Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS | DECEMBER 2019 | VOL. 45, ISSUE 10

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Next CVRMS Meeting Tues. DEC. 3

HOLIDAY PARTY & POTLUCK

The **CVRMS 2019 Holiday Party** will be a week earlier than our usual monthly meeting, on **December 3** at the Hiawatha Community Center in the Hiawatha City Hall, 101 Emmons St., Hiawatha. We will **meet around 6:00 pm** and **eat at 6:30 pm.** The club will provide ham and turkey, potatoes, dressing, & gravy (prepared by Dell) as well as soft drinks. Participants are invited to bring other dishes to contribute to our annual feast. Please bring your own ***table service*** and a ***big appetite.*** Ray has prepared a show of slides contributed by participants in the Field Trip to Omaha's Blank Park Zoo.

Hiawatha City Hall and Community Center

See Page 6 for Additional Information

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

What are Red Diamonds & Where Can They be Found

Red diamonds have the same mineral properties as colorless diamonds, but display red color. They are commonly known as the world's most expensive and rare color of diamonds, more so than pink diamonds or blue diamonds. The source of their color is debated, but the gemological community most frequently attributes both colors to gliding atoms in the structure of the diamond as it undergoes tremendous pressure during its formation. The most widely accepted theory is that a plastic deformation is produced in the crystal lattice structure during the formation of the diamond. It is believed that as the diamonds move through the crust with their parent kimberlite some of the atoms are misplaced, and the intense pressure present produced different shades of pink or red. This suggests that red diamonds are actually extremely dark pink. A red color can also be produced with high-energy particles irradiation of a colorless diamond and then annealing it at high pressures and high temperatures.

Moussaieff Red Diamond

Among the twelve colors of fancy diamonds, reds are the most expensive per carat price. They usually run in the range of hundreds of thousands of dollars per carat. Large size reds are rare and most are found in sizes below 1 carat. They exist only with one intensity of color, *Fancy,* although their clarity may vary from *Flawless* to *Included*, just like white diamonds. The biggest and most flawless red diamond is the *Fancy Red Moussaieff*, a 5.11 carat with flawless internal clarity. Most red diamonds mined each year come from Kimberley, Western Australia's, Argyle diamond mine. They are also found in Brazil, Russia, and some African countries. In 1987, the first gem quality red, called the Hancock Red, sold for over $926,000 per carat! "Pure" red diamonds are so rare and disproportionately priced that they are rarely marketed. An example of their value: one SI2 Clarity grade, 0.71 Carat, Fancy Red Diamond Radiant was recently priced at $ 603,600.
http://www.geologypage.com/2019/05/red-diamond.html?fbclid=IwAR1bjJj087K-2t0pb1ZwVWmIMyTdVKtoe_zGypLO8Bbbg346RPy81iB9bc8#ixzz64zvVcNI8

CVRMS Nov. 16 Meeting

CVRMS
2019 Annual Meeting
November 19,2019

7:15p.m. Meeting called to order by Marv Hoag.
Guests and new/old members welcomed. Jack Gilmore, Bill, Joel, Rona, Vicki Wyatt.

Minutes of last meeting reviewed. Motion to accept as published by Julie, second by Dale. Minutes accepted as published.

Treasurer's report-checking balance of $7,733.12. Motion to approve by Tom, second by Lee. Report will be filed.

Program by Dr. Jane Gilotti on Eclogites. Look up Mineralogical Society of America for more info.

Door prizes were various samples of eclogites furnished by Dr. Gilotti. 6 lucky winners were! Scott, Lisa, Terri Schott, Dennis, Bill Richards, Sharon.

Old business

Holiday Party Dec. 3, Tuesday. We will be allowed in a little earlier to set up. Hopefully by 4:15. Dinner is served at 6:30. The club will furnish drinks and meat. Dell will bring mashed potatoes, and dressing and gravy. The rest is pot luck. Be generous with your portions since we usually have about 50 people. Bring your own place settings. Also, we always appreciate door prizes. Ray will provide us with slides from the zoo trip.

River Products Display Case still being worked on. Cheaper to get a manufactured one than build our own. Marv will check on style they prefer at River Products.

New Business

Election of officers

Slate presented by committee. All current officers renominated. Rick Austin declined another term, and Toby Jordan was nominated for 3-year Director ending in 2022. Motion to accept recommended slate by Tom, second by Lisa. Motion approved with one nay.

Other business

Flyers are available for show. See Sharon.

Tom reported the demise of Michigan State Director Julia Donker.

Our member AJ has had some recent medical issues. Reports that he will be home soon. Get well wishes to AJ.

Motion to adjourn by Ann second by Tom.

9:30 p.m. meeting adjourned.

Respectfully submitted,
Dell James, Secretary

CVRMS Board Minutes Oct 29

7:10p.m. Meeting called to order at Marv Houg's home.

Members present - Marv Houg, Ray Anderson, Bill Desmarais, Jay Vavra, Sharon Sonnleitner, Dell James, Rick Austin.

Ideas for 2020 rock show.

