



Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS

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Next CVRMS Meeting Tues. Oct 15

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

featured speakers:

University of Iowa

Earth and Environmental Studies Students

***"Field and Research Studies
Sponsored by the CVRMS"***



Iowa geoscience students discussing low-angle faults at Tanque Verde Ranch in Arizona.

Professor Jane Gilotti and several students from the University of Iowa Department will discuss the field work and research activities made possible by CVRMS scholarships.

CVRMS Members
Wear Your Name Badges to the Meeting!
**Let's make guests and visitors
welcome at our meetings**

A Mind-Blowing Study Just Confirmed Earth Had Living Organisms 3.5 Billion Years Ago

In the search for the earliest life on Earth, it can be hard to tell whether you're looking at an actual fossil, or crinkles in the rock itself. Such doubts have long shadowed the 1980s discovery of 3.5 billion-year-old fossils in the Australian desert. Now, scientists think they have finally put the matter to bed. Examining ancient fossilized microbe formations called stromatolites, found in the Dresser Formation fossil site of the Pilbara region, researchers have finally detected traces of organic matter. You may remember the time scientists claimed to have found 3.7 billion-year-old fossils in Greenland. Later research determined that these fossils were just plain old rocks, and the crown was returned to the Pilbara fossils. But, no evidence of organic matter had previously been detected in these rocks. So a team from Australia analyzed drill core samples from deep underground where the rocks were unweathered; in fact their preservation was "exceptional." They analyzed thin slices of the rock using multiple techniques, including scanning electron microscopy and scanning transmission electron microscopy; energy dispersive X-ray spectroscopy and Raman spectroscopy; nano-scale secondary ion mass spectrometry; and stable carbon isotope analysis. This revealed that the stromatolites are predominantly made up of pyrite, riddled with nanoscopic pores. In these pores they identified inclusions of nitrogen-bearing organic material, as well as strands and filaments of organic matter that closely resemble the remnants of biofilms formed by microbe colonies. Previously, researchers had found evidence of 3.48 billion-year-old microbes in ancient hot spring deposits in the Pilbara. Since those deposits are about the same age as the crust of Mars, it's thought that they could tell us how to find fossils on Mars, especially since there's evidence the Red Planet once had hot springs, too. Indeed, NASA has been investigating the Pilbara to try to learn the possible geological signatures that could indicate the presence of stromatolites on Mars. <https://www.sciencealert.com/those-3-5-billion-year-old-fossils-in-australian-rocks-really-are-fossils-new-study-finds?utm>

CVRMS Sept. 17 Meeting

Hiawatha Community Center

Order called by President Marv Houg at 7:10 pm

Introduction of new members or guests:- Ashley Acunia. Welcome!

Minutes of last meeting read: Motion to approve by Lisa, 2nd by JJ.

Treasurer's report by Dale: Checking account balance \$722.86. Motion to approve by AJ, 2nd by Bill. Report approved for filing.

Program: Brent Studer, Kirkwood College Astronomy "*The origin of Earth's Water*"

Door Prize: Julie Whitlatch winner

Old Business:

- **2020 Show Discussion:** plans are moving along. Nothing new for now. Meteorites the theme.
- **Auction:** This weekend. Over 1400 lots. Volunteers are accepted with a review of the jobs available. Reminder that the entrance to the park has changed. Signs will reflect the directions. Marv concerned that it may be raining this weekend and may necessitate the unloading of stuff into the building. We shall see.
- **CVRMS Staff T Shirts:** Are available for pickup tonight. Let Sharon know.
- **Bus trip to Henry Doorly Zoo:** for October 6. Still some seats available. Let Bill Desmarais know.

New Business:

- Motion made by board to purchase new directional signs for show and auction. Second by Tom. Motion passed and signs purchased.

Motion to adjourn: by AJ, 2nd by Bill.

Meeting adjourned: 9:20 p.m.

Respectfully submitted,
Dell James, Secretary



CVRMS Board Minutes Sept 24

Members present Rick Austin, Marv Houg, Dale Stout, Ray Anderson, Sharon Sonnleitner, Jay Vavra, and Kim Kleckner.

Meeting called to order by Marv Houg at his home, 8:00 p.m.

Discussion of 2019 Auction:

Board had a wide-ranging discussion of last weekend's Auction, including the quality of many specimens, the prices they brought, the bidders, and many interesting stories. A total of 1,535 lots were auctioned to 100 bidders, bringing a preliminary total of \$38,755. Our "new" credit card payment option was used for 21 of the 129 payments received. **Many kudos** for Sharon's efforts in operating the food concession at the auction. After a motion by Dale with a second from Ray, the board voted unanimously to award \$100 to Sharon for her efforts which were so appreciated by all present at the Auction.

2020 CVRMS Auction:

After a short discussion of potential consignors, Marv reported that he has already received offers of 1250 lots for next year's auction. Only one contract has been completed, but nearly all auction slots have already been filled by 2 days after the last auction! Kim suggested we use projector to display the lot being auctioned so people could see it better and the samples wouldn't have to be carried into the crowd during bidding. Others thought people would still like to see the lots themselves. Discussion to continue. Kim also suggested that the audience seating should be arranged at an angle, in rows chevron to the stage to improve everyone's view. Discussion will continue.

2020 Rock Show Nothing new to discuss.

Bus trip to Omaha Zoo October 6:

Bill now has 38 signed up for the Oct. 6 CVRMS field trip to the Henry Doorly Zoo in Omaha. There are still a few seats left, so anyone interested has to let Bill know. It is free to members and family and \$25 for others. However, you will pay for Zoo admission at the door when you arrive. We leave at 6:00 am sharp. Sharon suggested revising future bus trip pricing, suggesting that we either charge per family (with 2-3 kids) or per adult (with 1-2 kids). After a brief discussion it was decided to continue the discussion to future meetings.

Other items:

Rick researched all glass display case for River Products and reported a cost over \$1000 each, more than we can pay. Board decided to continue to explore options.

