



Cedar Valley Gems

Cedar Valley Rocks & Minerals Society
Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS

MAYL 2022

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

Next CVRMS Meeting Tuesday May 17

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

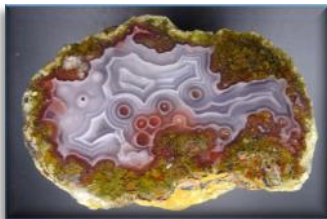
more videos from the 2016 Agate Expo

featured presentations

Jamie Brezina *"Sedimentary Agates of the United States"*



Eugene Mueller *"Agua Nueva Agate"*



—-Pandemic Precautions —-

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

If you have a cough or cold **STAY HOME**

Stan, Most Expensive T. Rex Ever Sold, Has Finally Been Found

The menacing remains of Stan, a *Tyrannosaurus rex* that sold for a record-breaking \$31.8 million at auction in October 2020, went to an undisclosed location after the sale but have finally been found: They are now halfway across the world from where Stan once prowled 67 million years ago in



what is now South Dakota. The dinosaur king is now in Abu Dhabi, awaiting the anticipated 2025 grand opening of a Natural History Museum, according to the Abu Dhabi Department of Culture and Tourism. Stan's location has remained a well-kept secret these past two years. After the nearly 40-foot-long dinosaur became the most expensive dinosaur specimen ever to be sold, hardly anyone knew where it went, including the Black Hills Institute (BHI) in South Dakota, the company that previously owned and housed Stan. Upon learning that Stan would go on public display in Abu Dhabi, the second-most populated city (after Dubai) of the United Arab Emirates (UAE), Pete Larson, paleontologist, president and founder of BHI, said "I was super, super happy." Stan's new home, the future Natural History Museum Abu Dhabi, will be a scientific research and teaching institution and an educational resource for learning about the evolving story of our planet. The museum will also house the Murchison meteorite, which contains the oldest known material on Earth: 7 billion-year-old stardust. <https://www.livescience.com/stan-tyrannosaurus-rex-abu-dhabi>

CVRMS Monthly Meeting, Apr. 19 — Minutes —

MEETING CALLED TO ORDER: 7:20 p.m. by Marv Houg president. **Attendance** total 30.

GUESTS AND NEW MEMBERS were introduced.

MINUTES FROM LAST MEETING: were reviewed. Motion to accept as published by Bill and second by Rodney. Motion passed.

DALE GAVE TREASURER'S REPORT: which included the show summary. Checking account balance \$17,623.51. Motion to accept treasurer's report by A.J., and second by Ray. Treasurer's report accepted.

PROGRAM: Ryan Clark, IGS, presented *Searching for Critical Minerals in Iowa and Beyond*. Words to recall from talk, *rare earth, fly ash, underclays, Plutons, and lithium batteries*. Very informative and educational. Thanks, Ryan

2022 ROCK SHOW RECAP: Very successful show with good reports from everyone involved. Great kudos for all of the club members who helped out. Approximately \$13,000 profit with approximately 5100 in attendance. Total numbers have not yet been tabulated.

2023 ROCK SHOW: Motion made to have a 2023 show by A.J., second by Carolyn. Motion passed. The board will discuss the theme but if anyone has an idea let Marv know.

SUMMER PICNICS: Reservations will be made for the same locations as previous picnics; **June** at *Ellis Park Overlook Shelter*, **July** at *Wanatee Park*, and **August** at *Morgan Creek Park*. Whether there will be pot luck will be discussed at next board meeting.

CVRMS AUCTION: October 8 and 9 at Amana RV Park. There will be a lot of equipment for auction from Tom Whitlatch's estate. More details to follow.

NEW BUSINESS: Marv will talk to Deb from River Rocks for new information regarding TAKO open house at quarry.

FIELD TRIPS: There was a field trip to Sheffield thanks to Matt. May 15 will be Four County and Blair's Ferry Sandpoint. It is limited to 25 people with all restrictions in place.

OTHER BUSINESS: The club needs to design a thank you note for whenever it is appropriate. Board will discuss.

DOOR PRIZE: Jack Gilmore won the door prize and picked from Marv's stash.

MOTION TO ADJOURN: by AJ, second by Rodney. Meeting adjourned at 9:06 p.m.