Review of ***potential speakers*** and those who have committed. Including Paul Sipiria, Brent Studer, Grant Harkness, David Peate, Ray Anderson, Bob McKay. Steven Spangler...Ray will contact.

All agreed that Ray should give *Iowa Meteorites* presentation after Saturday catered dinner.

Review of ***raffle prizes***. So far there is a geode cracker, set of specimens, wooden dinosaur, slab. Still need a couple more. Will ask vendors.

Posters-Ray has designed 8 posters for review. Plus crinoid posters.

Sharon reviewed two ***new vendors*** for 2020 show..

Bill and Jay will provide ***security***.

Auction

Consignors -some readjusting being done as usual. So far 1350 lots. Auction is full and Marv taking names for 2021 auction. Reminder to members that the auction is open to all members and non members. First come first served.

T-Shirts-Ray has a few shirts left, but anyone who is planning on working the show and does not have a green shirt, let Ray know what size you need and he will handle it.

Contracts-Jay will send out after the first of the year.

Other business-Ray, Bill, Kim have made outreach presentations and all have future presentations. We will keep a list.

Display case for River Products. Marv discussed the possibilities he found on various websites. He will pursue and it is under budget.

Crinoids for State Fossil - should we continue to pursue the desire to promote the Crinoid as Iowa's State Fossil. Various suggestions tossed around.

Marv had a brainstorm that it would be fun and interesting to put together a book of posters from early days to now. Ray and Sharon have a lot of posters. Need to work on it.

Marv could use some help gathering and organizing ***door prizes for Holiday Party***. Again, encouraging people to provide door prizes, bring food and have fun. Wear your name badges.

Motion to adjourn by Jay,2nd by Bill.

8:45 p.m. meeting adjourned.

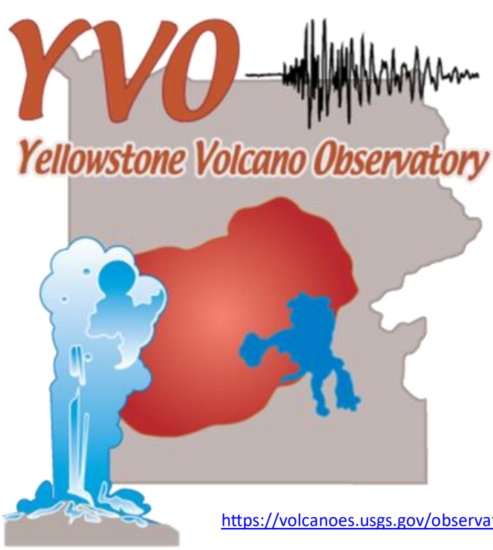
Respectfully submitted,
Dell James, Secretary

The Membership Has Voted

The November 19 CVRMS meeting was our official ***Annual Meeting,*** which meant that members elected club officers for 2020. The nominating committee suggested that **Toby Jordan** be elected to fill the Director position vacated by **Rick Austin** at the end of his term, and all the remaining board members should be reelected. The club membership voted unanimously to accept the nominating committee's suggestion and elect Toby and the remaining Board to another year's term.

Congratulations Toby and other electees!!

President	Marv Houg
Vice President	Ray Anderson
Treasurer	Dale Stout
Secretary	Dell James
Editor	Ray Anderson
Liaison	Kim Kleckner
Director '20	Jay Vavra
Director '21	Bill Desmarais
Director '22	Toby Jordan
Webmaster	Sharon Sonnleitner



https://volcanoes.usgs.gov/observatories/yvo/

If you were born in December you may choose from 3 birthstones, zircon, tanzanite, turquoise

Zircon is a mineral belonging to the group of nesosilicates. Its chemical name is zirconium silicate and its corresponding chemical formula is $ZrSiO_4$. A common empirical formula showing some of the range of substitution in zircon is $(Zr_{1-y}, REE_y)(SiO_4)_{1-x}(OH)_{4x-y}$. Zircon forms in silicate melts with large proportions of high field strength incompatible elements. The crystal structure of zircon is tetragonal crystal system. The natural color of zircon varies between colorless, yellow-golden, red, brown, blue, and green. Colorless specimens that show gem quality are a popular substitute for diamond and are also known as "*Matura diamond*".

Tanzanite is the blue/violet variety of the mineral zoisite (a calcium aluminium hydroxyl Sorosilicate—$Ca_2Al_3(SiO_4)_3(OH)$) belonging to the epidote group. It was discovered in Northern Tanzania in 1967, near the city of Arusha and Mount Kilimanjaro. Tanzanite is used as a relatively cheap gemstone, where it can substitute for the far more expensive sapphire after undergoing artificial heat treatment to form a deep blue coloration. Naturally formed tanzanite is extremely rare and is endemic only to the Mererani Hills. Tanzanite is noted for its remarkably strong trichroism, appearing alternately sapphire blue, violet and burgundy depending on crystal orientation. Tanzanite can also appear differently when viewed under alternate lighting conditions. The blues appear more evident when subjected to fluorescent light and the violet hues can be seen readily when viewed under incandescent illumination. Tanzanite is usually a reddish brown in its rough state, requiring heat treatment to bring out the blue violet of the stone.

