Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS

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

Next CVRMS Meeting Tuesday Oct. 19

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

featured speaker:

Alex Lockett

Graduate Student
Department of Earth and Environmental Sciences
The University of Iowa

“Geologic Mapping in the Southeastern Brooks Range, Alaska”



More Americans are coming to accept Charles Darwin's "dangerous idea" of evolution, according to thirty years' worth of national surveys. Researchers have found that public acceptance of biological evolution has increased substantially in the last decade alone, following twenty years of relative stagnation. Between 1985 and 2010, roughly 40 percent of surveyed adults in the US agreed that "human beings, as we know them today, developed from earlier species of animals." Taking into account the small number of fence-sitters, this suggests much of the nation was evenly divided on the theory. By 2016, that percentage had, at last, become a majority, reaching 54 percent. As it turns out, education has played a crucial role in that shift. When researchers began to analyze the demographics of survey respondents over the past thirty years, they noticed the completion of one or more college science courses was the strongest predictor of evolution acceptance. Nearly twice as many Americans held a college degree in 2018 as in 1988. In the current analysis, the proportion of American adults with scientific literacy increased from 11 percent in 1988 to 31 percent in 2019. In the US, evolution has become a highly politicized topic, especially among supporters of the Republican party, which tends to align its policies with evangelical Christian values. The result is that today, the **US has some of the lowest acceptance rates for evolution in the developed world**, with only Turkey scoring lower. Even now that a majority of Americans do not reject evolution, the rate of acceptance is still low compared to other nations and much lower than scientific consensus. In recent years, religious adherence has begun to decline in the US, but the political divide on evolution still very much exists. In 2019, researchers found 83 percent of liberal Democrats accepted evolution, whereas only 34 percent of conservative Republicans felt the same. Last year, Pew conducted a more global survey that showed a slightly higher acceptance of evolution in the **US at around 64 percent**. It's a number that nonetheless falls far below nations such as **Canada (77 percent), Germany (81 percent), and Japan (88 percent)**, showing the US still has some catching up to do. <https://www.sciencealert.com/more-americans-are-finally-coming-around-to-the-idea-that-life-really-does-evolve>

— Pandemic Precautions —

to attend, we recommend that you **BE VACCINATED**
while in the building, you **MUST BE MASKED**
and **PRACTICE SOCIAL DISTANCING**

CVRMS Meeting Minutes Sept. 21

Hiawatha Community Center

Called by President Marv Houg at 7:18
at Hiawatha Community Center

TREASURERS REPORT: by Dale Stout \$3,943.81 checking account balance. Some auction figures not in but sold about \$48,000 plus.

PROGRAM: Ray Anderson gave a talk on the geology of the Klein Quarry. It's history and various finds. Lots of questions and suggestions. Ray said it was a work in progress.

AUCTION REPORT: Dale recommended that the Society pay Sharon \$200 for food and extras. 2nd by Dennis. The club will pay \$200 to Sharon.

Different comments about food. Negative reports about dinner. A Food Truck was engaged because the club was not able to supply food without being licensed, as/per the camping ground rules..

TAKO (Take A Kid Outside): still scheduled for Oct 2: 8:00 a.m. Marv will get location information to people. After the TAKO event the club members who participated will be allowed to collect at the quarry. All safety precautions will apply.

2021 ROCK SHOW: November 6-7. Sign up online for Committees and/or Displays or email Sharon (address on back).

8:56 MOTION TO ADJOURN: by AJ, second by Tom.

Respectfully submitted,
Dell James, Secretary

— Sign up for Committees/Displays —

Fill out and Submit the form(s) found at:
[cedarvalleyrockclub.org/
show_committeesDisplays.html](http://cedarvalleyrockclub.org/show_committeesDisplays.html)



**Marston
Marble**

CVRMS Board Minutes Sept. 28

7:12 MEETING CALLED TO ORDER by Marv at his house.

PRESENT: Marv Houg, Kim Kleckner, Dale Stout, Ray Anderson, Bill Desmarais, Sharon Sonnleitner, Dell James

MINUTES OF PREVIOUS MEETING: Motion to accept as published by Ray, 2nd by Bill. Motion passed.

AUCTION RECAP: Club earnings after expenses not yet paid will be about \$10,000. After discussion regarding the success of the auction, a motion was made by Bill that the club would waive our commission on Gil Norris's lots in lieu of the \$2,000 we earned on the lots he donated to the club. Second by Dale. Motion unanimously passed. **Discussion followed** regarding how to speed up the auction? Various suggestions that included having material labeled, speeding up the readiness of next items up for bid, limit and stick to the number of lots. We had over 1,300 items and our goal was 1,200. Could we start on Friday night? **Marv is already taking lot requests** for next year's auction, already almost 900 lots. Maybe we could use more help at the cashier's table for faster checkout. **The success of food truck** was discussed. Dale will talk with truck operator about her thoughts. Various comments about the food were reviewed. **The Sunday meals** were not successful and we won't do that again. Next year's auction set for October 8-9.