Marv is working on a late October field trip for CVRMS and MAPS members, probably to Klein Quarry. More soon.

Motion to adjourn by Ray, 2nd by Jay. Adjourned 9:42 p.m.

Respectfully submitted,
Ray Anderson, reluctant secretary



Pleochroism in Tanzanite

"Pleochroism is the ability to show different colors in different directions of the crystal. Tanzanite is a rare crystal in that it is a trichroic gemstone. This is because Tanzanite shows blue in one direction, purple in another direction and finally yellow in the last direction. This makes it a very colorful gemstone and why you see so many different colors of Tanzanite." <https://www.tanzanitejewelrydesigns.com/blogs/news/what-is-tanzanite-pleochroism>



Tanzanite is noted for its remarkably strong trichroism, appearing alternately blue, violet and burgundy depending on crystal orientation

Tanzanite is the blue and violet variety of the mineral zoisite (a calcium aluminium hydroxyl sorosilicate) belonging to the epidote group.

The gemstone was given the name 'tanzanite' by Tiffany & Co. after Tanzania, the country in which it was discovered. The scientific name of "**blue-violet zoisite**" was not thought to be consumer friendly enough by Tiffany's marketing department, who introduced it to the market in 1968. In 2002, the American Gem Trade Association chose tanzanite as a December birthstone, the first change to their birthstone list since 1912. According to gemologists, the circumstances that led to the gem's formation 585 million years ago were so exceptionally unusual that the likelihood of finding tanzanite anywhere else on earth is one in a million, making it a **thousand times rarer than diamonds**. Tanzanite is **so rare** because it is found and mined in a small area only four kilometers wide and two kilometers long at the foot of Mount Kilimanjaro in the Manyara region of Northern Tanzania.

https://www.geologyin.com/2017/06/pleochroism-in-tanzanite.html?fbclid=IwAR2QuQoVY4f5Vpz_FAS4g9HcNXGkrv1ZO59PeMPBW_PBzZVdiAY5vAQbMDU



November's Birth Stones

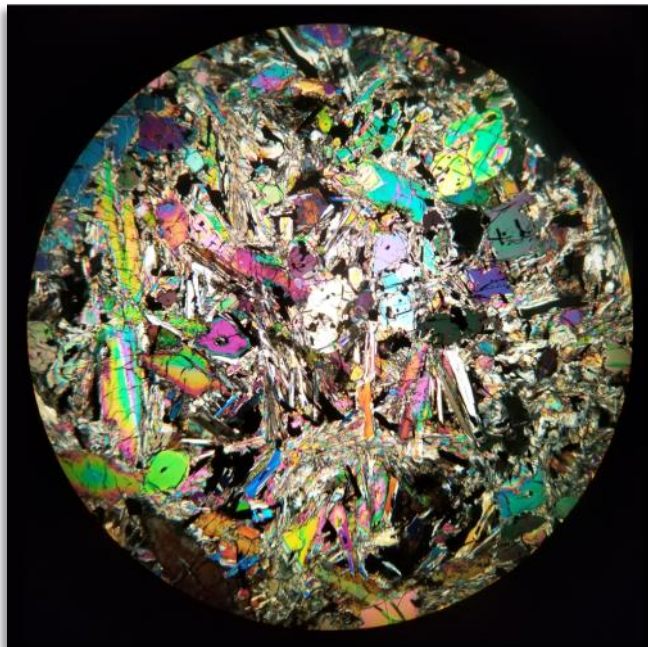


If you were born in November you may choose from 2 birthstones, tourmaline or opal.

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.

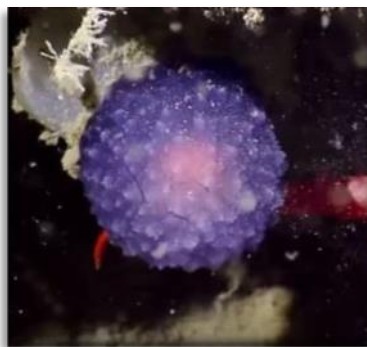
OPAL is a hydrated amorphous form of silica ($SiO_2 \cdot nH_2O$). Its water content may range from 3 to 21% by weight, but is usually between 6 and 10%. Because of its amorphous character, it is classed as a mineraloid, unlike crystalline forms of silica, which are classed as minerals. It is deposited 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 beautiful specimen, seen through a microscope??

September's Photo



If you were stumped by the identity of the "purple disco ball" looking object that was September's "What in the World?" photo, don't feel bad. The experts aren't sure either. Suctioned up from 5,301 feet

deep in an ocean canyon, the 5 cm-wide orb, was thought at first to be an egg sack. After a closer look, the team studying the object decided that it is most likely a **pleurobranch** – a type of sea slug that is known for its brilliant hues and inhabits a wide range of marine environments. But no pleurobranch is known to be purple, so this may be a new discovery. One investigator suggested it was an embryo, but of what, he's not sure. They also said that it may be a fibrous sponge or even a sea squirt predator.

Rock Calendar CVRMS EVENTS OF INTEREST

2019

Oct. 15 —CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Feature Speaker
"CVRMS Scholarships for Field Work"
by University of Iowa Geology Students

Nov. 19 —CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Feature Speaker
"Eclogite – the poster child for high-pressure metamorphism"
by Jane Gilotti —University of Iowa

Dec. 10 - CVRMS Christmas Pot Luck
Hiawatha Community Center
6.30 pm



2020

Jan. 21 —CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Feature Speaker
"Volcanoes and Volcanic Rocks"
by Ray Anderson—CVRMS

Feb. 17 —CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm

Mar. 18 —CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm

March 28-29 - CVRMS Gem, Mineral, and Fossil Show
"Meteorites: Earth's Oldest Rocks"
Hawkeye Downs
Cedar Rapids

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.