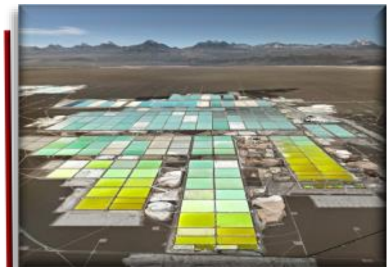
Turquoise is an opaque, blue-to-green mineral that is a hydrated phosphate of copper and aluminium, with the chemical formula $CuAl_6(PO_4)_4(OH)_8 \cdot 4H_2O$. It is rare and valuable in finer grades and has been prized as a gem and ornamental stone for thousands of years owing to its unique hue. The substance has been known by many names, but the word *turquoise* dates to the 17th century and is derived from the French *turques* for "Turks" because the mineral was first brought to Europe from Turkey, from mines in the historical Khorasan Province of Persia. Pliny the Elder referred to the mineral as *callais* and the Aztecs knew it as *chalchihuitl*.

• • *information from Wikipedia*

What in the World?

What in the World is the feature in this oblique aerial photo and where is it?

November's Photo



Last month's ***"What in the World"*** image was an aerial view of the brine pools and processing areas of the **Soquimich lithium mine** on the *Salar de Atacama*, the largest salt flat in Chile, about 700 miles north of Santiago. The silver-white metal is found dissolved in brine, a mere 130 feet below the surface of the desert. The thick slushy brine is pumped from the ground into shallow evaporation pools to dry under the hot desert sun. As the water slowly evaporates, it leaves behind a greasy yellowy material that yields one of the most precious metal of the 21st century. The *Salar de Atacama* is the world's largest and purest active source of lithium, containing 27% of the world's lithium reserve base As of 2017 it provided about 36% of the world's lithium carbonate supply, followed by China with 23%. It seems conceivable to connect the giant magmatic systems of the Altiplano-Puna volcanic complex as a Li source to Salar de Atacama brines, but understanding of the regional groundwater systems at the plateau margin is limited.

Rock Calendar
CVRMS EVENTS OF INTEREST

2019

Dec. 3- CVRMS Holiday Pot Luck
Hiawatha Community Center
6.30 pm
see page 6 for more information

Bring Your Favorite Treasure for Our Rock Show and Tell

2020

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

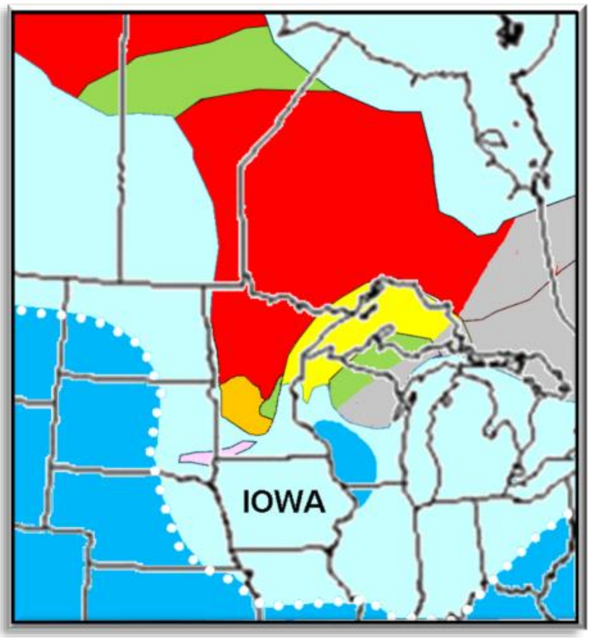
Feb. 18 —CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Featured Presentation
to be announced

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.

I mentioned in the article about "***The Factors That Control Metamorphic Processes"*** (*Page 11 of this newsletter*) that most Iowa erratics (*rocks transported into the state by glacial ice*) have been metamorphosed (*naturally altered by heat and pressure*) to some degree. This is because many of these rocks are very old and have experienced many tectonic stresses. I thought that this would be a good opportunity to discuss the histories of many of these rocks. If we look at Iowa erratics, we see that many are sedimentary rocks (*limestone, sandstone, shale, etc.*) that were plucked from nearby bedrock, but these rocks are comparatively soft and are generally ground to pieces before they have been transported very far. The Precambrian (*older than 500 million years*) erratics are much harder and more resistant and can be carried to the limits of the glacial ice. The map below shows the general ages of rocks that produced the erratics that we find in Iowa, picked up by the glacial ice from areas northeast to northwest of the State.