2021 ROCK SHOW NOV 6-7: Catered dinner and potluck are canceled. Ray has programs lined up. **Masks** required, but we will not police it. **One of the vendors** may need help with geode cracking. Suggestion was that Cornell students might help. Dale will talk to Cornell to see if they are interested. **Food truck** will function out of the Hawkeye Downs kitchen; suggested food time 9-5:30 on Saturday and 10-3:30 on Sunday. Sharon will let them know. **Silent Auction:** Kim and Kim will inventory all items so we will know what sells the best. **Discussion ensued about complaints regarding the use of bad language:** Everyone in the club needs to use clean language (no profanity). This applies to all club functions, including shows, auctions and meetings. **Gazette article:** Marv will contact someone regarding article.

Marv has gobs of stuff for pebble pit. Needs help moving it. Volunteers needed.

Ray has someone lined up for October's club meeting program.

TAKO on for this weekend at Klein Quarry. Club members who participated will be allowed in afterward with appropriate safety gear.

Motion to adjourn by Kim. 2nd by Ray. Meeting adjourned at 9:32.

Respectfully submitted,
Dell James, Secretary

Megalodon's Mortal Attack on Sperm Whale Revealed in Ancient Tooth

Millions of years ago, an ancient sperm whale had a very, very bad day when a megatoothed shark, possibly the fearsome *Otodus megalodon* or its ancestor *Otodus chubutensis* (the largest predatory sharks that ever lived) viciously attacked it in what is now North Carolina, a new study suggests. Marks from the attack, preserved as gouges out of the sperm whale's tooth, are the first evidence in the fossil record that megatoothed sharks tussled with sperm whales, the researchers said. The single tooth is all that's left of the ancient sperm



whale. The tooth was found in what is now called the Nutrien Aurora Phosphate mine, a large phosphate mine in Aurora, North Carolina, in the 1970s

or 1980s, when the mine was open to fossil collectors. The researchers aren't sure when this shark-whale brawl occurred. To reach the older phosphate-rich beds, mine workers removed bucketloads of overlying sedimentary rock and dumped them nearby, where fossil collectors could scour them, mixing up the different rock layers. The scientists don't know if the tooth comes from the older Miocene epoch, (14 million years ago) or the younger Pliocene fossil beds (about 5 million years ago). Either way, the tooth falls into the Neogene period (23 million to 2.5 million years ago) when the Earth's climate was warmer than it is today. The size and shape of the curved 4.5-inch-long tooth clearly indicates that it belongs to an extinct sperm whale species, and by using an equation that compares extinct sperm whale tooth size with body size, the researchers estimate this particular whale was small, only about 13 feet long. Three gouge marks on the tooth show that whatever took a bite out of it had evenly spaced, serrated teeth. Based on the size and spacing of the bite marks and serrations, the only possible culprits are the megatoothed shark *O. chubutensis* (which lived 28 million to 13 million years ago) and its descendant *O. megalodon* (which existed 20 million to 3.5 million years ago), the researchers found. None of the other fossil sharks known from the phosphate mine have teeth large enough and serrations even enough to have left these bite traces on the sperm whale tooth. Bite traces by these giant sharks (with a body length of megalodon over 60 feet long) have been found on other bones of extinct whales and dolphins, but never on the head or other bones of a sperm whale. <https://www.livescience.com/megalodon-shark-attacks-whale-fossils.html>

Spotlight Gemstones: Tourmaline / Opal

October's Birth Stones



If you were born in October you may choose from
2 birthstones, tourmaline or opal.

TOURMALINE is a crystalline boron silicate mineral compounded with elements such as aluminium, iron, magnesium, sodium, lithium, or potassium. It is a six-member ring cyclosilicate having a trigonal crystal system, occurring as long, slender to thick prismatic and columnar crystals that are usually triangular in cross-section, often with curved striated faces. The style of termination at the ends of crystals is sometimes asymmetrical, called *hemimorphism*. Tourmaline is distinguished by its three-sided prisms; no other common mineral has three sides. Prism faces often have heavy vertical striations that produce a rounded triangular effect. Tourmaline is classified as a semi-precious stone, and the gemstone comes in a wide variety of colors. Varieties include **schorl** (brownish-black to black), **dravite** (dark yellow to brownish-black), **rubellite** (red or pinkish-red), **indicolite** (light blue to bluish-green), **verdelite** or Brazilian emerald (green), and **achroite** (colorless). In all, 32 tourmaline group endmembers are recognized. **Bicolor** or **tricolor** tourmaline crystals are also found.