Respectfully submitted,
Dell James, Secretary

CVRMS Board Minutes Apr. 26

MEETING CALLED TO ORDER: 7:10 by Marv at his house. **Board Members** present Kim Kleckner, Marv Houg, Dale Stout, Ray Anderson, Bill Desmarais, Sharon Sonneleitner, Matt Burns, Dell James

MINUTES OF PREVIOUS MEETING: reviewed. Bill made a motion to accept and Ray seconded. Minutes approved.

TREASURER'S REPORT: by Dale. Show receipts were reviewed with corrections made. There are still some invoices not received and unpaid. At the present profits were \$12,459.90, which is still the highest ever. Motion to approve report by Bill, second by Matt, report approved.

2022 ROCK SHOW REVIEW: Various discussions about the need for door prizes and selling grab bags. No decision reached. Lots of work went into making the show a success. Thanks to everyone's help.

2023 ROCK SHOW DISCUSSION: Theme discussed, suggestions include agates or crystals, final decision to be made at next month's board meeting. We need a dealer to sell equipment at the show. Marv will ask around.

AUCTION OCTOBER 8-9 AMANA CAMP GROUNDS: Jay will send out contracts. Food will be by truck on Saturday only. Need items to list on flyer. Pictures of items needed from consigners.

FIELD TRIPS: Trips to 4-County Quarry and Blair's Ferry Sandpit are scheduled for May 15. Dale will send out email including rules and instructions. **Ray reported** on reconnaissance trip to Moscow Quarry, low priority for future trip. **Matt continues** to work on more field trips.

TAKO (TAKE A KID OUTDOORS): May 14 at Klein Quarry. Dale will send info on that too. Need club member volunteers to talk to kids etc.

MISCELLANEOUS: We still need to work on arranging wire wrap class. Dell will call a contact she has. **Kim knows a flint knapper** who might give a class. She will check on his availability. More to come. **Phil Currie and his wife, Eva Koppelhus**, are receiving an award in this area and Bill and Karen will attend the ceremony. Since Phil has been friends of the club for many years, Bill suggested that the club contribute to a gift for them. Bill proposed that an amethyst cathedral might be an appropriate gift since Phil did not have one in his office. Marv agreed to provide one for \$145, and Bill said he would contribute some of the purchase price. Ray made moved for the club to contribute \$95 for the gift, with Bill paying the balance of \$50. The motion was seconded by Dale, and it was approved. Bill will ship it to Phil.

MOTION FOR ADJOURNMENT by Matt, seconded by Kim, meeting adjourned at 9:35 pm.

Respectfully submitted,
Dell James, Secretary

World's Oldest Known Case of Cannibalism Revealed in Trilobite Fossils

It's a dog-eat-dog world out there. But before there were dogs (or even dinosaurs) there were trilobites brutally biting each other on the Cambrian seafloor.



Redlichia rex

New research has revealed that these armored predators didn't only hunt smaller and weaker animals for food, but would occasionally take bites out of their trilobite comrades of the same species. This finding represents the earliest evidence of cannibalism in the fossil record to date. Trilobites are now-extinct marine arthropods that first appeared in the fossil record around 541 million years ago. They were stout creatures with thick exoskeletons, which is likely one of the reasons so many trilobite fossils remained preserved all these years; exoskeletons fossilize much easier than softer tissues. There are two trilobite species from the same genus found in Emu Bay Shale formation on Kangaroo Island in South Australia. *Redlichia takoensis*, a deposit feeder that ate particles on the ocean floor, and the larger, predatory *R. rex*. Many of the *R. takoensis* fossils were found with what appeared to be bite marks, mostly on their hind ends. This was expected, as paleontologists already knew that *R. rex* made meals of *R. takoensis*. In the Emu Bay formation, fossilized feces, called coprolites, left behind by *R. rex* contain trilobite shell remnants. This suggests that *R. rex* had the capability of eating the smaller trilobite species. What was unexpected, though, were signs of similar bite marks on *R. rex*. These injuries, the researchers concluded, were likely the result of cannibalism. While not much is known about trilobite mouthparts, researchers are certain that these injuries weren't "bites" in the traditional sense. Instead, the underside of a trilobite featured two rows of legs, and on these legs were little inward-facing spines. If you have ever eaten crab legs or lobster, then imagine an animal with legs like the tool modern chefs use to crack open these shells. *R. rex* was born to hunt trilobites, and apparently it didn't matter much which species. Most of the injuries seen on the Emu Bay fossils were injuries to the abdomen and not the head, probably because the injured animals were trying to get away from their predator's clutches. But there may have been a bit of survivorship bias at play too. The injured fossils got away; they weren't eaten. Trilobites that sustained head injuries likely ended up as coprolites. While this is the earliest documented example of cannibalism for any animal in the fossil record, it's likely that cannibalism is much older and more widespread than even these fossils suggest. <https://www.livescience.com/oldest-cannibalism-found-in-trilobite-fossils>

each other on the Cambrian seafloor. New research has revealed that these armored predators didn't only hunt smaller and weaker animals for food, but would occasionally take bites out of their trilobite comrades of

