Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS **SEPTEMBER 2023** **VOL. 49, ISSUE 09**

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

Next CVRMS Meeting
Tues. September 19
7:00 pm

Hiawatha Community Center

101 Emmons St., Hiawatha - 7:15 pm

featured presentation

Geology and Hydrogeology of the Iowa (and Cedar) River Watershed

by Ray Anderson

Cedar Valley Rocks & Minerals Society

Coralville Lake & Lake Macbride
Johnson County
Color Infrared

Jellyfish May Have Been Roaming the Seas for at Least 500 Million Years

Despite lacking blood, a heart, or a brain, slimy jellyfish are one of Earth's most ubiquitous sea creatures, and various species live in all of the planet's oceans. They are some of the Earth's oldest animals, having been around for roughly more than **500 million years *(that's 250 million years older than the earliest dinosaurs).*** Now, scientists with Toronto's Royal Ontario Museum have found the oldest swimming jellyfish in the fossil record. The discovery of the newly named *Burgessomedusa phasmiformis* is described in a study published August 1 in the journal *Proceedings of the Royal Society B.* Jellyfish belong to a clade of animals called medusozoans, which includes the box jellies, hydroids, stalked jellyfish, and true jellyfish that swim in the oceans today. Medusozoans are part of the group Cnidaria, which also includes sea anemones and corals. The discovery of *Burgessomedusa* shows that large, swimming jellyfish that are bell- or saucer-shaped had already evolved over 500 million years ago. Jellyfish are made of roughly 95 percent water, making them tricky to capture in the fossil record. However, the *Burgessomedusa* fossils are exceptionally well preserved in the Burgess Shale in the Canadian Rockies. The Royal Ontario Museum now holds close to 200 specimens that were used to learn more about the internal anatomy and tentacles of ancient jellyfish, with some specimens measuring more than seven inches long. Like some modern jellyfish, *Burgessomedusa* would also have been capable of free-swimming. Their tentacles would have helped it catch pretty big prey. Although jellyfish and their relatives are thought to be one of the earliest animal groups to have evolved, they have been remarkably hard to pin down in the Cambrian fossil record. This discovery leaves no doubt they were swimming about at that time. This study uses fossil specimens that were discovered at the Burgess Shale during the late 1980s and 1990s. This adds yet another remarkable lineage of animals that the Burgess Shale has preserved chronicling the evolution of life on Earth. https://mail.google.com/mail/u/0/#inbox/FMfcgzGtwVzrtqnQjfKwKzGWtnHFpNnC

Artistic reconstruction of a *Burgessomedusa phasmiformis* swimming in the Cambrian sea

Man Uses Strange Rock as Doorstop For Decades. It Turned Out to Be Worth a Fortune

One of the largest meteorites ever recorded in Michigan never came to the attention of experts until a whopping 80+ years after its discovery. Living a humble life as a 22-pound doorstop at a local farm, the space rock laid around for several decades before being recognized by the scientific community. "*I could tell right away that this was something special,*" Mona Sirbescu, a geologist at Central Michigan University explained. *"It's the most valuable specimen I have ever held in my life, monetarily and scientifically."* David Mazurek, a man from Grand Rapids, Michigan, had asked Sirbescu if she could examine a rock he'd had for 30 years, in case it was a meteorite. Not only was it indeed a space rock, but a spectacular one at that. The object, nicknamed the **Edmore meteorite**, is a large iron-nickel meteorite with a considerable amount of nickel, constituting around 12 percent. How the meteorite came into Mazurek's possession is a story in itself. According to Sirbescu, when Mazurek bought a farm in Edmore, Michigan in 1988, he was shown around the property by the previous owner, and saw a large, strange-looking rock being used to prop open a shed door.

When Mazurek asked the outgoing owner about the rock, he was told the doorstop was actually a meteorite. The man went on to say that in the 1930s he and his father had seen the meteorite shoot down at night onto their property, *"and it made a heck of a noise when it hit"*. The next morning, the pair found the crater left by the object, and dug the meteorite out of the newly formed ditch. It was still warm, they said. The craziest bit? The man told Mazurek that, since the meteorite was a part of the property, it would now belong to him. And so Mazurek kept the space rock for 30 years, and continued using it as a doorstop, except for the occasions when his kids took the rock to school for show and tell. Eventually, he noticed people were making money from finding and selling small pieces of meteorites, so he figured he should get his giant rock evaluated. We can imagine Mazurek must have been elated when he finally did so, as meteorites, due to their rarity and scientific value, can often fetch high price tags. *"What typically happens with these at this point is that meteorites can either be sold and shown in a museum or sold to collectors and sellers looking to make a profit,"* Sirbescu said. In the end, Mazurek sold his meteorite to Michigan State University's Abrams Planetarium. The price tag? $75,000. Not too bad for an old doorstop. https://www.sciencealert.com/man-uses-strange-rock-as-doorstop-for-decades-it-turned-out-to-be-worth-a-fortune