OPAL is a hydrated amorphous form of silica ($SiO_2 \cdot nH_2O$). Its water content may range from 3 to 21% by weight, but is usually between 6 and 10%. Because of its amorphous character, it is classed as a mineraloid, unlike crystalline forms of silica, which are classed as minerals. It is deposited at a relatively low temperature and may occur in the fissures of almost any kind of rock, being most commonly found with limonite, sandstone, rhyolite, marl, and basalt. The internal structure of precious opal makes it diffract light. Depending on the conditions in which it formed, it can take on many colors. Precious opal ranges from clear through white, gray, red, orange, yellow, green, blue, magenta, rose, pink, slate, olive, brown, and black. Of these hues, the black opals are the most rare, whereas white and greens are the most common. It varies in optical density from opaque to semitransparent. Fossils are sometimes replaced or coated by opal.

What in the World?



What in the World? Is this pipe-like feature imbedded in the rocks of this cliff??

September's Photo



September's *What in the World?* photo shows one of several potash production canals located east of the Bonneville Salt Flats near the Great Salt Lake in Utah. These canals, while considered unsafe, have become increasingly popular recreation sites.

ROCK CALENDAR CVRMS EVENTS OF INTEREST

2021

Oct. 19 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
feature program
*"Geologic Mapping
in the Brooks Range, Alaska"*
by Alex Lockett

**** PANDEMIC PROTOCOLS WILL BE MANDATED ****
More details on Page 1

Oct. 22-24 — MAPS 2021 Fossil Expo
Illinois State Fair Grounds
Springfield, Illinois
http://www.midamericapaleo.org/content/news/2021_Jan_Prelim_Announce.pdf

Nov. 6-7 — CVRMS Rks, Fos, & Min Show
Hawkeye Downs
Cedar Rapids, Iowa
for more details see Page 10
**** PANDEMIC PROTOCOLS WILL BE IN EFFECT ****

Nov. 16 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
feature program
"To Mt. Belford and Back "
by Bill Desmarais

**** PANDEMIC PROTOCOLS WILL BE MANDATED ****

Dec. 14 — CVRMS Christmas Party
Hiawatha Community Center 6:00 pm
Details to follow:

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.

Once again our "Ask a Geologist" column for this month was suggested by CVRMS member **Jack Gilmore**. While he was at my **barn/rock preparation laboratory** last week Jack suggested that I discuss **Shungite** (a term he had run across while reading.

Shungite is a black, lustrous, non-crystalline mineraloid consisting of **more than 98 percent by weight of carbon**. It was first described from a deposit near Shunga village, in Karelia, Russia, from where it gets its name. Shungite has been reported to contain trace amounts of fullerenes ($0.0001 < 0.001\%$). A.K.A. "bucky balls," these hollow spheres are produced by the bonding of 60 carbon atoms. The term "shungite" was originally used in 1879 to describe a mineraloid with more than 98 per cent carbon. More



Sample of elite shungite



Shungite crystal
mekaba-star

recently the term has also been used to describe **shungite-bearing rocks**, leading to some confusion. Shungite-bearing rocks have also been classified purely on their carbon content, with **elite shungite** having a carbon content in the range 90-98 weight percent, **petrovsky shungite** with carbon contents in the ranges 50-70 percent, and **regular shungite** with 30-50 percent carbon. It is further classified as *bright*, *semi-bright*, *semi-dull*, and *dull* on the basis of its luster. Shungite has two main modes of occurrence, as disseminated within the host rock and as an apparently mobilized material. **Migrated shungite**, which is bright (lustrous) shungite, has been interpreted to represent migrated hydrocarbons and is found as either **layer shungite**, layers or lenses near conformable with the host rock layering, or **vein shungite**, which is found as cross-cutting veins.