Spotlight Gemstone: Emeralds

May's Birth Stone



May's birthstone, the emerald, is one of the most regal of all and one which denotes life and love. It is also one of the most valuable (the very highest quality emeralds can be more expensive than diamonds). Emeralds are the deep green variety of the mineral beryl $[\text{Be}_3\text{Al}_2(\text{Si}_6\text{O}_{18})]$, colored by the element chromium. Emeralds are very hard, 7.5-8 on the Mohs scale. The best emeralds are found in South America, having been cherished by the Inca and Aztec peoples, who regarded emerald as a holy gemstone. In contrast, "Cleopatra's Mines" in Egypt had already been exhausted by the ancient Egyptians, so that when they were rediscovered in the 19th century, there was simply nothing left! These are only a few of the cultures which treasured this gemstone. In Roman times, emerald was associated with Venus, goddess of beauty and love. Its pigment was so venerated that Pliny remarked that green "gladdened the eye without tiring it!" It is also valued in the Catholic Church, green being considered the most elemental and natural of the colors used in their worship. The Vedas, Hinduism's oldest scriptures, acknowledge the healing powers of emeralds, promoting well-being as well as good fortune. Emeralds are also highly prized in Islam - green was the Prophet Muhammed's favorite color, and all dwellers of paradise are said to be dressed in green. In the 1960s, the



The world's largest uncut emerald

American jewelry industry changed the definition of "emerald" to include the green vanadium-bearing beryl as emerald. As a result, *vanadium emeralds*, purchased as emeralds in the United States, are not recognized as such in the UK and Europe. In America, the distinction between traditional emeralds and the new vanadium kind is often referred to as "Colombian Emerald."

What in the World?



What in the World is this figure etched into sandstone and where is it??

April's Photo

April's *What in the World* photo was a spectacular image of a lava bubble in Hawaii, from nearly a half-century ago. The photo, taken by the U.S. Geological Survey on Oct. 11, 1969, shows a 65-foot-tall Hawaiian lava dome that resembles a fiery star colliding with



Earth. These lava domes form when thick magma bubbles to the surface and piles up around the vent. There

isn't enough pressure to cause a violent eruption, so it piles up instead. Lava domes can grow as tall as 1,600 feet tall, but usually swell to about 30 to 320 feet,

ROCK CALENDAR CVRMS EVENTS OF INTEREST

2022

May 17 — CVRMS Monthly Meeting

Hiawatha Community Center 7:15 pm
Program to be determined

June 21— CVRMS Picnic Pot Luck

Ellis Park Overlook Shelter 6:00 pm
Rock Identification and Show & Tell

July 19 — CVRMS Picnic Pot Luck

Wanatee Park Meadowlark Shelter 6:00 pm
Geode Cracking

Aug. 16 — CVRMS Picnic Pot Luck

Morgan Creek Park Shelter 6:00 pm
BINGO Night

Sept. 23-25 — Geode Fest

First Christian Church Parking Lot
3476 Main Street
Keokuk, IA

<http://keokukiowatourism.org/event-calendar/geode-fest>

Oct. 2 — Sunday At The Quarry

BMC Morgan Quarry
About 1 mile west of Dewer, Iowa
10:00 am — 4:00 pm

Oct. 8-9 — CVRMS Rock Auction

Amana RV Park and Event Center
Amana, Iowa
Saturday Oct. 8 Auction 9:00 a.m. to about 8:00 pm
Sunday Oct. 9 Auction 9:00 am to about 3:30 pm

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.