In a discussion a few weeks ago I speculated about how many of Earth's minerals have been unwittingly created by humans. I recently encountered the following article in a *Geology In* article and thought you might enjoy it. The original article can be viewed at <http://www.geologyin.com/2017/03/scientists-identify-208-natural.html>

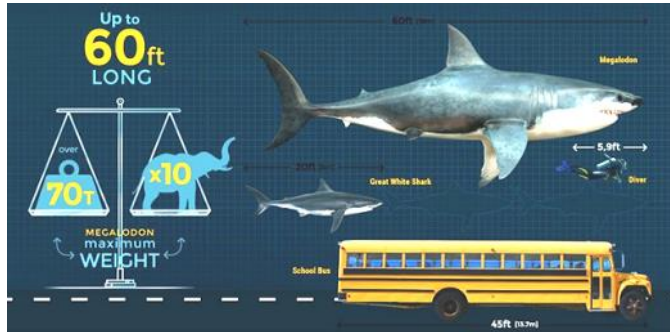
Scientists Identify 208 Natural Minerals That Formed From Human Activity

Scientists have identified a sudden explosion of mineral diversity on the surface of our planet that would not exist if it weren't for humans, adding weight to the argument that we're living in a new geological epoch - the Anthropocene. A new study has found that the incredible upsurge of new minerals around the time of the industrial revolution led to the unprecedented diversification of crystals on Earth, eclipsing even the *Great Oxidation Event* 2.3 billion years ago as the "*greatest increase in the history of the globe.*" This increase in new mineral appearances is so rapid, most of it in the last 200 years, compared to the 4.5-billion-year history of Earth. There is nothing like it in Earth's history, noted Robert Hazen from the Carnegie Institution for Science. Hazen's team analyzed the 5,208 minerals on Earth that are officially recognized by the International Mineralogical Association, and found that 208 of them would not exist if it weren't for human activity. These human-triggered minerals include **chalconatronite**, a rare copper mineral that crystallizes as a bright blue crust on ancient Egyptian bronze artefacts, and **andersonite**, a uranium-laced mineral with a fluorescent green or yellow glow that forms on the walls of mine tunnels. The bronze-hued **abhurite** was discovered on the wreck of the SS *Cheerful*, which sank off the coast of Cornwall, England in 1885, and only formed because of a chemical reaction between the salt water and the ship's sunken supply of tin ingots. Most of the 208 minerals triggered by humanity came about thanks to mining, while six were found on the walls of smelters, three in a geothermal piping system, and four on prehistoric sacrificial burning sites in the Austrian mountains. Many other new minerals could also be forming in our giant waste dumps, encrusting old batteries and electrical appliances, the team suggested. "*There are probably all sorts of things forming as a result of old silicon chips or batteries,*" Hazen said. "*TVs have all these exotic phosphors they use, and magnets and all sorts of high-tech materials. When you start hydrating and oxidizing them, you're going to start finding a lot of exotic new materials.*" The list did not include new minerals that have been deliberately synthesized by humans, such as those produced in magnets, batteries, and synthetic gemstones, as the 'true' definition of a mineral according to the International Mineralogical Association is that it must occur "*naturally.*" Over the course of Earth's history, the team found that most minerals on Earth appeared very gradually during the Great Oxidation Event, which began roughly 2.3 billion years ago, and could have lasted as long as until 1 billion years ago. The event saturated Earth with atmospheric oxygen for the first time, thanks to an explosion of photosynthetic bacteria, and the minerals on the surface increased from just over 2,000 varieties to more than 4,000. While this event gave rise to around two-thirds of the 5,208 mineral types officially recognized today, that gradual build was nothing compared to the sudden burst of diversity that's occurred over the past few centuries. Since the mid-1700s, the diversity of minerals on Earth has exploded faster than ever before, according to the team noting the "*blazing pace*" that humans triggered over the past 250 years - especially when compared to the slow burn of the Great Oxidation Event. They say this unprecedented diversification is the fastest rate of new mineral production in Earth's history, and a clear marker of a new geological epoch caused by humans - the much-debated Anthropocene. "*Simply put, we live in an era of unparalleled inorganic compound diversification. Indeed, if the Great Oxidation eons ago was a 'punctuation event' in Earth's history, the rapid and extensive geological impact of the Anthropocene is an exclamation mark.*" The Anthropocene has yet to be officially recognized, but scientists have been arguing for years that human influence on the planet has been so dramatic, it will be clearly defined in Earth's strata - layers of sedimentary rock or soil that delineate major geological events in our planet's history. Hazen's team now say that this explosion of new minerals has to be considered by the International Commission on Stratigraphy - the group that will ultimately decide whether or not to reorganize the Anthropocene - as a serious marker of a new epoch. "*That's really, I think, the most important factor in deciding whether or not the Anthropocene is a new geological time period - the fact that we have created these materials, these crystals, that are incredibly diverse and beautiful and they persist through billions of years,*" according to Hazen. "*They are going to be forever on Earth - a distinctive marker layer that makes our time different from any other time in the preceding 4.5 billion years.*" Previous arguments for the Anthropocene suggest that humans cut short the 11,700-year-old Holocene epoch in 1950, when nuclear tests created a new stratum in Earth's surface. Or it could have started in 1610, when a dramatic drop in atmospheric CO₂ levels, triggered by the arrival of Europeans in the Americas in 1492, was captured in the Antarctic ice-core records. This new study is more solid evidence of human influence on the planet, Hazen and his team argue. "*If you're a geologist who came back 100,000 years or a million or a billion years from now ... you would find amazing mineralogical evidence of a completely different time.*"