Shungite may also occur as clasts within younger sedimentary rocks. Shungite was once regarded as an abiogenic petroleum formation, but its biological origin has now been confirmed. Non-migrated shungite is found directly stratigraphically above deposits that were formed in a *shallow water carbonate shelf to non-marine evaporitic environment*. The shungite-bearing sequence is thought to have been deposited during active rifting, consistent with the alkaline volcanic rocks that are found within the sequence. The organic-rich sediments were probably deposited in a brackish lagoonal setting. The concentration of carbon indicates elevated biological productivity levels, possibly due to high levels of nutrients available from interbedded volcanic material. The stratified shungite-bearing deposits that retain sedimentary structures are interpreted as *metamorphosed oil source rocks*. Some diapiric mushroom-shaped structures have been identified, which are interpreted as possible mud volcanoes. Layer and vein shungite varieties, and shungite filling vesicles and forming the matrix to breccias, are interpreted as migrated petroleum, now in the form of metamorphosed bitumen. Most shungite has been found in Russia. The main deposit is in the Lake Onega area of Karelia, at Zazhoginskoye, near Shunga, with another occurrence at Vozhmozero. Two other much smaller occurrences have been reported in Russia, one in Kamchatka in volcanic rocks and the other formed by the burning of spoil from a coal mine at high temperature in Chelyabinsk. Other occurrences have been described from Austria, India, Democratic Republic of Congo and Kazakhstan. The Shunga deposits contain an estimated total carbon reserve of more than 250 gigatons. It is found within a sequence of Palaeoproterozoic metasedimentary and metavolcanic rocks that are preserved in a synform. The sequence is dated by a gabbro intrusion, which gives a date of 1980 ± 27 Ma, and the underlying dolomites, which give an age of 2090 ± 70 Ma. There are nine shungite-bearing layers within the Zaonezhskaya Formation, found in the middle of the preserved sequence. Of these the thickest is layer six, which is also known as the "productive horizon," due to its concentration of shungite deposits. Four main deposits are known from the area, the Shungskoe, Maksovo, Zazhogino and Nigozero deposits. The Shungskoe deposit is the most studied and is nearly mined out. Shungite has been used as a folk medical treatment since the early 18th century. Peter the Great set up Russia's first spa in Karelia to make use of the water purifying properties of shungite, which he himself had experienced. He also instigated its use in providing purified water for the Russian army. The anti-bacterial properties of shungite have been confirmed by modern testing. Shungite has been used since the middle of the 18th century as a pigment for paint, and is currently sold under the names "carbon black" or "shungite natural black". Crystal healing pseudoscience proponents and 5G conspiracy theorists have falsely alleged the misinformational belief that shungite may absorb 5G radiation.

Scientists Crack Mystery Of How Fossil Concretions Form

All over the world, spectacular fossils have frequently been found preserved inside solid, roughly spherical rocks called "concretions." From geologists to casual observers, many have wondered why these hardened masses of carbonate formed around dead organisms, with round shapes and sharp



boundaries with the surrounding material, and typically in marine mud and mudstone. Several important questions regarding concretions have long puzzled scientists. What conditions

cause them to form? How long do they take to grow? Why do they stop growing? Why are they so distinct from the surrounding rock or sediments? Now, researchers have developed a method to analyze concretions using L-shaped "cross-plot diagrams" of diffusion and growth rate. With this method, they analyzed dozens of concretions from three sites across Japan and compared them with concretions from England and New Zealand. The results of this new study dramatically impact understanding of the rate at which concretions form. Until now, the formation of spherical carbonate concretions was thought to take hundreds of thousands to millions of years, however, the new results show that concretions grow at a very fast rate over several months to several years. This rapid sealing mechanism could explain why some concretions contain well-preserved fossils of soft tissues that are rarely fossilized under other conditions. The concretions maintain their characteristics, with well-preserved fossils at their centers or textures indicative of the original presence of organic matter. Simple mass balance calculations also demonstrate that the carbon fixed in the carbonate concretions came predominantly from the organisms inside the concretions. All of the studied concretions were composed of calcite, with relatively consistent compositions throughout, distinct from the surrounding muddy matrix. Fine-grained, generally clay-rich sediments were found to be important to limit diffusion and permeability, and to slow the migration of solutes. Thus, bicarbonate concentrations would rise high enough at a reaction front to cause rapid precipitation of calcium carbonate, with sharp boundaries from the surrounding mud. This new unified model for the creation of spherical concretions, which can be generalized by simple formulas, can be applied to interpret concretions from all over the world. <https://www.geologyin.com/2018/05/researchers-resolve-formation-mechanism.html>

What is Star Hollandite Quartz

Star Hollandite Quartz is a type of quartz crystal that has very small inclusions of Hollandite in it, that look like tiny black stars. Hollandite is an oxide mineral. A monoclinic-prismatic white mineral containing aluminum, barium, iron, lead, manga-



Rare Urchin Quartz (Quartz crystal with Mannardite phantom inside) from Brazil

nese, oxygen, silicon, and sodium. It is the barium-manganese (III) endmember of the coronadite group. Hollandite Quartz is a variety of Quartz, silicon dioxide, which has dark grey/black six-pointed "star" inclusions of the mineral Hollandite. Star Hollandite formations are formed when deposits of Hollandite become trapped within Quartz during its formation. As the Hollandite becomes subjected to high thermal temperatures within the Earth, the Hollandite bursts into star formations within the Quartz. This variety of quartz is very rare. Quartz is a hard, crystalline mineral composed of silicon and oxygen atoms. Quartz belongs to the trigonal crystal system. The ideal crystal shape is a six-sided prism terminating with six-sided pyramids at each end. Common colored varieties include citrine, rose quartz, amethyst, smoky quartz, milky quartz, and others. These color differentiations arise from the presence of impurities which change the molecular orbitals, causing some electronic transitions to take place in the visible spectrum causing colors.