CVRMS Board Meeting July 27 — Minutes —

MEETING CALLED TO ORDER: 7:20pm by Marv Houg at his house. Members present were Dell James, Matt Burns, Marv Houg, Kim Kleckner, Ray Anderson, Bill Desmarais, Sharon Sonnleitner, and Jay Vavre.

SECRETARY'S MINUTES: Reviewed and Ray motion to approve and Kim seconded. All approved.

TREASURER'S REPORT: No report, Dale not present.

2024 ROCK SHOW: Discussion about raising the vendor table fees, since Hawkeye Downs raised our rental cost. Sharon had done extensive work old and new costs and charges. Matt made a motion to raise the per-foot table fees by 21% starting with the 2024 show which increases fees to $9 (demo dealers) or $10 per running foot (regular dealers). Bill seconded. All approved.

2023 ROCK AUCTION: Marv received an email from someone who had inherited things and about 2000 pounds of rocks and equipment, including a faceting machine. **Jay requested** that Marv can get pertinent information from potential new consigners for next auction. **Marv will ask Dale** if he confirmed the Food Truck for the Saturday auction.

FIELD TRIPS: Matt will keep us informed about future field trips.

BILLS BUS TRIP: Bus company will let Bill know about cost what with fluctuating gas prices. **39 people** have signed up. **Discussion about future trips**. Need to get within 4 hours distance. Kim suggested Calkins Nature Center near Iowa Falls and Bill will look into it and the West Bend grotto.

NEW BUSINESS: Jay volunteered to take the *Mineralogical Record* magazines donated by Paul Garvin. **Dell will call** *Collectors Journal* about add for auction. **Etiquette by audience** during a presentation: "No phones or questions during presentations." **A teacher from Des Moines** asked about a program on geodes for a class. Marv will respond to her and give her the names of people in the Des Moines Club. **Sunday at the quarry** is October 1, the theme is *Exploring the Earth*, will be at the Morgan Quarry, 4016 Donald St. Waterloo. Usually attracts a huge crowd.

WIRE WRAP CLASSES: The first wire wrap class will be on August 24 at 6:00 p.m. at Hiawatha Community Center. Matt made a motion that we pay Sara Wehage $50 to cover gas for her trip from Des Moines. Ray seconded. All approved.

MOTION TO ADJOURN by Jay seconded by Ray. Meeting adjourned 9:00 pm .

Respectfully submitted,
Dell James, Secretary

Deadly Swarm of Earthquakes in Japan Caused by Magma Moving Through Extinct Volcano

A huge swarm of earthquakes that has been rocking Japan for three years appears to be the result of fluids moving through an extinct, collapsed volcano, new research suggests. The swarm is happening on the Noto Peninsula by the Sea of Japan, on the north coast of the country. There has not been volcanic activity in this area for 15.6 million years. However, a new study published June 8 in the journal *JGR Solid Earth* found that the quakes are occurring in a pattern that suggests liquid magma is still moving around deep below the surface in an ancient, collapsed caldera. "*This earthquake swarm was caused by upward fluid movement through a complex network of faults,*" according to the study's lead author Keisuke Yoshida, an Earth scientist at the Research Center for Prediction of Earthquakes and Volcanic Eruptions at Tohoku University in Japan. The swarm began in December 2020. Since then, there have been over 1,000 magnitude 2 or larger earthquakes, including one magnitude 5.4 quake in June 2022 and a magnitude 6.5 quake in May 2023 that killed one person and injured dozens more. Yoshida and his colleagues investigated the swarm by studying the seismic waves from more than 10,000 magnitude 1 or larger quakes that occurred in the area in the past three years. They found that the quakes originated 12.4 miles deep in the crust, before gradually migrating to shallower depths. This is consistent with fluid ascending through an existing network of faults, the researchers reported. The location of the quake epicenters occurred in a circular pattern, suggesting a ring-like structure to this fault network. This could indicate an ancient, collapsed caldera from a now-extinct volcano. It's not unusual for long-dead volcanos to still hold pockets of gooey magma, the researchers wrote, and when these fluids move, they can deform the crust and cause faults to slip and slide against one another. Swarms like this can happen anytime in subduction zones, where the grinding of one plate under another continuously moves fluids around the crust, Yoshida said. It's also possible that the devastating magnitude 9.1 Tohoku earthquake in 2011 set off fluid movement that is still echoing today; that quake was followed by several small swarms in northeastern Japan, Yoshida said. The question now, Yoshida said, is how this current swarm transitioned from many small quakes to the large, damaging temblor that occurred in May this year. The team is working to understand how the crust might have been moving without shaking, a phenomenon called aseismic slip, before that quake. *"I would like to obtain information on the transition process from the earthquake swarm to the M6.5 earthquake that occurred in May 2023,"* Yoshida said. *"In particular, we need to know the fluid and aseismic slip conditions prior to the M6.5 earthquake*. https://www.livescience.com/planet-earth/earthquakes/deadly-swarm-of-earthquakes-in-japan-caused-by-magma-moving-through-extinct-volcano?