<http://www.geologyin.com/2017/03/scientists-identify-208-natural.html>



The Megalodon was the largest known predator in the history of the Earth, at least based on its weight. The sperm whale is a little bit longer, but also lighter. Over the years the size estimations of the Megalodon shark have changed, as the science surrounding its evolution has progressed. One of the



issues in estimating its true size is that the skeletons of sharks are made out of cartilage which does not easily fossilize. The leaves teeth as the only common fossils from which scientists can compute the size for this massive shark. Most current, scientifically accepted estimates for the Megalodon's maximum size fall into the **60-70 foot** range, with a weight of **50-70 tons**. The largest living shark, the Great White, maxes out at about 21 feet and 3 ½ tons. It was difficult to determine the size of the Megalodon, because sharks are made mostly of cartilage, not bone. Cartilage doesn't fossilize well, so finding intact specimens is not possible. Instead, it is only possible to find pieces, like vertebrae and teeth, that can be used to attempt reconstruction. Some of the ways scientists attempt to determine Megalodon size using teeth include enamel height, root width, largest anterior tooth height, and crown height. Each one of those methods can result in different results, so scientists still cannot completely agree on how big Megalodon actually was. Opinions of Megalodon's size range from 52 feet all the way up to 82 feet, with most of the scientific consensus remaining on the lower end of that range. The Megalodon has been compared to the whale shark (around 41.5 feet) but the scientific community has determined that Megalodon was larger, based on both weight and length. Megalodon was also far bigger than the great white shark, which would only be around half of Megalodon's size. Megalodon has also been found to be far larger than the gigantic theropod dinosaurs such as Spinosaurus, T-Rex, as well as the large ocean going marine reptiles such as Basilosaurus, and Tylosaurus. While all of those animals were at least 25 feet in length and often as large as 57 feet, they didn't match the length of Megalodon. Many dinosaurs were heavier than Megalodon, but not as long. Despite its lower weight, its overall length and powerful jaws made it a highly formidable predator, capable of taking down whales and other creatures that were larger or that weighed more.

<https://www.fossilera.com/pages/megalodon-size>



Pyrite is an iron sulfide with the chemical formula FeS_2 (iron(II) disulfide). Pyrite is considered the most common of the sulfide minerals.

Pyrite is sometimes called Fool's Gold because of its similarity in color and shape to Gold. In the old mining days, Pyrite was sometimes mistaken for Gold, as they frequently occur together.

Pyrite occurs in numerous shapes and habits. The smaller crystal aggregates may give off a beautiful glistening effect in light, and the larger crystals may be perfectly formed, including fascinating cubes, penetration twins, and other interesting crystal forms.

Pyrite has the same chemical formula as the rarer mineral Marcasite, but it crystallizes in a different crystal system, thereby classifying it as a separate mineral species.

Pyrite is usually found associated with other sulfides or oxides in quartz veins, sedimentary rock, and metamorphic rock, as well as in coal beds and as a replacement mineral in fossils, but has also been identified in the sclerites of scaly-foot gastropods.



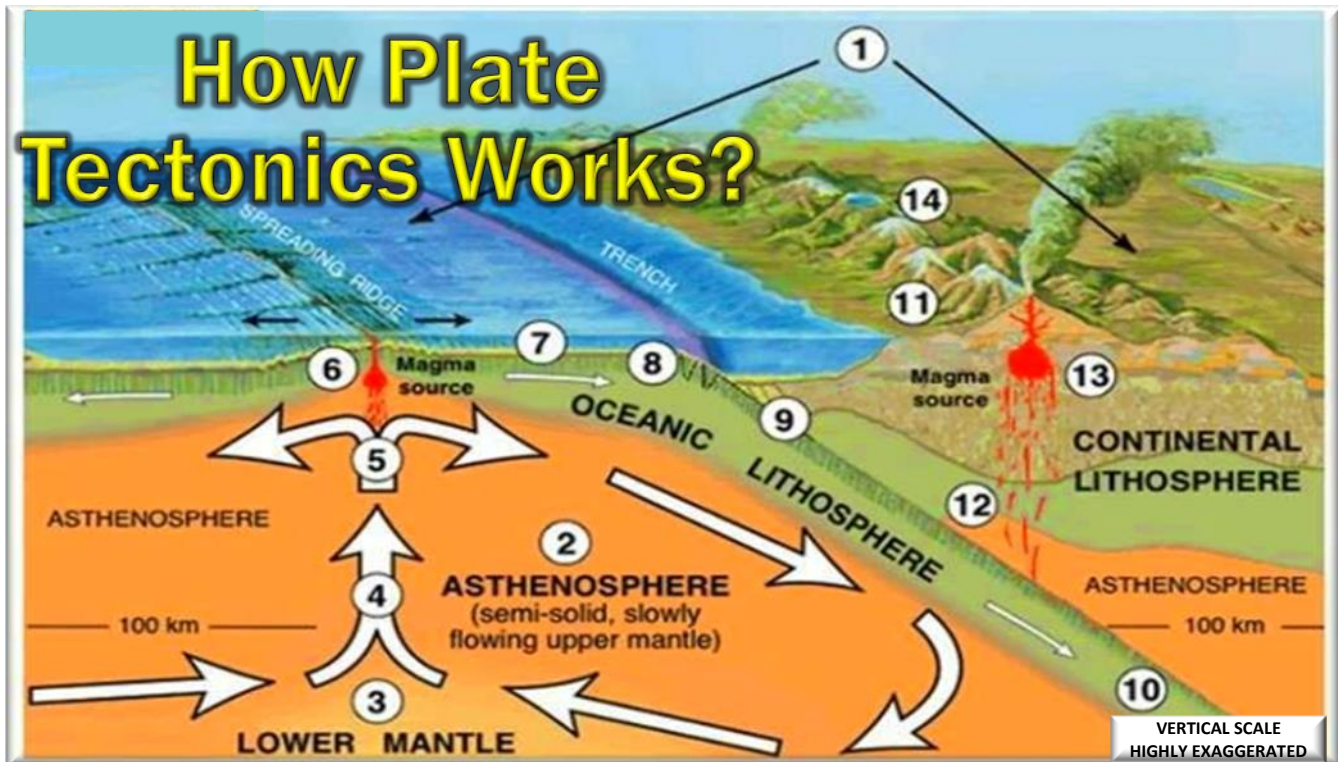
Pyritized ammonite. From Saratov Russia. Upper Callovian (around 162 million years). Photo: Leah Lutten

Despite being nicknamed fool's gold, pyrite is sometimes found in association with small quantities of gold.