The map (left) shows the areas where bedrock is dominantly softer Phanerozoic sedimentary rocks in blue (*light blue for the glaciated areas, dark blue for areas not glaciated*). The harder Precambrian rocks originated in the other colored areas. The gray identifies areas where Precambrian rocks are exposed at the surface, but the glaciers that crossed them did not move into Iowa. The oldest Precambrian rocks, shown as orange on the map, The Minnesota River Terrane, were first formed 3.6 to 3.9 Ga (*billion years ago*) and are among the oldest rocks on Earth. The large red area in the center of the map is the Superior Craton. It was formed when 12 microcontinents were smashed together during a series of 5 orogenies (*continental collisions*) between about 2.5 and 2.8 Ga. It was followed by a collision joining it with the Minnesota River Terrane 2.68 Ga. These collisions metamorphosed older rocks and created new rocks in very diverse settings, such as volcanic oceanic arcs (*like Japan*), ancient basins that filled with sediments, oceanic tectonic melanges (*jumbles of blocks of rocks that avalanched off of uplifting mountains*), uplift within the craton (*with heat and pressure altering rocks*), fold-thrust belts created by continents crashing together and deforming, and rocks being buried deeply and altered by heat and pressure as new continents piled up. What is common among them is that these features are mostly formed in a compression setting. The green map areas were formed between 1.8 and 1.9 Ga when other Archean continental fragments shoved volcanic island arcs into the Superior Craton from the north and several sequence of volcanic island arcs smashed into the craton from the south forming most of Iowa's basement. Basins developed and banded iron formations were deposited in Minnesota and adjoining areas, and a variety of granitic rocks were intruded into the central Minnesota St. Cloud area. These granite plutons yielded most of the giant erratics that were transported into Iowa by glacial ice. Eventually, a Supercontinent called ***Columbia*** was formed. About 1.6 Ga Columbia was deeply weathered with only quartz sands making it to the continental margins where they were deposited as thick sand sheets, later cemented together with more quartz to form the *Sioux Quartzite* and related rocks. About 1.5 Ga Columbia began to break up with areas of deep fractures filled with basalts developing in several areas of Superior. About 1.2 billion years ago continental pieces again drifted together to form the Supercontinent of ***Rodinia***, once again deforming and metamorphosing Superior rocks. At one stage in the formation of Rodinia a large crack (*rift*) developed along the southern edge of the Superior craton, the ***Midcontinent Rift***, with vast outpouring of basalt piling up to tens of thousands of feet in thickness in the Lake Superior area and in Iowa's subsurface. The more deeply buried basalts were metamorphosed by this deep burial, filling cracks and vesicles with a variety of secondary minerals including epidote, which gives these normally black basalts a greenish hue. These are the rocks that the glaciers picked up and carried into Iowa. An almost limitless number of rock types, displaying a host of metamorphic features, waiting for the lucky rock hound to discover them and interpret their histories. I guess we are just lucky to live in Iowa.

CVRMS ANNUAL HOLIDAY PARTY

Favorite Rock Show and Tell

Favorite Rock Show and Tell

December 3

6:00 p.m. to **9:00** p.m. (eat at **6:30**)

Bring Your Favorite Rock to Show

* * Pot Luck * *

*** bring your own famous holiday dish ***

*** bring your own place settings ***

CVRMS will provide drinks and main dish (turkey/ham)
mashed potatoes, stuffing, and gravy, games and door prizes

A COLLECTION WILL BE TAKEN

for HACAP & Linn County Food Bank

(if you can't make it to the party and wish to contribute mail check to Dale S.)

Hiawatha Community Center
101 Emmons St., Hiawatha

Every now and again, scientists discover fossils that are so bizarre they defy classification, their body plans unlike any other living animals or plants. *Tullimonstrum* (also known as the Tully Monster), a 300-million-year-old fossil discovered in the Mazon Creek fossil beds in Illinois, is one such creature. At first glance, Tully looks superficially slug-like. But where you would expect its mouth to be, the creature has a long thin appendage ending in what looks like a pair of grasping claws. Then there are its eyes, which protrude outward from its body on stalks. Tully is so strange that scientists have even been unable to agree on whether it is a vertebrate (with a backbone, like mammals, birds, reptiles and fish) or an invertebrate (without a backbone, like insects, crustaceans, octopuses and all other animals). In 2016, a group of scientists claimed to have solved the mystery of Tully, providing the strongest evidence yet that it was a vertebrate. But a new study calls this conclusion into question, meaning this monster is as mysterious as ever. The Tully Monster was originally discovered in the 1950s by a fossil collector named Francis Tully. Ever since its discovery scientists have puzzled over which group of modern animals Tully belongs to. The enigma of Tully's true evolutionary relationships has added to its popularity, ultimately leading it to become the ***State Fossil of Illinois***. There have been many attempts to classify the Tully Monster. The majority of these studies have focused on the appearance of some of its more prominent features. These include a linear feature in the fossil interpreted as evidence of a gut, the light and dark banding of the fossil and the peculiar grasping claws of its mouth. The body plan of the Tully Monster is so unusual in it's entirety that it will greatly expand the diversity of whatever group it ultimately belongs to, changing the way we think about that group of animals. The 2016 research argued the animal should be grouped with vertebrates because its eyes contain pigment granules called melanosomes, which are arranged by shape and size in the same way as those in vertebrate eyes. But the recent research shows that the eyes of some invertebrates such as octopus and squid also contain melanosomes partitioned by shape and size in a similar way to Tully's eyes, and that these are also preserved in fossils. This discovery was accomplished using a type of particle accelerator called a *synchrotron radiation lightsource* located at Stanford University in California. It allowed the exploration of the chemical makeup of samples from fossils and from animals living today. The synchrotron bombards specimens with intense bursts of radiation to "*excite*" the elements within them. When excited, each element releases X-rays with a specific signature. By detecting the emitted X-ray signatures, researchers were able to tell what elements were excited and ultimately what the specimen we're interested in is made of. They found that melanosomes from the eyes of modern vertebrates have a higher ratio of zinc to copper than the modern invertebrates studied. To their surprise, they then found the same pattern could be seen in fossilized vertebrates and invertebrates found at Mazon Creek. They then analyzed the chemistry of Tully's eyes and the ratio of zinc to copper was more similar to that of invertebrates than vertebrates. This suggests the animal may not have been a vertebrate, contradicting previous efforts to classify it. They also found that Tully's eyes contain a different type of copper than that found in vertebrate eyes. But the copper also wasn't identical to that in the invertebrates they studied. So the new study added weight to the idea that Tully is not a vertebrate, it doesn't clearly identify it as an invertebrate either. Where do researchers go from here? A broader analysis of the chemistry of melanosomes and other pigments in the eyes of a wider range of invertebrates would be a good next step. This may help to further narrow down the group of animals to which Tully belongs. Ultimately the riddle of what kind of creature the Tully Monster is continues. But our research demonstrates how studying fossils at the chemical and molecular levels can play an important part in figuring out the identity of this and other enigmatic creature.