Jack came through with another "Ask a Geologist" question a few days ago when he asked me just what the heck "Siliceous Ooze" was. That is a term that I have encountered frequently in geological literature to describe the material that becomes banded cherts, like those associated with Banded Iron Formations in Minnesota. I said that it was the silicon (opal) "tests" of plankton and other microscopic ocean-dwellers that died and settled to the sea bottom. In areas of the seas with a very slow rate of sedimentation, the ooze would build up and form and solidify, ultimately as chert. Well, I clearly don't understand how that process works. So I did a little research, and we will all learn more about **Siliceous Ooze**.

The [Geology is the Way](http://geologyistheway.com) web site has a good description of siliceous ooze and the process that converts it to chert. They noted that, while cherts are dominantly SiO₂, they also contain other particles like clay and oxides, that originate from deposition of silt and clay (primarily wind-blown dust). Trace elements may color these rocks, which can display white, black, green, red, or grey hues. Several organisms produce shells or skeletal fragments that consist of amorphous silica. The most important silica producers are **diatoms**, **Dictyochales** (also called **Silicoflagellates**), and **radiolarians** (unicellular planktonic organisms that live in the upper 650 feet of the water column). Diatoms are single-celled algae (protists) that rely on photosynthesis and produce shells made of opaline silica from 2-200 micrometers (0.002 – 0.2 mm) in diameter. Radiolarians are protozoa that are part of the zooplankton and build 0.1 – 0.2 mm large shells of amorphous silica. After the death of these organisms their silica shells slowly settle and accumulate on the seafloor. Radiolarians and Dictyochales evolved in the Early Cambrian (about 550 million years ago) while diatoms didn't appear until the early Jurassic (about 200 million years ago). The descent of these shells through the water columns may take up to several weeks or months. During this time, the remains may be consumed by other organisms or partially dissolve in water. The amorphous silica produced by diatoms and radiolarians is very unstable and tends to dissolve in the silica-undersaturated marine waters, producing



Eocene (55-34 million years ago) radiolarian ooze seen through a Scanning Electron Microscope. Red square is 300 μm .

ing **silicic acid (H₄SiO₄)**. Dissolution processes are stronger in the shallower part of the water column, while deep marine waters, generally more acidic, are less aggressive to silica. The deposition of siliceous ooze on the seafloor is also an indirect effect of the dissolution of carbonates, which increases with depth in present-day oceans. In more acidic, deep waters that are rich in CO₂ the carbonate shells of other organisms (like foraminifera) dissolve, therefore enriching the resulting sediment in siliceous ooze. In present-day oceans, siliceous oozes accumulate on abyssal plains at more than 1,300–1,600 foot depth. Cherts that originate from the lithification of siliceous ooze are classified according to the prevailing microfossils that constitute them as **radiolarites** (or **radiolarian chert**), if they are radiolarians, or **diatomites**, if they are diatoms. In present-day oceans, radiolarian cherts form close to the tropical regions, while diatomites are more common in the Arctic and Antarctic Oceans. There are other organisms that may produce important deposits of siliceous oozes, such as sponges and even cyanobacteria on the Precambrian Earth. Sponges are benthic organisms (living anchored to the seafloor) that produce spicules, which are needle-like skeletal fragments that sustain the organism and offer defense against predators. Spicules can be microscopic to larger than a few millimeters. Cherts consisting of spicules are called **spiculites**. But how does the jelly-like siliceous ooze transform into chert? After the deposition of siliceous ooze, a series of mineralogical transformations starts to take place. Amorphous, hydrous silica, which is an unstable compound, is substituted first by metastable cristobalite and tridymite forms of quartz, then by microcrystalline or cryptocrystalline quartz. These phase transformations reduce the porosity and cement the original sediment into relatively strong cherts. For additional information see <https://geologyistheway.com/sedimentary/chert/>.

Meet the Ancient Owl that Embraced Daylight

Not every owl is a night owl. Of the 200-plus owl species that fly the world today, the vast majority are nocturnal or crepuscular and hunt at dusk, night, or dawn. But a select few are diurnal or cathemeral, meaning they're most active in the daytime, or really, anytime. This can be determined by a species' habitat, as well as their diet. For example, snowy owls spend their summers in the Arctic, when the sun stays up for



Miomurina diurna, an extinct owl found in a Chinese fossil formation, probably looked similar to some of the diurnal owls today.