Pyrite is quite easy to distinguish from gold: pyrite is much lighter, but harder than gold and cannot be scratched with a fingernail or pocket knife.

Pyritization: Organisms may become pyritized when they are in marine sediments saturated with iron sulfides. As organic matter decays it releases sulfide which reacts with dissolved iron in the surrounding waters. Pyrite replaces carbonate shell material due to an undersaturation of carbonate in the surrounding waters.

<https://www.geologyin.com/2019/09/pyrite-interesting-facts-about-fools.html?fbclid=IwAR0FJm1dPwA-48-c9At3-MRe1if9G9j05JzWYyEkR5NrP78bsMqaf9ZEIE8U#JYK3fuJutl42zkFA.99>



1. There are two basic types of LITHOSPHERE: continental and oceanic. CONTINENTAL lithosphere has a low density because it is made of relatively light-weight minerals. OCEANIC lithosphere is denser than continental lithosphere because it is composed of heavier minerals. A plate may be made up entirely of oceanic or continental lithosphere, but most are partly oceanic and partly continental.
2. Beneath the lithospheric plates lies the ASTHENOSPHERE, a layer of the mantle composed of denser semi-solid rock. Because the plates are less dense than the asthenosphere beneath them, they are floating on top of the asthenosphere.
3. Deep within the asthenosphere the pressure and temperature are so high that the rock can soften and partly melt. The softened but dense rock can flow very slowly (think of Silly Putty) over geologic time. Where temperature instabilities exist near the core/mantle boundary, slowly moving convection currents may form within the semi-solid asthenosphere.
4. Once formed, convection currents bring hot material from deeper within the mantle up toward the surface.
5. As they rise and approach the surface, convection currents diverge at the base of the lithosphere. The diverging currents exert a weak tension or "pull" on the solid plate above it. Tension and high heat flow weakens the floating, solid plate, causing it to break apart. The two sides of the now-split plate then move away from each other, forming a DIVERGENT PLATE BOUNDARY.
6. The space between these diverging plates is filled with molten rocks (magma) from below. Contact with seawater cools the magma, which quickly solidifies, forming new oceanic lithosphere. This continuous process, operating over millions of years, builds a chain of submarine volcanoes and rift valleys called a MID-OCEAN RIDGE or an OCEANIC SPREADING RIDGE.
7. As new molten rock continues to be extruded at the mid-ocean ridge and added to the oceanic plate (6), the older (earlier formed) part of the plate moves away from the ridge where it was originally created.
8. As the oceanic plate moves farther and farther away from the active, hot spreading ridge, it gradually cools down. The colder the plate gets, the denser ("heavier") it becomes. Eventually, the edge of the plate that is farthest from the spreading ridges cools so much that it becomes denser than the asthenosphere beneath it.
9. As you know, denser materials sink, and that's exactly what happens to the oceanic plate—it starts to sink into the asthenosphere! Where one plate sinks beneath another a subduction zone forms.
10. The sinking lead edge of the oceanic plate actually "pulls" the rest of the plate behind it—evidence suggests this is the main driving force of subduction. Geologists are not sure how deep the oceanic plate sinks before it begins to melt and lose its identity as a rigid slab, but we do know that it remains solid far beyond depths of 65 miles beneath the Earth's surface.
11. Subduction zones are one type of CONVERGENT PLATE BOUNDARY, the type of plate boundary that forms where two plates are moving toward one another. Notice that although the cool oceanic plate is sinking, the cool but less dense continental plate floats like a cork on top of the denser asthenosphere.
12. When the subducting oceanic plate sinks deep below the Earth's surface, the great temperature and pressure at depth cause the fluids to "sweat" from the sinking plate. The fluids sweated out percolate upward, helping to locally melt the overlying solid mantle above the subducting plate to form pockets of liquid rock (magma).
13. The newly generated molten mantle (magma) is less dense than the surrounding rock, so it rises toward the surface. Most of the magma cools and solidifies as large bodies of plutonic (intrusive) rocks far below the Earth's surface. These large bodies, when later exposed by erosion, commonly form cores of many great mountain ranges that are created along the subduction zones where the plates converge.
14. Some of the molten rock may reach the Earth's surface to erupt as the pent-up gas pressure in the magma is suddenly released, forming volcanic (extrusive) rocks. Over time, lava and ash erupted each time magma reaches the surface will accumulate—layer upon layer—to construct volcanic mountain ranges and plateaus, such as the Cascade Range and the Columbia River Plateau (Pacific Northwest, U.S.A.).

<http://www.geologyin.com/2014/09/how-plate-tectonics-works.html?m=1#Ksy33dsSPcR4X1b2.32>

There Could Be Up to 10 Billion Earth-Like Planets in Our Galaxy Alone

Our galaxy could be littered with warm, watery planets like Earth. That's the conclusion of researchers at Penn State University, who used data from NASA's Kepler telescope to estimate the number of Earth-like planets in the Milky Way. Their results, published in *The Astronomical Journal*, suggest that an Earth-like planet orbits one in every four Sun-like stars. Totaled up, that means there could be up to 10 billion Earth-like worlds in our home galaxy. The estimate is an important step in the search for alien life, since any potential life on other planets would most likely be found on an Earth-like world, warm enough to hold liquid water. So a better understanding of the potential number of Earth-like planets in the galaxy can inform projects like the Wide-Field Infrared Survey Telescope, which will launch into space in the mid 2020s and hunt for signs of oxygen and water vapor on distant planets. "We get a lot more return on our investment if we know when and where to look," said Eric Ford, a professor of astrophysics. Ford's team defined an Earth-like planet as being anywhere from three-quarters to one-and-a-half times the size of Earth, and orbiting its star every 237 to 500 days. That's presumably within the star's habitable zone – the "range of orbital distances at which the planets could support liquid water on their surfaces." The researchers' estimate is based on data from NASA's Kepler space telescope. It watched over 530,000 stars for tiny dips in a star's brightness that could be caused by a planet passing in front of it. This work transforms our understanding of the galaxy. Kepler found more than 2,600 exoplanets, revealed that there are more planets than stars in the Milky Way, and gave researchers new insight into the diversity of planet types. The telescope also allowed scientists to confirm for the first time that many exoplanets are similar to Earth. The telescope was retired last year after it ran out of fuel, but passed the planet-hunting torch to the Transiting Exoplanet Survey Satellite (TESS), which launched in April 2018. Overall, Kepler's results suggested that 20 percent to 50 percent of the stars visible in the night sky had Earth-like planets in their habitable zones. But Kepler was best at detecting large planets close to their stars (since they block out more light). So the researchers created computer simulations of hypothetical universes of stars and planets, based on a combination of Kepler's planet catalogue and information from the European Space Agency's Gaia spacecraft. The simulation gave the scientists a sense of how many exoplanets in each hypothetical universe Kepler would have detected, and which kinds. They could then compare that data to what the real Kepler telescope detected in our universe to estimate the abundance of Earth-sized planets in the habitable zones of Sun-like stars. "There are significant uncertainties in what range of stars you label 'Sun-like,' what range of orbital distances you consider to be 'in the habitable zone,' what range of planet sizes you consider to be 'Earth-like,'" Ford said. **"Given those uncertainties, both 5 and 10 billion are reasonable estimates."**