<https://www.geologyin.com/2020/08/star-hollandite-quartz.html>

Fossil Footprints Are The Earliest Known Trace of Humans in North America

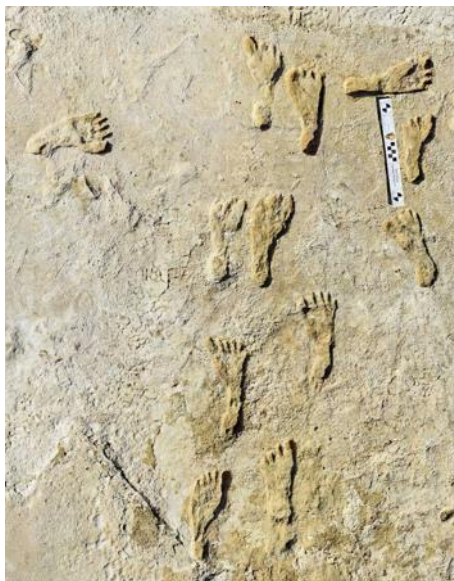
A new discovery offers definitive evidence that humans were in North America far earlier than archaeologists previously thought, a whopping 7,000 years earlier. Fossil footprints found on the shore of an ancient lake bed in New Mexico's White Sands National Park date as far back as 23,000 years ago, making them the oldest ever found in North America. That timing means humans occupied southern parts of the continent during the peak of the final ice age, which upends our previous understanding of when and how they moved south. The previous idea was that the first people to occupy North America crossed a land bridge that existed between modern-day Siberia and Alaska during the last ice age, between 26,500 and 19,000 years ago. According to that theory, they would have had to settle near the Arctic because ice sheets covering Canada made it impossible for them to go south. Then later, once these glaciers melted between 16,000 and 13,500 years ago, the migration toward South America began. This new finding, however,



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"definitively places humans

Showing the different "time periods" of the last ice age, and before the sand dunes formed, White Sands would have looked like a mix of grasslands and wetlands surrounding the great ancient Lake Otero.



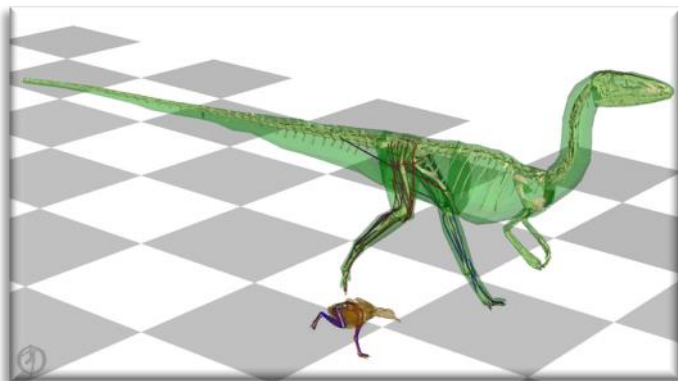
White Sands has the largest collection of fossilized human footprints.

in North America at a time when the ice sheet curtains were very firmly closed," according to Sally Reynolds, a paleoecologist at Bournemouth University in England and co-author of the new study. So most likely, Reynolds said, humans migrated south in multiple waves, and one of those was before the last ice age. Those early people may have even sailed down the Pacific coast. *"Then more came down after the ice receded,"* Reynolds said. The finding was published Thursday in the journal *Science*, and the study also describes nearby tracks found from mammoths, dire wolves, and giant ground sloths, prey for ancient humans. Reynolds' team found 60 human footprints between 21,000 and 23,000 years old. The researchers estimated the tracks' age by dating microscopic seeds from an aquatic plant found in layers of lake sediment that sandwiched the prints. *"It's unequivocal evidence,"* Reynolds said. *"The layers go seeds, footprints, seeds."* The footprints are now the oldest in the Americas, taking over from a 15,600-year-old footprint found in Chile a decade ago. Most of the tracks belonged to teenagers and children, the team found, possibly indicating the youngsters played in the area while adults hunted and gathered. Reynolds said that before this finding, the earliest estimate as to when humans started occupying North America was 16,000 years ago. The only clue that people might have arrived earlier is a set of stone tools and artifacts found in remote Mexican cave. Archaeologists estimated that sediment encasing those artifacts was 32,000 years old, but that's not a trustworthy measure, Reynolds said. Artifacts can migrate up and down through sediment layers over time. *"Footprints, by contrast, are fixed on the landscape,"* Reynolds said.