12 to 24 hours a day. They also mainly eat lemmings, chunky rodents that are easier to catch on the tundra while it's light out. But what would cause these finely tuned hunters to switch their schedules? A recent study traces an *evolutionary reversal* in one of the largest living groups of owls and presents "the first fossil evidence for diurnal behavior" among the birds. The research focuses on a well-preserved skeleton from northern China's Ma Liushu Formation. Measuring about 12 inches from head to toe, *Miomurina diurna* is estimated to be 6 to 10 million years old and is related to modern diurnal species such as burrowing owls. Paleontologists analyzed the size and shape of the extinct bird's eye, cranial, and lower leg bones and compared them to measurements from modern relatives. They found that the morphological features of the fossil jibed closely with day-hunting species from the group Surniini, which includes several North American owls, including the short-eared owl. They also dissected an undigested food pellet in the specimen's stomach and discovered small mammal bones like the ones extracted from kestrels from the same time period. The two birds might have coexisted in dry, high savanna along the Tibetan Plateau, but likely used different foraging strategies. In contrast with other ancient owls, whose senses of sight, sound, and even smell were suited to the darkness, *Miomurina diurna* seemed to be better adapted for daytime, with large eyes and less-tubular ears that match the traits in grassland owls today. As such, the extinct owl's environment might have been the main driver behind its behavioral shift: The study goes so far to attribute the night-to-day switch to "steppe habitat expansion and climate cooling in the late Miocene." But it all points to a much larger question: What made owls become owls? <https://www.popsci.com/animals/daytime-owl-extinct/>

2022 Eastern Iowa Science & Engineering Fair Winner

The Cedar Valley Rocks and Minerals Society continued its support of area science education by participating as a prize and donor sponsor of the **2022 Eastern Iowa Science & Engineering Fair**. The Society awarded a "**1st Place Junior Geology-Related Project**" certificate along with a cash prize of \$80 to **Ryan Squires**, an eighth grader from North Scott HS, Eldridge. His entry was entitled "*Carbon Mineralization using CO₂ enriched environments in certain types of rocks.*" His entry was completed under the supervision of Jacob Hunter and Emily Kruse. Ryan placed five specimens (olivine, wollastonite, brucite, pumice, and basalt) in a carbon enriched environment for 3 weeks, in order to test how much carbon dioxide each specimen could mineralize. The idea is that the calcium and magnesium (for example) ions in the specimen minerals react with CO₂ to form calcite and magnesite (for example) and so the CO₂ is mineralized. Ryan had speculated that pumice would gain the most weight because of its greater porosity. His actual results showed a very slight gain for the



basalt while the other specimens all lost weight during the experiment. He felt that the somewhat violent process he used to enrich the CO₂ environment of the specimens (placed in a modified PVC tube with CO₂ injected from a CO₂ cartridge and then highly tightened) resulted in various mineral fragment losses. Further, he thought that the 3-week period of testing was most probably not enough time to see any reliable results. Besides his award from our Society, Ryan also received a coveted honorable mention award from the Fair for his project. In addition to this cash prize, the Society donated \$40 for general use by the Eastern Iowa Science & Engineering Fair organization.

Bill Souleitner

CVRMS Science Fair Judge

Highlights from the 2022 CVRMS Rocks, Fossils, and Minerals Show



Aerie Artwork treasures
photo by Marv Houg



raffle prize—geode-covered bowling ball
from Gerry Pogue
photo by Ray Anderson



Sue the T-Rex and fan
photo by Sharon Constant



panning for gold and gems at J.L. Treasures
photo by Sharon Sonnleitner

Marv's fantastic geodes
photo by Marv Houg



The Noble Stone's beautiful offerings
photo by Marv Houg



Declassified Government Data Reveal an Interstellar Object Exploded in The Sky in 2014