https://www.sciencealert.com/there-could-be-up-to-10-billion-warm-and-watery-earth-like-planets-in-our-galaxy?utm_source=ScienceAlert++Daily+Email+Updates&utm_campaign=43315a01a2-

What is Crazy Lace Agate?

Lace Agate is a variety that exhibits a lace-like pattern with forms such as eyes, swirls, bands or zigzags.

Crazy lace agate is a banded chalcedony (microcrystalline quartz) that's infused with iron and aluminum and is often brightly colored and complexly patterned. This produces the creamy browns, blacks, greys and golds (and occasional pinks or reds) swirled together in this stone. This stone is found exclusively within the area known as Chihuahua, in Northern Mexico. Crazy lace agate is believed to have been created in the Cretaceous period, about 65-90 million years ago.



Crazy lace agate From Chihuahua, Mun, de Buenaventura, Sierra Santa Lucia, Ejido Benito Juarez, Mexico. Credit: Anton

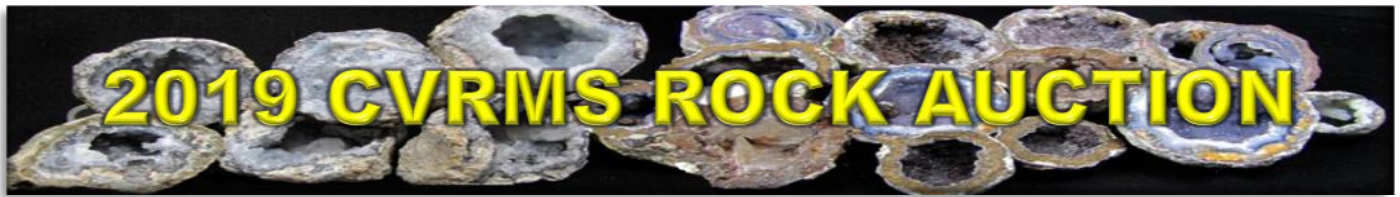
Agate is the most famous chalcedony variety, recognized by its concentric color bands, formed by the remains of iron and manganese. The chemical composition of agate is the same as quartz, but with a different physical structure. Instead of forming as large crystals, it is composed of tiny fibers and crystals whose shapes give rise to diagrams or drawings that acquire different names: as in this case "agate crazy." This mineral is formed in rock cavities of different types, especially lava. Most agates occur as nodules in volcanic rocks or ancient lavas, in former cavities produced by volatiles in the original molten mass, which were then filled, wholly or partially, by siliceous matter deposited in regular layers upon the walls. Agate has also been known to fill veins or cracks in volcanic or altered rock underlain by granitic intrusive masses. Such agates, when cut transversely, exhibit a succession of parallel lines, often extremely thin, giving a banded appearance to the section. The first deposit on the wall of a cavity, forming the "skin" of the agate, is generally a dark greenish mineral substance, like celadonite, delessite or "green earth", which are rich in iron probably derived from the decomposition of the augite in the enclosing volcanic rock. Agates can also be found in sedimentary rocks. They need a cavity to form, so they are typically seen in limestone, dolomite, and shale which may have shells, tree branches, or roots in them that later decay away.

<http://www.geologyin.com/2019/07/what-is-crazy-lace-agate.html>

UN Report on Earth's Oceans Confirms the Catastrophe Is Already Unfolding Around Us