The *Tullimonstrum* fossil.

http://www.geologyin.com/2019/11/the-mysterious-tully-monster-just-got.html?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+GeologyIn+%28Geology+IN%29

Mexican anthropologists say they have found two human-built pits dug 15,000 years ago to trap mammoths. Researchers from Mexico's National Institute of Anthropology and History said the pits were found during excavations on land that was to be used as a garbage dump.

The pits filled with bones from at least 14 mammoths were found in the neighborhood of Tultepec, just north of Mexico City. Archaeologists thought early humans only killed mammoths if the animals were trapped or hurt. However, INAH's discovery of the human-built traps could mean such hunts were planned. Researchers said hunters may have traveled in groups of about 20 to 30, and used torches and branches to force animals into the traps. It is possible, he said, that a chain of traps had been built to increase the odds of capturing prey, and that more could be discovered. Some of the animals were apparently butchered. The pits were about 6 feet deep and 80 feet in diameter. The institute said hunters may have chased mammoths into the traps. Remains of two other species that disappeared in the Americas - a horse and a camel - were also found. Woolly mammoths, elephant-like creatures that once inhabited nearly every continent, went extinct about 4,000 years ago. Several competing theories explain their demise, but it was likely a combination of climate change, which created untenable conditions for the animals and also killed off a plant-based diet, as well as the birth of humans that sought their skin and meat.

https://www.stuff.co.nz/world/americas/117241411/mammoth-traps-dating-back-15000-years-found-in-mexico?fbclid=IwAR3DOXn0-

Hopper Halite crystal from Searles Lake, Trona, California

A hopper crystal is a form of crystal, defined by its "*hoppered*" shape. This form appears, when a crystal grows faster at the edges of each face, than at the center. This is due to a higher electrical attraction along the edges of the crystal, so they draw the mineral molecules stronger than the interior sections.
The edges of hoppered crystals are fully developed, but the interior spaces are not filled in. This results in what appears to be a hollowed out step lattice formation, as if someone had removed interior sections of the individual crystals. In fact, the "*removed*" sections never filled in, because the crystal was growing so rapidly that there was not enough time (or material) to fill in the gaps. The interior edges of a hoppered crystal still show the crystal form characteristic to the specific mineral, and so appear to be a series of smaller and smaller stepped down miniature versions of the original crystal. Hoppering occurs when electrical attraction is higher along the edges of the crystal; this causes faster growth at the edges than near the face centers. This attraction draws the mineral molecules more strongly than the interior sections of the crystal, thus the edges develop more quickly. However, the basic physics of this type of growth is the same as that of dendrites but, because the anisotropy (a difference in physical properties in different crystal axes) in the solid–liquid inter-facial energy is so large, the dendrite so produced exhibits a faceted morphology. Hoppering is common in many minerals, including lab-grown bismuth, galena, quartz (called skeletal or fenster crystals), gold, calcite, halite (salt), and water (ice).