<https://www.sciencealert.com/newly-discovered-fossil-footprints-show-humans-were-in-north-america-thousands-of-years-earlier-than-we-thought>



Movies like *Jurassic Park* may give the impression that we know everything about dinosaurs, including how they used to walk or run. But it's actually incredibly difficult to figure out how extinct creatures moved their bodies. Now, a fruitful combination of computational biomechanics and so-called "predictive simulation" are helping fill in these locomotive



Researchers first modeled the running gait of a living bird to calibrate their simulation.

knowledge gaps. To replicate the movements of a Triassic dino that lived around 200 million years ago, *Coelophysis bauri*, a team of researchers with diverse expertise developed a novel 3D simulation program. According to their results, small, two-legged dinosaurs like *C. bauri* likely swung their tails as they walked or ran, similar to how humans swing their arms. They reproduced how different muscles would interact, and looked at how *C. bauri*'s gait and momentum would have been impacted by tail movements. The tail, it turned out, regulated angular momentum and efficiency, reducing the muscular strain on the dinosaur's body. The team believes this mechanism likely applied to other dinosaurs as well. Previously, paleontologists mostly believed that the tail was just a passive counterbalance that offset the weight of dinosaurs' heads and necks. They assumed that the tail would just be there hanging. To make sure their model was consistent with real-life biomechanics, the team first used it to simulate birds called tinamous, elegant Central and South American avians with anatomy similar to bipedal dinosaurs. When they were sure that their simulation could faithfully replicate the bird's bodily movements in real life, they turned their model to the *C. bauri* dinosaur. To really get at the tail's importance, the team repeated the simulation, but removed the dino's tail from the model. The tailless dino also had to increase its muscle effort by 18 percent, which suggests that the tail also helped keep energy expenditure low. The researchers are now primed to explore locomotion and other behaviors in a whole host of other extinct critters, and not just dinosaurs. Pretty much anything is fair game. <https://www.popsoci.com/animals/two-legged-dinosaurs-wagged-tails/>



Halite is a type of salt, the mineral (natural) form of sodium chloride (NaCl). Halite forms isometric crystals. The mineral is typically colorless or white, but may also be light blue, dark blue, purple, pink, red, orange, yellow or gray depending on



Pink Halite

inclusion of other materials, impurities, and structural or isotopic abnormalities in the crystals. Halite has economic value. In addition to its use in food, salt is traditionally used in large quantities in wintertime to prevent roadways from icing up. Halite is principally mined from ancient rock salt successions. Rock salt is a chemical sedimentary rock composed of halite and formed by evaporation of seawater. Pink Halite is a type of Halite that had its color tainted from bacteria of various algae species. Halite is known as the "natural form of salt" and is a very common mineral found near oceans and salt lakes. This stone can be found in the form of masses and a tubular crystal structure. The specimen pictured above is from a dried up salt lake in San Bernardino, California. Be careful to avoid getting pieces of Pink Halite wet as it may start to disintegrate before your eyes. Through geologic time, the lake has alternated between having water and being dry. What little water does occur in modern Searles Lake is highly saline. When the water evaporates, halite precipitates. The pinkish coloration is from incorporation of pigments (carotenoids) in halophilic archaea and algae that live in the water.

<https://www.geologyin.com/2021/09/pink-halite.html>

Space Rock that Destroyed Ancient City May Have Inspired the Biblical Story of Sodom

As the inhabitants of an ancient Middle Eastern city now called Tall el-Hammam went about their daily business one day about 3,600 years ago, they had no idea an unseen icy space rock was speeding toward them at about 38,000 mph. Flashing through the atmosphere, the rock exploded in a massive fireball about 2.5 miles above the ground. The blast was around 1,000 times more powerful than the Hiroshima atomic bomb. The shocked city dwellers who stared at it were blinded instantly. Air temperatures



Artist's depiction of the destruction of Sodom.