Spotlight Gemstone: Sapphire

September's Birth Stone

Sapphire, the birthstone for September and the gem of the 5th and 45th anniversaries, is a gemstone variety of the mineral corundum, an aluminium oxide (Al_2O_3). It frequently contains traces of iron, titanium, chromium, copper, or magnesium. Typically associated with the color blue, sapphires can also naturally occur in a wide variety of other colors such as blue, yellow, purple, orange, green colors (which are also called "*fancy sapphires*"). "*Parti sapphires*" are those sapphires which show two or more colors in a single stone. The only color which sapphire cannot be is red (*red colored corundum is called ruby*). Commonly, natural sapphires are cut and polished into gemstones and worn in jewelry. They also may be created synthetically in laboratories for industrial or decorative purposes in large crystal boules. Because of the remarkable hardness of sapphires, 9 on the Mohs scale (the third hardest mineral, after diamond at 10 and moissanite at 9.5), sapphires are also used in some non-ornamental applications, including infrared optical components, wristwatch crystals and movement bearings, and very thin electronic wafers used as insulating substrates in special-purpose solid-state electronics. The sapphire is one of the three gem-varieties of corundum, the other two being *ruby* (defined as corundum in a shade of red) and *padparadscha* (a pinkish orange variety). Although blue is their most well-known color, sapphires may also be colorless or shades of gray and black. Blue sapphires are evaluated based upon the purity of their primary hue. Purple, violet, and green are the most common secondary hues found in blue sapphires. Blue sapphires with up to 15% violet or purple are generally said to be of fine quality. Blue sapphires with any amount of green as a secondary hue are not considered to be fine quality. The 423-carat (84.6 g) Logan sapphire in the National Museum of Natural History, in Washington, D.C., is one of the largest faceted gem-quality blue sapphires in existence.

What in the World?

What in the World is this fascinating geological structure and how did it form??

August's Photo

Last month's ***What in the World*** photo is a sample of **Howardite,** also known as "*Rattlesnake Jasper*" and "*Royal Flamingo Jasper.*" It is a rare form of opalized/silicate volcanic tuff from northern **Nevada**. Howardite is a very unique and beautiful red to brown brecciated jasper interspersed with clear agate and/or opal.

ROCK CALENDAR
CVRMS EVENTS OF INTEREST

2023

Sept. 9-10 — CVRMS Rock Auction
Amana RV Park and Event Center
Amana, Iowa
(see page 10 for additional information)

Sept. 19 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

Sept. 22-24 — Geode Fest
First Christian Church Parking Lot
3476 Main Street
Keokuk, IA

Sept. 30 — CVRMS Bus Field Trip
U of Wisc. Geology Museum and Burpee Museum
(see page 11 for additional information)

Oct. 1 — Sunday at the Quarry
BMC Aggregates Morgan Quarry
4618 East Donald Road, just east of Waterloo
10:00 am — 4:00 pm

Oct. 17 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

Nov. 22 (Wed) — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

Dec. 7 (Thur) — CVRMS Christmas Party
Hiawatha Community Center 7:15 pm
Details to be announced

Ask a Geologist

by Ray Anderson aka "Rock Doc", CVRMS Vice President

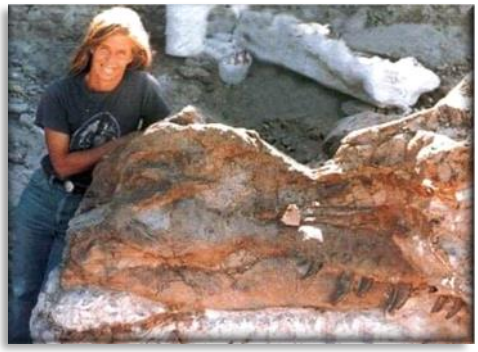
Ask a Geologist is a monthly column that gives CVRMS members an opportunity to learn more about a geologic topic. If you have a question that you would like addressed, please send it to rockdoc.anderson@gmail.com, and every month I will answer one in this column. Please let me know if you would like me to identify you with the question. I will also try to respond to all email requests with answers to your questions.