A fireball that blazed through the skies over Papua New Guinea in 2014 was actually a fast-moving object from another star system, according to a [recent memo](#) released by the US Space Command (USSC). The object, a small [meteorite](#) measuring just 1.5 feet (0.45 meter) across, slammed into [Earth's](#) atmosphere on 8 January 2014, after traveling through space at more than 130,000 mph (210,000 km/h) – a speed that far exceeds the average velocity of meteors that orbit within the solar system, according to a 2019 study of the object published in the preprint database [arXiv](#). That 2019 study argued that the wee meteor's speed, along with the trajectory of its orbit, proved with 99 percent certainty that the object had originated far beyond our [solar system](#) – possibly "from the deep interior of a planetary system or a star in the thick disk of the [Milky Way](#) galaxy," the authors wrote. But despite their near certainty, the team's paper was never peer-reviewed or published in a scientific journal, as some of the data needed to verify their calculations was considered classified by the US government, [according to Vice](#). Now, USSC scientists have officially confirmed the team's findings. In a memo dated March 1 and shared on Twitter on April 6, Lt. Gen. John E. Shaw, deputy commander of the USSC, wrote that the 2019 analysis of the fireball was "sufficiently accurate to confirm an interstellar trajectory." This confirmation retroactively makes the 2014 meteor the first interstellar object ever detected in our solar system, the memo added. The object's detection predates the discovery of 'Oumuamua – a now-infamous, cigar-shaped object that is also moving far too fast to have originated in our solar system – by three years, according to the USSC memo. (Unlike the 2014 meteor, 'Oumuamua was detected far from Earth and is already speeding out of the solar system, according to [NASA](#).) Amir Siraj, a theoretical astrophysicist at Harvard University and the lead author of the 2019 paper, told [Vice](#) that he still intends to get the original study published, so that the scientific community can pick up where he and his colleagues left off. Because the meteorite ignited over the South Pacific Ocean, it's possible that shards of the object landed in the water and have since nestled on the seafloor, he added. While locating these scraps of interstellar debris might be a nigh-impossible task, Siraj said he is already consulting with experts about the possibility of mounting an expedition to recover them. "The possibility of getting the first piece of interstellar material is exciting enough to check this very thoroughly and talk to all the world experts on ocean expeditions to recover meteorites," Siraj told [Vice](#).

<https://www.sciencealert.com/declassified-government-data-reveal-an-interstellar-object-exploded-in-the-sky-in-2014>

Green Phantom Quartz

Quartz (SiO_2) is the most abundant single mineral on earth. It makes up about 12% of the Earth's crust, occurring in a wide variety of igneous, metamorphic and sedimentary rocks. An outline of the shape of a smaller crystal that is visible inside a crystal is called a **ghost** or a **phantom**. In the case of **green phantom quartz**



Green Phantom Quartz Crystal Cluster

the color and the phantom effect is created by the precipitation of chlorite on the outer surface of the growing quartz crystal for a short time. The chlorite is then embedded in the crystal when quartz growth begins again. This chlorite precipita-

tion can reoccur multiple times during the crystal's growth, producing multiple stacked phantoms, much like Russian Matroska puppets. The phantom is often very faint and ghost-like. Very little information on the formation and occurrences of green phantom quartz could be found. However, one of the sources of this rare variety of quartz appears to be the Himalayan Mountains of Tibet and China..



Other examples of Green Phantom Quartz Crystals show the quartz phantoms outlined by green chlorite crystals

Scientists Find Fossil of Dinosaur That Died On Day of Asteroid Strike

Scientists believe they have been given an extraordinary view of the last day of the dinosaurs after they discovered the fossil of an animal they believe died that day. The perfectly preserved leg, which even includes remnants of the animal's skin, can be accurately dated to the time the asteroid that brought about the dinosaurs' extinction struck Earth 66m years ago, experts say, because of the presence of debris from the impact, which rained down only in its immediate aftermath. "It's absolutely bonkers," said Phillip Manning, a professor of natural history at the University of Manchester. He said that the *thescelosaurus* leg discovered at the Tanis dig site in North Dakota was the "ultimate dinosaur drumstick". He said: "The time resolution we can achieve at this site is beyond our wildest dreams ... This really should not exist and it's absolutely gobsmackingly beautiful. I never dreamt in all my career that I would get to look at something a) so time-constrained; and b) so beautiful, and also tells such a wonderful story." The dig has been filmed for a BBC documentary *Dinosaurs: The Final Day* with Sir David Attenborough; during which the broadcaster will review the fossil finds. "When Sir David looked at [the leg], he smiled and said 'that is an impossible fossil'. And I agreed," Manning said. He said the team had also discovered the remains of fish that had breathed in impact debris from the asteroid strike, which occurred 1,864 miles away in the Gulf of Mexico. That and the presence of other debris that rained down for a specific period immediately after the asteroid strike allowed them to date the site much more accurately than standard carbon dating techniques. Robert DePalma, the University of Manchester graduate student who is leading the Tanis dig, said: "We've got so many details with this site that tell us what happened moment by moment, it's almost like watching it play out in the movies. You look at the rock column, you look at the fossils there, and it brings you back to that day." The BBC film team witnessed the