rapidly rose above 3,600 degrees Fahrenheit. Clothing and wood immediately burst into flames. Swords, spears, mudbricks and pottery began to melt. Almost immediately, the entire city was on fire. Some seconds later, a massive shock-wave smashed into the city. Moving at about 740 mph, it was more powerful than the worst tornado ever recorded. The deadly winds ripped through the city, demolishing every building. They sheared off the top 40 feet of the 4-story palace and blew the jumbled debris into the next valley. None of the 8,000 people or any animals within the city survived, their bodies were torn apart and their bones blasted into small fragments. About a minute later, 14 miles to the west of Tall el-Hammam, winds from the blast hit the biblical city of Jericho. Jericho's walls came tumbling down and the city burned to the ground. No one was exactly sure what had happened, but that layer wasn't caused by a volcano, earthquake or warfare. None of them are capable of melting metal, mudbricks and pottery. To figure out what could, our group used the *Online Impact Calculator* to model scenarios that fit the evidence. Built by impact experts, this calculator allows researchers to estimate

the many details of a cosmic impact event, based on known impact events and nuclear detonations. It appears that the culprit at Tall el-Hammam was a small asteroid similar to the one that knocked down 80 million trees in Tunguska, Russia in 1908. It would have been a much smaller version of the giant miles-wide rock that pushed the dinosaurs into extinction 65 million ago. We had a likely culprit. Now we needed proof of what happened that day at Tall el-Hammam. Our research revealed a remarkably broad array of evidence. At the site, there are finely fractured sand grains called shocked quartz that only form at 725,000 pounds per square inch of pressure, imagine six 68-ton Abrams military tanks stacked on your thumb. The destruction layer also contains tiny diamondoids that, as the name indicates, are as hard as diamonds. Each one is smaller than a flu virus. It appears that wood and plants in the area were instantly turned into this diamond-like material by the fireball's high pressures and temperatures. Experiments with laboratory furnaces showed that the bubbled pottery and mudbricks at Tall el-Hammam liquefied at temperatures above 2,700° F. That's hot enough to melt an automobile within minutes. The destruction layer also contains tiny balls of melted material smaller than airborne dust particles. Called spherules, they are made of vaporized iron and sand that melted at about 2,900° F. In addition, the surfaces of the pottery and melt-glass are speckled with tiny melted metallic grains, including iridium with a melting point of 4,435° F, platinum that melts at 3,215 F and zirconium silicate at 2,800° F. Together, all this evidence shows that temperatures in the city rose higher than those of volcanoes, warfare and normal city fires. The only natural process left is a cosmic impact. The same evidence is found at known impact sites, such as Tunguska and the Chicxulub crater, created by the asteroid that triggered the dinosaur extinction. One remaining puzzle is why the city and over 100 other area settlements were abandoned for several centuries after this devastation. It may be that high levels of salt deposited during the impact event made it impossible to grow crops. We're not certain yet, but we think the explosion may have vaporized or splashed toxic levels of Dead Sea salt water across the valley. It's possible that an oral description of the city's destruction may have been handed down for generations until it was recorded as the story of Biblical Sodom. The Bible describes the devastation of an urban center near the Dead Sea, stones and fire fell from the sky, more than one city was destroyed, thick smoke rose from the fires and city inhabitants were killed. Could this be an ancient eyewitness account? If so, the destruction of Tall el-Hammam may be the second-oldest destruction of a human settlement by a cosmic impact event, after the village of Abu Hureyra in Syria about 12,800 years ago. Importantly, it may be the first written record of such a catastrophic event. The scary thing is, it almost certainly won't be the last time a human city meets this fate. Tunguska-sized airbursts, such as the one that occurred at Tall el-Hammam, can devastate entire cities and regions, and they pose a severe modern-day hazard. Unless orbiting or ground-based telescopes detect these rogue objects, the world may have no warning, just like the people of Tall el-Hammam. <https://www.livescience.com/biblical-fireball-archaeological-evidence-jericho>