Bismuth hopper crystal

https://www.geologyin.com/2019/06/what-is-hopper-crystal.html?fbclid=IwAR3P9sj_kM7p90giLSrv3G4JqI4DZghWFjd1S4FzD8yX4wVwceMfaYJMTHE

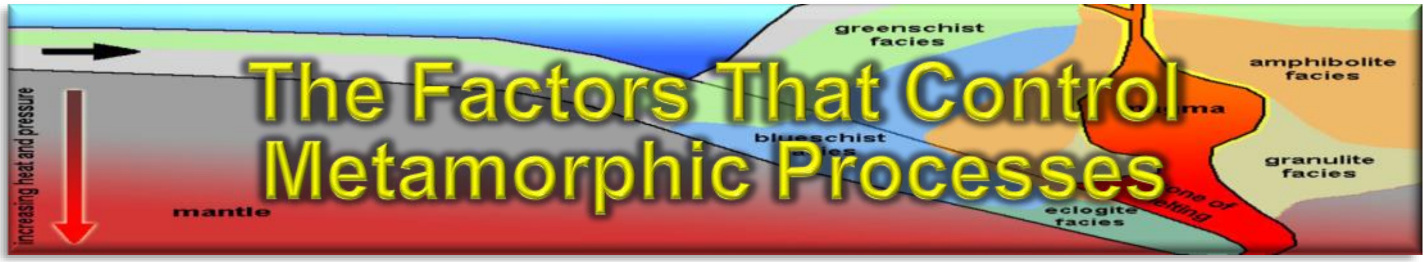
Nine Species of Human Once Walked Earth. Now There's Just One. Did We Kill The Rest ?

Nine human species walked the Earth 300,000 years ago. Now there is just one. The Neanderthals, ***Homo neanderthalensis***, were stocky hunters adapted to Europe's cold steppes. The related **Denisovans** inhabited Asia, while the more primitive ***Homo erectus*** lived in Indonesia, and ***Homo rhodesiensis*** in central Africa. Several short, small-brained species survived alongside them: ***Homo naledi*** in South Africa, ***Homo luzonensis*** in the Philippines, ***Homo floresiensis*** ("hobbits") in Indonesia, and the mysterious **Red Deer Cave People** in China. Given how quickly we're discovering new species, more are likely waiting to be found. By 10,000 years ago, they were all gone. The disappearance of these other species resembles a mass extinction. But there's no obvious environmental catastrophe – volcanic eruptions, climate change, asteroid impact – driving it. Instead, the extinctions' timing suggests they were caused by the spread of a new species, evolving 260,000-350,000 years ago in Southern Africa: ***Homo sapiens***. The spread of modern humans out of Africa has caused a sixth mass extinction, a greater than 40,000-year event extending from the disappearance of Ice Age mammals to the destruction of rainforests by civilization today. But were other humans the first casualties? We are a uniquely dangerous species. We hunted wooly mammoths, ground sloths and moas to extinction. We destroyed plains and forests for farming, modifying over half the planet's land area. We altered the planet's climate. But we are most dangerous to other human populations, because we compete for resources and land. History is full of examples of people warring, displacing and wiping out other groups over territory, from Rome's destruction of Carthage, to the American conquest of the West and the British colonization of Australia. There have also been recent genocides and ethnic cleansing in Bosnia, Rwanda, Iraq, Darfur and Myanmar. Like language or tool use, a capacity for and tendency to engage in genocide is arguably an intrinsic, instinctive part of human nature. There's little reason to think that early *Homo sapiens* were less territorial, less violent, less intolerant – less human. Optimists have painted early hunter-gatherers as peaceful, noble savages, and have argued that our culture, not our nature, creates violence. But field studies, historical accounts, and archaeology all show that war in primitive cultures was intense, pervasive and lethal. Neolithic weapons such as clubs, spears, axes and bows, combined with guerrilla tactics like raids and ambushes, were devastatingly effective. Violence was the leading cause of death among men in these societies, and wars saw higher casualty levels per person than World Wars I and II. Old bones and artifacts show this violence is ancient. The 9,000-year-old Kennewick Man, from North America, has a spear point embedded in his pelvis. The 10,000-year-old Nataruk site in Kenya documents the brutal massacre of at least 27 men, women, and children. It's unlikely that the other human species were much more peaceful. The existence of cooperative violence in male chimps suggests that war predates the evolution of humans. Neanderthal skeletons show patterns of trauma consistent with warfare. But sophisticated weapons likely gave *Homo sapiens* a military advantage. The arsenal of early *Homo sapiens* probably included projectile weapons like javelins and spear-throwers, throwing sticks and clubs. Complex tools and culture would also have helped us efficiently harvest a wider range of animals and plants, feeding larger tribes, and giving our species a strategic advantage in numbers. But cave paintings, carvings, and musical instruments hint at something far more dangerous: a sophisticated capacity for abstract thought and communication. The ability to cooperate, plan, strategize, manipulate and deceive may have been our ultimate weapon. The incompleteness of the fossil record makes it hard to test these ideas. But in Europe, the only place with a relatively complete archaeological record, fossils show that within a few thousand years of our arrival, Neanderthals vanished. Traces of Neanderthal DNA in some Eurasian people prove we didn't just replace them after they went extinct. We met, and we mated. Elsewhere, DNA tells of other encounters with archaic humans. East Asian, Polynesian and Australian groups have DNA from Denisovans. DNA from another species, possibly *Homo erectus*, occurs in many Asian people. African genomes show traces of DNA from yet another archaic species. The fact that we interbred with these other species proves that they disappeared only after encountering us. But, why would our ancestors wipe out their relatives, causing a mass extinction – or, perhaps more accurately, a mass genocide? The answer lies in population growth. Humans reproduce exponentially, like all species. Unchecked, we historically doubled our numbers every 25 years. And once humans became cooperative hunters, we had no predators. Without predation controlling our numbers, and little family planning beyond delayed marriage and infanticide, populations grew to exploit the available resources. Further growth, or food shortages caused by drought, harsh winters or overharvesting resources would inevitably lead tribes into conflict over food and foraging territory. Warfare became a check on population growth, perhaps the most important one. Our elimination of other species probably wasn't a planned, coordinated effort of the sort practiced by civilizations, but a war of attrition. The end result, however, was just as final. Raid by raid, ambush by ambush, valley by valley, modern humans would have worn down their enemies and taken their land. Yet the extinction of Neanderthals, at least, took a long time – thousands of years. This was partly because early *Homo sapiens* lacked the advantages of later conquering civilizations: large numbers, supported by farming, and epidemic diseases like smallpox, flu, and measles that devastated their opponents. But while Neanderthals lost the war, to hold on so long they must have fought and won many battles against us, suggesting a level of intelligence close to our own. Today we look up at the stars and wonder if we're alone in the universe. In fantasy and science fiction, we wonder what it might be like to meet other intelligent species, like us, but not us. It's profoundly sad to think that we once did, and now, because of it, they're gone. https://www.sciencealert.com/did-homo-sapiens-kill-off-all-the-other-humans?utm_source=ScienceAlert+-+Daily+Email+Updates&utm_campaign=a67f7577bd-MAILCHIMP_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_fe5632fb09-a67f7577bd-365948861