The fossil of a dinosaur which scientists believe was killed on the day of an asteroid strike 66 million years ago

moment paleontologists, who had been digging at the site for a decade, discovered a dinosaur leg belonging to a *thescelosaurus*, a small herbivore. "Never before has a dinosaur victim of the asteroid strike been found," the broadcaster reported. The BBC reported that the team had also found the fossilized remains of a turtle that was skewered by a wooden stake and small mammals and their burrows, as well as skin from a *triceratops*, a pterosaur embryo inside its egg, and what scientists think could be a fragment from the asteroid impactor itself. The Chicxulub asteroid, which was approximately the size of Mount Everest, hit the Gulf of Mexico. The impact of the asteroid caused tremors which resulted in tsunamis and flash floods that swept

many creatures and plants across thousands of miles. The BBC has spent three years filming the Tanis dig for the documentary, which was scheduled to air in late April and will be narrated by Sir David. "We've got so many details with this site that tell us what happened moment by moment, it's almost like watching it play out in the movies," Mr. DePalma said. "You look at the rock column, you look at the fossils there, and it brings you back to that day." The BBC said that the findings would have to be submitted for peer review before they were confirmed. <https://news.yahoo.com/scientists-fossil-dinosaur-died-day-172747172.html>

CVRMS Outreach Brings the Wonder of Rocks and Fossils to Area Children

Educational outreach is one of the most important activities for the *Cedar Valley Rocks and Minerals Society*. Several of our members regularly respond to requests for presentations on rocks, fossils, and minerals by area schools, libraries, city recreation departments, and other such organizations.



These presentations often include talks, displays, and hands-on examinations of various specimens. On Friday, April 8, Bill and Karen Desmarais, long time club members, were at **Washington Elementary School** in **Mt. Vernon**. Bill gave a presentation on minerals and rocks to LeAnn Breisemeister's class (with Karen's help of course). Bill discussed the differences between minerals and rocks, and to help make the point he gave each student a bag with 5 minerals and 5 rocks. The students got to test a mineral for hardness and some of the other special properties of minerals. Finally, the class was shown many examples of minerals and rocks, including fossils (including Bill's specialty dinosaur bones) and several types of

Bill discussing the rocks and mineral samples in the specimen bags presented to Washington Elementary students in Mt. Vernon

geodes, **Iowa's State Rock**. The future has Bill giving dinosaur presentations at the Springville and Ely libraries as part of their summer reading programs in June. He also will do a dinosaur program for three classes of 3rd and 4th grade students at Truman Elementary School here in Cedar Rapids in May. As you can see the club has a great community outreach program and you should know that Ray and Bill did the "**Freeze Fest**" event in February for the Iowa City Recreation Department. We also set up an Iowa City Recreation teacher with supplies and ideas for her to use when she teaches a rock class at the Iowa City Rec-center.

This future geologist is clearly in awe of Bill's mineral specimen.



Washington Elementary students in Mt. Vernon gather around Bill as he discusses the fossils on a limestone plate.



photos by Karen Desmarais

Why did trilobites go extinct?

Trilobites are weird creatures; they look like giant swimming potato bugs wearing helmets, and lived on Earth for a whopping 270 million years. These armored invertebrates, whose species once numbered in the thousands, thrived in the oceans as they scavenged and dug for food, and even managed to survive two mass extinctions. But about 252 million years ago, trilobites disappeared from the fossil record. What finally wiped out this class of resilient bottom dwellers? The trilobite's disappearance coincided with the **end-Permian extinction** (also known as the **Permian-Triassic extinction**), the third and the most devastating mass extinction event. Volcanic eruptions in Siberia spewed enormous amounts of lava for around 2 million years, sending trillions of tons of carbon dioxide into the atmosphere, and triggering **ocean acidification** making it very difficult for marine animals to survive. Up to 95% of marine species, including the trilobites, succumbed to the end-Permian extinction, also known as the **Great Dying**. The trilobites, however, had already started a downward spiral toward extinction by that point. Environmental and evolutionary changes had whittled away at this class of creatures.