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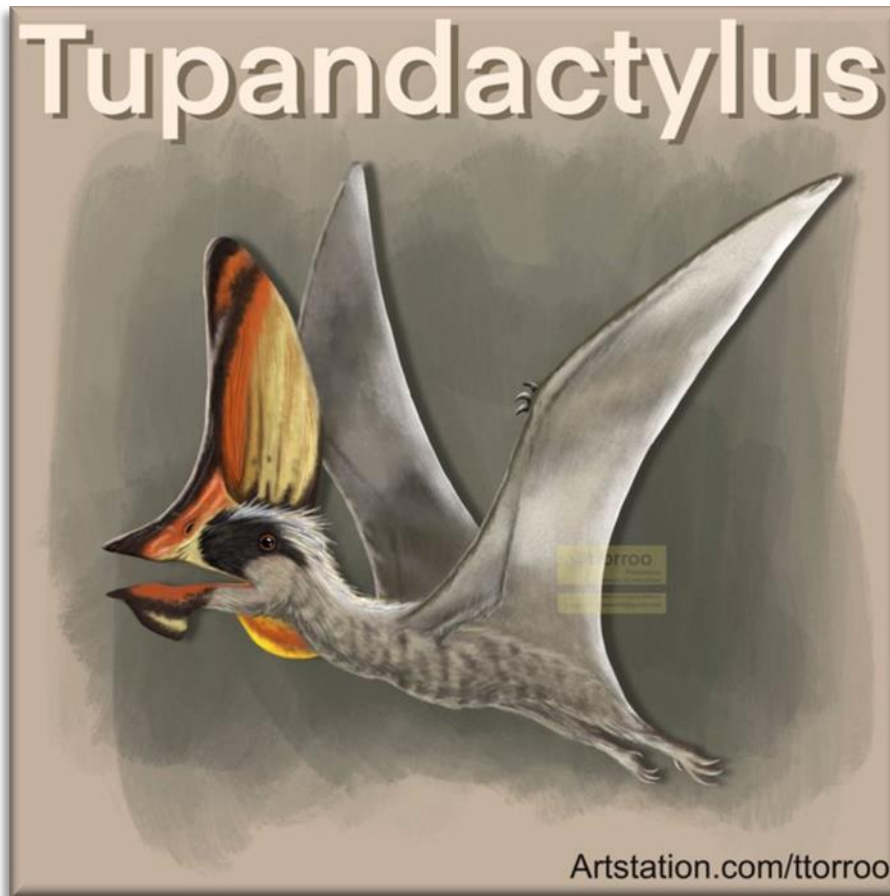
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Police Raid in Brazil Saves The Most Detailed Pterosaur Fossil Discovered to Date

A police raid in Brazil has saved our scientific knowledge of an incredibly well-preserved flying lizard that sported a ridiculously large head crest. The police had been investigating illegal fossil trade, and in 2013 found the pterosaur *Tupandactylus navigans* fossil amongst 3,000 other specimens. University of São Paulo paleontologist Victor Beccari and colleagues realized they had the most complete fossil of Tapejaridae (a group of crested pterosaurs) after piecing together the 7-foot limestone slab that had been sawed into six pieces to make it easier to hide. CT scans helped reveal the amazing detail of the animal's unwieldy head ornament, almost half of the animal's total height, imprinted in the stone, which the researchers have just described in a new paper. Pterosaurs are relatively rare in the fossil record because they have fragile, thinly walled hollow bones that allow them to remain light for flight; previously only fragments of tapejarid heads had been recovered. The absence of lake-floor dwelling animals where the fossil was buried, in what's



now the Crato Formation, suggests lack of oxygen contributed to the remarkable preservation of this fossil's soft crest and beak tissues. *T. navigans* had a strange crest jangling down from its lower jaw too, as can be seen in the stunning paleoart. The newly revealed fossil is inspiring on Twitter. "This pterosaur was over 8.2 feet in wingspan and was 3.3 feet tall (40 percent of this is accounted for by the head crest)," Beccari reported. "With such a tall head crest and a relatively long neck, this animal may have been restricted to short-distance flights." Around 115 million years ago, these ancient lizards may have used their ability to fly to flee predators via the skies over what's now northern Brazil, the team explains. Their flight was supported by a bone called the notarium. This bone is a fusion of the first chest vertebrae that increases resistance to the bending and torsion stresses caused by flapping wings; the presence of the notarium confirms the pterosaur was indeed capable of powered flight. Comparing the fossil to previous finds, the team suspects some differences might be due to sexual dimorphism (where members of the same species appear different depending on sex) rather

than the existence of two distinct species as was thought until now. This, however, needs further investigation to confirm. "Pterosaurs were already mind-blowing before, but this new specimen, with its huge, awkward crest and long neck, is mind-boggling because, sort of like [flashy] peacock tails, they would have made him an attractive mate, but an easy target for predators and a poor flyer," Beccari revealed. "Like the peacock, it probably spent its time eating fruit off the ground or using its long neck to grab food from higher bushes." The illegal export of insightful fossils like this one is a huge problem for Brazil. Luckily, police found it before the fossil vanished into the world of private collectors, so that scientists could properly examine it and share this ancient marvel with us all. <https://www.sciencealert.com/incredibly-preserved-fossil-seized-in-a-police-raid-reveals-pterosaur-would-have-struggled-to-fly-for-long-2>

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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. During the COVID emergency meetings will be via ZOOM. When the emergency is over, meetings will return to the Hiawatha Community Center in the Hiawatha City Hall, [101 Emmons St., Hiawatha IA](http://101EmmonsSt.HiawathaIA). The December meeting is a potluck dinner held on the 1st Tuesday at 6:30. June, July, and August meetings are potlucks held at 6:30 p.m. at area parks on the 3rd Tuesday of each month

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.

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