Last month I saw this short biography of the amateur paleontologist Susan Hendrickson who discovered the exquisitely preserved fossil t-rex, and I thought you might enjoy reading it.

August 12, 1990: Susan Hendrickson Discovered the Largest and Most Complete Tyrannosaurus Rex Skeleton

by Sari Rosenberg

On August 12, 1990, Susan Hendrickson discovered what turned out to be the largest and most complete Tyrannosaurus rex skeleton. On display at the Field Museum in Chicago, Ill., the T-rex is known as "**Sue**" in honor of the self-taught paleontologist who unearthed it. Born in Chicago, Ill., on December 2, 1949, Hendrickson's path to paleontology was an unconventional one.



Susan Henderson in the field with T-rex "**Sue**".

As a young girl, she was rebellious and adventurous. She convinced her parents to let her move to Fort Lauderdale, Fla., with her aunt. Once she discovered her love for swimming, Hendrickson dropped out of high school at age 17. After traveling around the country with her boyfriend, she settled in the Florida Keys when she was hired by two professional divers who owned an aquarium fish business. In the early 1960s, she began participating in wreck diving expeditions where she first cultivated her love for exploring. Hendrickson's first introduction to fossils was during a dive in the Dominican Republic in the mid-1970s. She took a day trip to an amber mine in the mountains and became fascinated with fossils when a miner showed her an insect preserved in amber. By the mid-1980s, she became one of the largest amber providers to scientists, including discovering three perfect 23-million-year-old butterflies. By the late 1980s, Hendrickson had linked up with a team of paleontologists and joined them in discovering and excavating fossilized dolphins, seals, and sharks at an ancient seabed in Peru. She followed one of the paleontologists from her Peru expedition to South Dakota. It was at that location where she made her incredible discovery of what she called *"the biggest, baddest carnivorous beast that ever walked on earth."* On August 12, 1990, Hendrickson and her colleagues were on their way home from the field site when they got a flat tire. While she waited for the tire to be changed, Hendrickson took a walk along the foot of a nearby cliff. On the ground, she saw small fragments of bones and then she looked upward. That's when she saw larger bones sticking out of the face of the cliff. Sure enough, she discovered the largest, most complete and best preserved Tyrannosaurus rex ever found. Sixty-seven million years old, the T-rex she discovered is 42 feet long with over 200 bones preserved. Hendrickson's discovery was extremely important in helping us better understand dinosaurs. Scientists were able to support the long-standing theory that modern birds evolved from, or are related to, dinosaurs. In addition, the fossil allowed them to learn that the T-rex was a lot slower than had previously been hypothesized. Two years after discovering Sue, Hendrickson joined a team of marine archaeologists in 1992 to take part in another series of diving expeditions. Two of her team's most notable discoveries on this trip were the Royal Quarters of Cleopatra as well as Napoleon Bonaparte's lost fleet from the Battle of the Nile. In the last few years, she has been spending a lot of her time working on protecting the environment on an island in Honduras. In 2008, she published her autobiography *"Hunt for the Past: My Life as an Explorer."* Although she was self-taught, Hendrickson received an Honorary PhD from University of Illinois at Chicago in 2000 and a Medal of Honor from Barnard University in 2002 for her contributions to paleontology and marine archaeology. Her advice to future explorers: *"Never lose your curiosity about everything in the universe – it can take you places you never thought possible!"*

https://www.mylifetime.com/she-did-that/august-12-1990-susan-hendrickson-discovered-the-largest-and-most-complete-tyrannosaurus-rex-skeleton

T-rex "**Sue**" on display at Field Museum in Chicago.