Climate change is already having staggering effects on oceans and ice-filled regions that encompass 80 percent of the Earth, and future damage from rising seas and melting glaciers is now all but certain, according to a sobering new report from the **United Nations, the Intergovernmental Panel on Climate Change (IPCC)**. The warming climate is killing coral reefs, supercharging monster storms, and fueling deadly marine heat waves and record losses of sea ice. The report on the world's oceans, glaciers, polar regions, and ice sheets, released on September 25, finds that such effects foreshadow a more catastrophic future as long as greenhouse gas emissions remain unchecked. Given current emissions levels, a number of serious effects are essentially unavoidable, says the report. Hundred-year floods will become an annual occurrence by 2050 in some cities, including Los Angeles, and small island nations, according to the IPCC. *"What more evidence do we need?"* said Eric Garcetti, LA's mayor, in response to the report. *"These are our streets flooding, these are our homes burning, and in cities, we know this is real, and this is not just about resilience, it's about adaptability."* If emissions continue to increase, global sea levels could rise by more than three feet by the end of this century - about 12 percent higher than the group estimated as recently as 2013. Melting glaciers could harm water supplies, and warming oceans could wreck marine fisheries. The excess of greenhouse gases in the atmosphere today has already raised sea level, and made the water warmer, more acidic, less productive, and capable of holding less oxygen. The conclusion of the report is inescapable: The impacts of climate change on the ocean are well underway. Unless we take very serious action very soon, these impacts will get worse - much, much worse. More than 100 scientists from around the world contributed to this report, which comes on the heels of several other warnings the group has issued recently. Last fall, the IPCC said the world must make rapid, far-reaching changes to energy, transportation and other systems to hold warming below an increase of 1.5 degrees Celsius (2.7 degrees Fahrenheit) a key threshold in the Paris climate agreement. The findings also come as world leaders gathered at the United Nations for a much-anticipated "climate summit" aimed at injecting new momentum into the flagging effort to persuade countries to do more to move away from fossil fuels and toward cleaner forms of energy. Although dozens of smaller nations did announce plans for coming years, the world's largest emitters have stopped short of committing to transformational changes. *"The climate emergency is a race we are losing - but it is a race we can win if we change our ways now,"* UN Secretary General António Guterres told world leaders in his latest attempt to spur action. *"Even our language has to adapt: What once was called 'climate change' is now truly a 'climate crisis.' ... We are seeing unprecedented temperatures, unrelenting storms and undeniable science."* One of the document's most striking findings involves the rise in sea level, which is being driven mainly by the rapid melting of ice in Greenland, Antarctica and the world's smaller glaciers. Sea level rise is accelerating, and the world could see 3.6 feet in total sea level rise by 2100 in a very high-emissions scenario. Even these estimates may be too small, because when scientists looked at an alternative method for gauging how much seas could rise - simply canvassing the views of experts - even larger estimates emerged. For some major coastal cities, a historical 100-year flood event will happen annually by 2050, even in the most optimistic scenario, the report found. That includes large cities such as Jakarta, Manila, Bangkok, Lima, Singapore, Barcelona and Sydney, according to the IPCC. In the United States, cities facing this fast-moving sea-level danger include Los Angeles, Miami, Savannah, Honolulu, San Juan, Key West and San Diego. Like coastal cities, various small island nations also face imminent dangers from rising seas and as a result have been among the most vocal in pushing for more-aggressive climate action. Although it may be possible to adapt to rising seas if global emissions are somehow kept low throughout the century, the system could still tip toward very large ice losses from Greenland and Antarctica, scientists found. If that happens, the rate of sea-level rise could become truly catastrophic, especially by the years 2200 and 2300, when it could exceed 10 feet. Ice loss is accelerating in Greenland and Antarctica, scientists found. Permafrost, which contains enormous amounts of carbon that can be released as it thaws, has warmed to record high levels. Summer Arctic sea ice is now probably lower than at any time in *"at least 1,000 years,"* and the oldest, thickest ice has already declined by 90 percent. And then there is the entire world ocean. *"Over the 21st century, the ocean is projected to transition to unprecedented conditions,"* the report states. One of the most shocking findings involves *"marine heat waves,"* which have been blamed for mass deaths of corals, kelp forests and other key ocean organisms. The large majority of these events are already directly attributable to climate change, and by 2100, they will become 20 times as common in the best case, and 50 times as common in the absolute worst case, compared with the late 1800s, the report found. Many of these changes to oceans and ice are unfolding in parts of the Earth where few people live, and so the shifts are not always readily visible to most humans. But the changes taking place there ultimately will affect people worldwide, in the form of rising seas and other effects. And as those effects worsen, so does the difficulty of adapting to them. *"People at the poles are experiencing climate change frequently, much more than the rest of us,"* said Ted Schuur, one of the drafting authors of the report and a permafrost expert at Northern Arizona University. *"But I think that's in our future. Everybody living outside of these polar regions is going to start having these same effects."*

https://www.sciencealert.com/un-report-says-monumental-change-already-here-for-world-s-oceans-and-frozen-regions?utm_source=ScienceAlert+Daily+Email+Updates&utm_campaign=133ae51c91-MAILCHIMP_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_fe5632fb09-133ae51c91-365948861



2019 CVRMS ROCK AUCTION



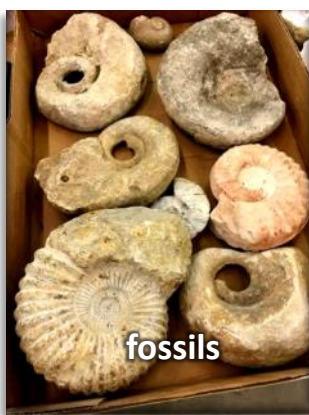
Marv auctioning



Darren auctioning



agates and wood



fossils



wood and geodes



agates galore

Auction Facts

Sept. 21-22, 2019

- 1,535 lots were auctioned
- 100 bidders
- gross receipts \$38,755



beautiful septarians

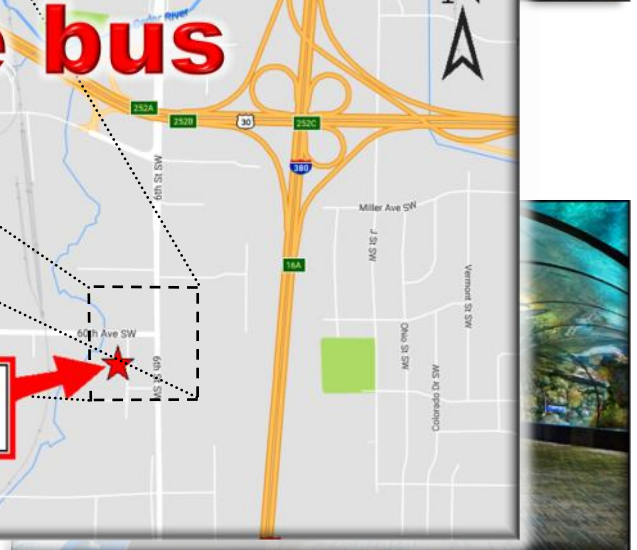
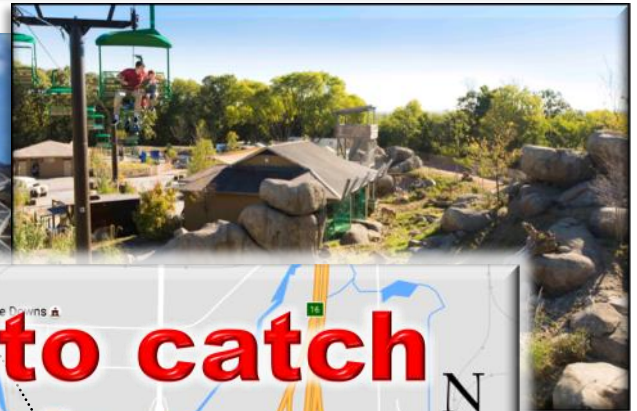
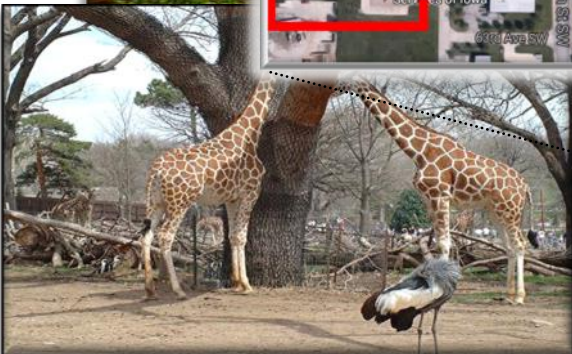