Early Cambrian trilobite
Redlichiid

When trilobites first emerged at the beginning of the **Cambrian period** (541 million to 485 million years ago), they were extremely diverse, potentially because there weren't that many competitors. Trilobite adaptations during the early Cambrian were mainly related to growth and development, such as variations in how many segments or limbs they had. But during the **Ordovician Period**, starting around 485 million years ago, competition and predation came more into play than it had before. Some trilobites developed different eye positioning, harder exoskeletons or the ability to roll into a ball. These adaptations, paleontologists suspect, made trilobites more successful on the increasingly competitive ocean floor. Then came the world's **first mass extinction**: the **Ordovician-Silurian extinction** around 444 million years ago, caused by a global cooling and a decrease in sea levels. The number of trilobites species, once in the thousands, dropped into the hundreds. Although food webs and ecosystems remained intact, the trilobites never quite diversified or reached the numbers they achieved previously, possibly because of escalating competition in their ocean. **The second mass extinction**, the **Late Devonian**, hit the trilobites starting around 375 million years ago. The **Late Devonian extinction** was slower and the cause less specific than the one before and after it. It's harder to study because it happened over a long interval, but it likely led to a slowing of evolution and diversification. Though the direct cause is less clear, the effect of the second extinction on the trilobites was profound. Entire orders — in biology animals are categorized into orders, families, groups and, finally, species — went extinct. After the second extinction, there was only one family remaining in the class Trilobita: the *Proetidae*. It's unclear what made *Proetidae* so resilient. They were relatively simple creatures compared with some of the more massive and monstrous trilobites that have existed. **By the third extinction**, the **end-Permian**, the competition, predators and environmental changes had flipped the odds against the ancient *Proetida*. They couldn't withstand the **global warming** events set in motion by the volcanic eruptions. The specifics of what made the trilobites so resilient, and yet so vulnerable, is still very much under study. One way to learn more about why they went extinct is to figure out why they never diversified again to the same extent. But that question remains unanswered.



Middle Ordovician trilobite
Cheirus ingricus



Proetida, the Late Devonian
extinction survivor



Silurian trilobite
Calymene niagarensis

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<https://www.livescience.com/why-trilobites-went-extinct.html>

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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](http://101EmmonsSt.com). 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

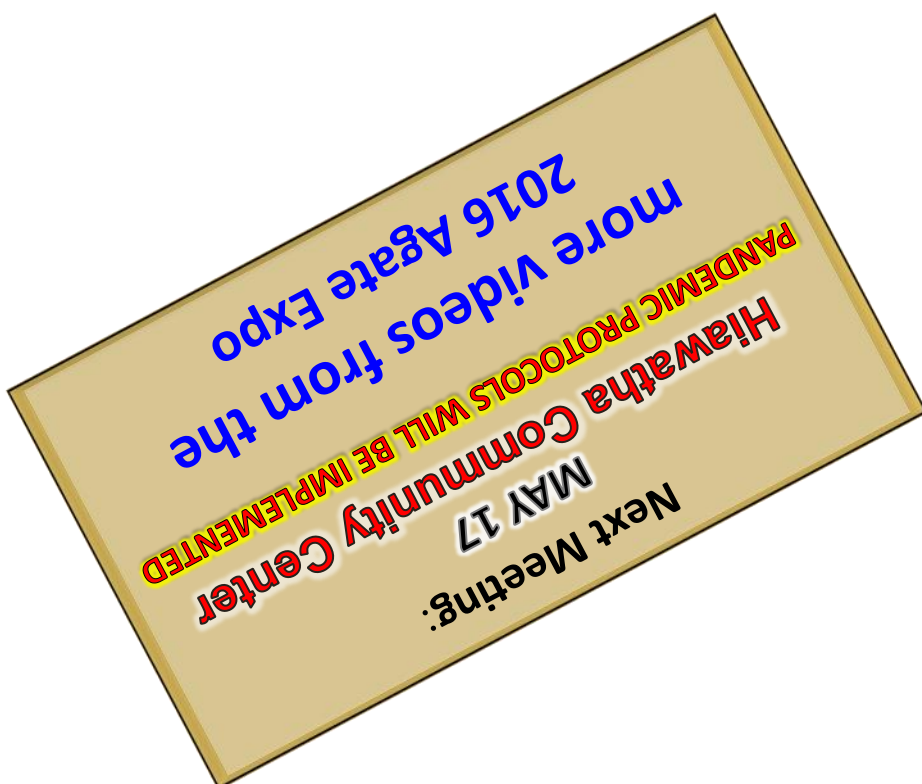
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