A strange green rock discovered in Morocco last year was hailed by the press as the first meteorite from Mercury. But scientists who've been puzzling over the stone ever since say the accumulating evidence may point in a different direction. Maybe, just maybe, they say, the 4.56-billion-year-old rock fell to Earth from the asteroid belt located between Mars and Jupiter. If that's true, the rock is "*still extremely interesting*," says Tim McCoy, who curates the Smithsonian Museum of Natural History's collection of 35,000 meteorites. *"[It] tells us something about the birth of the solar system, but not the birth of the innermost planet."* The olive green meteorite, flecked with bits of white and brown, first came to scientists' attention last year when a German collector, Stefan Ralew, saw the unusual stone in Morocco and shipped it off for analysis to Tony Irving, a geochemist and meteorite specialist affiliated with the University of Washington in Seattle. Irving routinely receives such packages from all over the world. "*From experience, I knew it was very unlikely to be an Earth rock,"* Irving says. "*It wasn't from Mars, and if it was a meteorite, it was highly unusual.*" As it turns out, the rock was even weirder than it looked. *"The minerals were very low in iron,"* he says, *"and most meteorites have more iron in their minerals than this."* Irving's mind turned to the planet Mercury. New data had been coming in from NASA's Messenger spacecraft, which is orbiting Mercury. It revealed that Mercury's surface lacked iron. "*I think it was the Messenger data that I had recently studied and just sort of compared it, on a whim almost,"* Irving says. *"[I was] quite amazed to find that some of the chemical features were a pretty close match."* He started to get excited. Every now and then, something big strikes a planet and knocks off a few chunks. Experts predict that some chunks of Mercury may have already made the 57-million-mile trip to Earth, but none have been found. This could be a piece. But Irving needed more evidence, so he packed up samples and sent them to colleagues around the country for further analysis. One of the most exciting findings came from a colleague who had measured the magnetic field of one of the pieces. It was smaller than almost anything yet seen in the solar system. *"And it's very close to the present magnetic field of Mercury," Irving says. "Putting it all together, I could see that there was a possibility of proposing this Mercury idea."* And that's just what he did. This March, Irving presented his theory at the Lunar and Planetary Science Conference in Texas. But scientists at the meeting were more skeptical. In the audience was Shoshana Weider, a fellow at the Carnegie Institution of Washington, who works on the Messenger mission. Her first thought, when she heard that the rock might be from Mercury, was, "*That would be nice."* But she's not convinced. *"There was nothing that jumped out and said, 'No, this can't be from Mercury,' "* she says, *"but there were a few bits that didn't quite match with Mercury."* For example, the rock lacks sulfur, while Mercury's surface is covered in it. She's not the only one with doubts about the green rock. The Smithsonian's Tim McCoy has a problem with the rock's age. "*The meteorite is very, very old — 4.56 billion years old,"* he says. "*So it's essentially formed at the same time as the birth of the planet, whereas Mercury is a huge, hot planet that probably wouldn't have cooled off enough to have solid rock 4.56 billion years ago."* McCoy has his own ideas about the meteorite's origins. He has another shiny metallic rock in his collection that, under the microscope, contains some crystals the same color as the Morocco specimen. That crystal is chromian diopside. It's the same mineral that gives Irving's meteorite its distinctive green color. And just like Irving's rock, this one is 4.56 billion years old. But it's not from Mercury; it's known to be from that asteroid belt between Mars and Jupiter. McCoy says that maybe the new green meteorite came from the asteroid belt, too. Irving says he won't be too upset if it turns out the meteorite came from somewhere else. "*As far as I'm personally concerned, if this rock turns out to be not from there and we can find an alternative,"* he says, "*that's just fine with me."* In the meantime, admirers of the little green rock will soon be able to own a piece. The German collector who sent Irving that first sample has several other fragments that he's planning to sell.