a successful auction

"Bill's Big Bus Boogie" 2019

Omaha's Henry Doorly Zoo and Aquarium

Henry Doorly Zoo Field Trip Bus
 will leave from Cedar Valley World Travel
 6100 7th St SW, Cedar Rapids
 Sun. Oct. 6 - **6:00 a.m.** and return ~ **9:00 p.m.**
monitored parking available



**where to catch
the bus**

Cedar Valley World Travel
6100 7th St.

Time is here for the 2019 "Bill's Big Bus Boogie" adventure which will take CVMRS members and friends on a field trip to the Omaha's Henry Doorly Zoo and Aquarium on Sunday, October 6, 2019. Consistently ranked one of the world's best zoos, Omaha's Henry Doorly Zoo and Aquarium is the ultimate interactive zoo experience and a biological park leading the nation's conservation efforts. Visit the world's largest indoor desert and nocturnal exhibits along with one of North America's largest indoor rainforests. Other world-class exhibits include the **Scott Aquarium, Hubbard Orangutan Forest and Gorilla Valley, Lozier IMAX® Theater, Durham's Bear Canyon, Berniece Grewcock Butterfly and Insect Pavilion**, and more. Explore **Kingdoms of the Night** featuring the world's largest indoor swamp, a canyon and massive caves. Experience **Skyfari**, the aerial tram that transports guests to a new view of Omaha's Henry Doorly Zoo and Aquarium. Plan your visit in advance by downloading their free mobile app, available through Apple's App Store and Google Play. The bus trip will be free for club members, and they need only pay museum admission. You may order zoo admission tickets in advance on-line if you wish to avoid a wait in the ticket line. The trip is opened to the public for **\$25/seat** (contact **Bill Desmarais** at **319-365-0612** or **desmarais_3@msn.com** if you are interested.) We will leave from the **Cedar Valley Transit Lines 6100 7th St. - Cedar Rapids, IA 52404 at 6:00 am SHARP** and return about **9:00 pm**. Bring food and drink but it must fit under your seat.



[Click for link to downloadable zoo map](#)

It will be another great and memorable "Bill's Big Bus Boogie" field trip!

2019 Officers, Directors, and Committee Chairs

| | | |
|---------------------|---|---------------|
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| Director '20 | Jay Vavra (vavrjij@gmail.com)..... | 447-9288 |
| Director '21 | Bill Desmarais (desmarais_3@msn.com) | 365-0612 |
| Sunshine..... | Dolores Slade (doloresdslade@aol.com) | 351-5559 |
| Hospitality | Karen Desmarais (desmarais_3@msn.com) | 365-0612 |
| Webmaster..... | Sharon Sonnleitner (sonnb@aol.com) | 396-4016 |

Club meetings are held the 3rd Tuesday of each month from September through November and from January through May at 7:15 p.m., 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 2nd Tuesday at 6:30. June, July, and August meetings are potlucks held at 6:30 p.m. at area parks on the 3rd Tuesday of each month

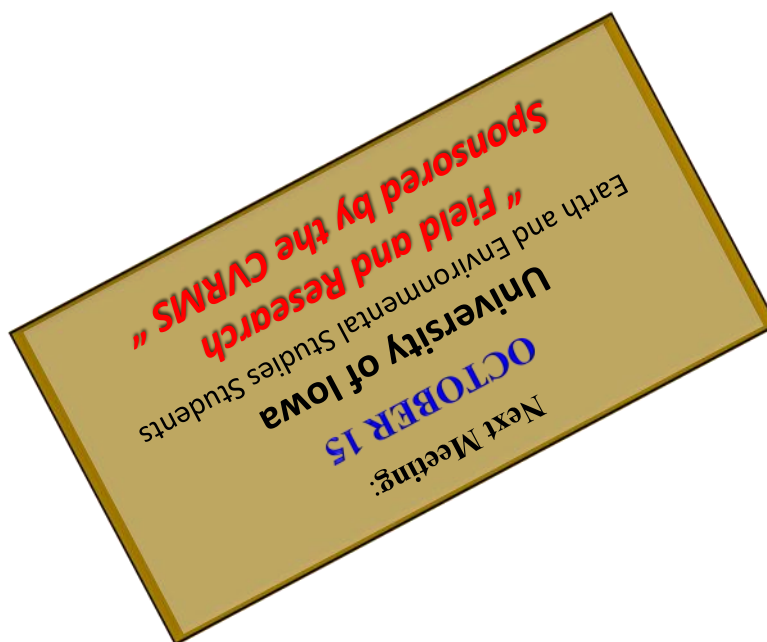
CEDAR VALLEY ROCKS & MINERAL SOCIETY

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

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

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

CVRMS website:
cedarvalleyrockclub.org



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