19 Mass Extinctions Had CO_2 Levels We're Now Veering Toward

Within a human lifetime, concentrations of CO2 in Earth's atmosphere could reach levels associated with 19 **"mass extinctions"** that have taken place in the last 534 million years, new research suggests. By 2100, atmospheric carbon dioxide levels could rise to 800 parts per million by volume (ppmv) (almost double the concentration of roughly 421 ppmv recorded this year) if we fail to curb emissions from burning fossil fuels and converting land for agriculture. That would be edging close to the average CO2 concentrations (870 ppmv) associated with huge crashes in marine biodiversity over the last 534 million years, according to a study published June 22 in the journal Earth's Future. These extinction events are preserved in the fossil record, allowing scientists to plot how biodiversity and atmospheric CO2 evolved throughout Earth's history. Atmospheric CO2 contributes to biodiversity loss via ocean acidification. The oceans soak up atmospheric carbon dioxide, which turns the water more acidic, reducing the availability of calcium carbonate ions needed for organisms to build their skeletons and shells. When these effects are strong enough to affect the entire food chain, they can lead to mass extinctions. In the new study, researchers found that CO2 concentrations oscillate with marine biodiversity in the fossil record. *"When carbon dioxide goes up, extinction goes up, and when carbon dioxide goes down, extinction goes down,"* researchers said. They used this relationship to estimate biodiversity loss under current atmospheric conditions. *"The current concentration of CO2 in the atmosphere is 421 ppmv,"* they said. *"When we plug that into the relationship between biodiversity and concentration of CO2 in the past, that corresponds to a biodiversity loss of 6.39%."* This estimate comes close to the percentage of biodiversity lost in the smallest "mass" extinction event considered in the study which doomed 6.4% of species 132.5 million years ago. This means "humans have already caused extinction-grade biodiversity losses," they said. Scientists generally define mass extinctions as three quarters of species dying out over short geological time periods, in under 2.8 million years. Under this definition, five mass extinction events have shaped Earth's history, with a sixth likely underway, and another 45 peaks in biodiversity loss that can also be considered mass extinctions. For this study, a mass extinction was defined as *"any peak in biodiversity loss that is flanked by lesser values."* By this definition, there have been 50 mass extinctions in the last 534 million years, ranging from 6.4% to 96% of marine species going extinct. The results suggest ocean acidification resulting from elevated CO2 concentrations is *"the immediate kill mechanism"* of most mass extinctions, according to the study. The link between CO2 in the atmosphere, global temperature, and biodiversity loss is well established. Atmospheric CO2 concentrations are currently rising by more than 2 ppmv every year, which may trigger a 10% loss in biodiversity over the next few decades, Davis said. https://www.livescience.com/planet-earth/climate-change/19-mass-extinctions-had-co2-levels-were-now-veering-towards-study-warns.

What Is LIDAR?

LIDAR stands for ***Light Detection and Ranging.*** Much like sound-based echolocation technologies such as sonar, this popular ranging method uses the time it takes for a focused, coherent wave of light to travel towards a surface and back again to calculate distances. First used in the 1960s for military targeting, the technology has since been adapted to make use of advances in satellite-based radio-navigation systems and rapid computer processing to become a high-precision mapping tool. How does it work? As light of different energies reflects from different substances in specific ways, the intensity of an electromagnetic *'echo'* can convey a lot of information about layers of material. Different wavelengths of laser emission are today used to probe through foliage and water columns to construct highly detailed topographical layouts of landscapes and seafloors. Emitted into the sky, LIDAR can study the atmosphere to profile clouds, measure wind speeds, and analyze the makeup of gases and particulates. With technology dropping in price, we might see its application in even more fields. Many brands of mass-market autonomous vehicles, for example, are exploring the use of LIDAR as a means of allowing cars to 'see' the environment. The latest generations in smart personal technology are also putting LIDAR to good use as a way to scan surroundings in 3D. LIDAR is undoubtedly a tool we'll be seeing a lot more of in the future. What's the difference between RADAR and LIDAR? Both RADAR (which is now more commonly known as radar) and LIDAR bounce waves of electromagnetic radiation off objects to measure how far away it is from the light source. Where they differ is primarily in the wavelengths they occupy. Radar (Radio Detection and Ranging) was developed from research into the reflections of radio waves in the late 19th century. By the Second World War, radio frequency-based ranging technology was being used in military applications for detecting incoming enemy attacks. These low-frequency radio waves are ideal for traveling great distances through dense fog and cloud cover. Unfortunately, those long waves reduce the resolution of any objects being measured. At a distance of just 325 feet, the smallest details detectable by radar have to be a few meters across. Development of the ruby laser in the 1960s opened the way for higher frequency electromagnetic radiation sources to be used. Numerous pulses of laser light in the infrared, visible, or ultraviolet parts of the spectrum provide much tighter resolution at higher ranges, allowing LIDAR to reveal details a radar's wavelength would never see.