Several fragments of this unusual rock were discovered last year in Morocco. It's been hailed as the first meteorite from the planet Mercury, but where it came from in the solar system isn't certain.

https://www.npr.org/2013/04/11/176714430/origin-of-meteorite-is-a-puzzle-to-scientists



Many of the rocks that we find around Iowa were transported into Iowa from Minnesota and Canada by continental glaciers. Most of those rocks are ***billions of years old*** and so have experienced a variety of geologic processes including mountain building. The extreme conditions that they experience during these processes have altered or ***metamorphosed*** most of them to various degrees.

Parent Rocks Are Changed to Make Metamorphic Rocks

The *parent rock* or **protolith,** the rock that exists before metamorphism starts, can be sedimentary, igneous, or metamorphic. The critical feature of the ***parent rock*** is its **mineral composition**. This is because the stability of minerals (how influenced they are by changing conditions) is what counts when metamorphism takes place. In other words, when a rock is subjected to increased temperatures and pressures, certain minerals will undergo chemical reactions and turn into new minerals, while others might just change their shape. Because some metamorphic rocks form as part of a continuous series as pressures and temperatures increase progressively, some people use the term ***parent rock*** to apply to the original rock type when it lithified, others refer to each stage in a rock's metamorphic history to be the parent rock to the next metamorphic stage. But, we don't always know what processes a rock might have experienced. For that reason the term parent rock is most easily applied to the direct precursor of the metamorphic rock we're interested in.

Temperature

The temperature that the rock is subjected to is a key variable in controlling the **type of metamorphism** that takes place. In igneous rocks, mineral stability is a function of temperature, pressure, and the presence of fluids (especially water). All minerals are stable over a specific range of temperatures. For example, quartz is stable from surface temperatures all the way up to about 3250°F. If the pressure is higher, that upper limit will be higher. If there is water present, it will be lower. On the other hand, most clay minerals are only stable up to about 300° or 400°F. Above that, they transform into micas. Most other common minerals have upper limits between 300°F and 1800°F. Some minerals will crystallize into different **polymorphs** (same composition but different crystalline structure) depending on the temperature and pressure. Quartz is a good example because slightly different forms are stable between 0°F and 3250°F . The minerals kyanite, andalusite, and sillimanite are polymorphs with the composition Al_2SiO_5. They are stable at different pressures and temperatures, and are important indicators of pressures and temperatures in metamorphic rocks.

Pressure

Pressure is important in metamorphic processes for two main reasons. First, it has implications for mineral stability. Second, it has implications for the texture of metamorphic rocks. Rocks that are subjected to very high confining pressures are typically denser than others because the mineral grains are squeezed together, and because they may contain mineral polymorphs in which the atoms are more closely packed. Because of plate tectonics, pressures within the crust are typically not applied equally in all directions. In areas of plate convergence, the pressure in one direction (perpendicular to the direction of convergence) is typically greater than in the other directions. In situations where different blocks of the crust are being pushed in different directions, the rocks will be subjected to sheer stress. One of the results of directed pressure and sheer stress is that rocks become ***foliated*** — meaning that minerals within them become aligned.

Fluids

Water is the main fluid present within rocks of the crust. The presence of water is important for two main reasons. First, water facilitates the transfer of ions between minerals and within minerals, and therefore increases the rates at which metamorphic reactions take place. So, while the water doesn't necessarily change the outcome of a metamorphic process, it speeds the process up so metamorphism might take place over a shorter time period, or metamorphic processes that might not otherwise have had time to be completed are completed. Secondly, water, especially hot water, can have elevated concentrations of dissolved substances, and therefore it is an important medium for moving certain elements around within the crust. So not only does water facilitate metamorphic reactions on a grain-to-grain basis, it also allows for the transportation of ions from one place to another. This is very important in ***hydrothermal processes*** and in the formation of mineral deposits.

Time

Most metamorphic reactions take place at very slow rates. For example, the growth of new minerals within a rock during metamorphism has been estimated to be about ***1/2 inch in 10 million years***. For this reason, it is very difficult to study metamorphic processes in a lab. While the rate of metamorphism is slow, the tectonic processes that lead to metamorphism are also very slow, so in most cases, the chance for metamorphic reactions to be completed is high. For example, one important metamorphic setting is many miles deep within the roots of mountain ranges. A mountain range takes tens of millions of years to form, and tens of millions of years more to be eroded to the extent that we can see the rocks that were metamorphosed deep beneath it.

http://www.geologyin.com/2018/01/the-factors-that-control-metamorphic.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., 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:

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