Amazonian archeological site revealed by LIDAR

https://www.sciencealert.com/what-is-lidar

Note: The State of Iowa has contracted several aerial LIDAR surveys. This information has proved invaluable for geologic mapping and many other applications. The Iowa data can be accessed at *Lidar | geodata (iowa.gov)*.

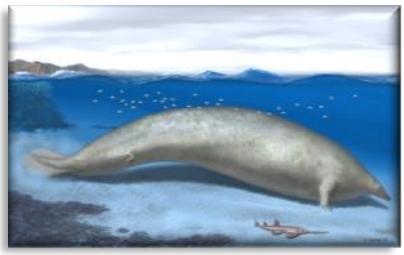
How Diamonds Make Their Way to The Surface

"A diamond is forever." That iconic slogan, coined for a highly successful advertising campaign in the 1940s, sold the gemstones as a symbol of eternal commitment and unity. But new research carried out by researchers in a variety of countries and published in *Nature*, suggests that diamonds may be a sign of break up too, of Earth's tectonic plates, that is. It may even provide clues to where is best to go looking for them. Diamonds, being the hardest naturally-occurring stones, require intense pressures and temperatures to form. These conditions are only achieved deep within the Earth. **So how do they get from deep within the Earth, up to the surface?** Diamonds are carried up in molten rocks, or magmas, called kimberlites. Until now, we didn't know what process caused kimberlites to suddenly shoot through the Earth's crust having spent millions, or even billions, of years stowed away under the continents. Most geologists agree that the explosive eruptions that unleash diamonds happen in sync with the supercontinent cycle: a recurring pattern of landmass formation and fragmentation that has defined billions of years of Earth's history. However, the exact mechanisms underlying this relationship are debated. Two main theories have emerged. **One proposes** that kimberlite magmas exploit the *"wounds"* created when the Earth's crust is stretched or when the slabs of solid rock covering the Earth, known as tectonic plates, split up. **The other** theory involves mantle plumes, colossal upwellings of molten rock from the core-mantle boundary, located about 1,800 miles beneath the Earth's surface. In addition, many kimberlites don't display the chemical *"flavors"* we'd expect to find in rocks derived from mantle plumes. In contrast, kimberlite formation is thought to involve exceedingly low degrees of mantle rock melting, often less than 1%. So, another mechanism is needed. A recent study offers a possible resolution to this longstanding conundrum. The researchers deployed statistical analysis, including machine learning, an application of artificial intelligence (AI), to forensically examine the link between continental breakup and kimberlite volcanism. The results of their global study showed the eruptions of most kimberlite volcanoes occurred 20 to 30 million years after the tectonic breakup of Earth's continents. Furthermore, a regional study targeting the three continents where most kimberlites are found (Africa, South America and North America) supported this finding. It also added a major clue: kimberlite eruptions tend to gradually migrate from the continental edges to the interiors over time at a rate that is uniform across the continents. This begs the question: *what geological process could explain these patterns?* To address this question, the researchers employed multiple computer models to capture the complex behavior of continents as they experience stretching, alongside the convective movements within the underlying mantle. They proposed that a domino effect can explain how breakup of the continents eventually leads to formation of kimberlite magma. During rifting, a small region of the continental root (areas of thick rock located under some continents) is disrupted and sinks into the underlying mantle. The sinking of colder material and upwelling of hot mantle causes a process called *edge-driven convection*. Their models show that this convection triggers a chain of similar flow patterns that migrate beneath the nearby continent. They show that while sweeping along the continental root, these disruptive flows remove a substantial amount of rock, hundreds of feet thick, from the base of the continental plate. Various other results from their computer models show that this process can bring together the necessary ingredients in the right amounts to trigger just enough melting to generate gas-rich kimberlites. Once formed, and with great buoyancy provided by carbon dioxide and water, the magma can rise rapidly to the surface carrying its precious cargo. This model doesn't contradict the spatial association between kimberlites and mantle plumes. On the contrary, the breakup of tectonic plates may or may not result from the warming, thinning and weakening of the plate caused by plumes. However, their research clearly shows that the spatial, time-based and chemical patterns observed in most kimberlite-rich regions can't be adequately explained solely by the presence of plumes. The processes triggering the eruptions that bring diamonds to the surface appear to be highly systematic. They start on the edges of continents and migrate towards the interior at a relatively uniform rate. This information could be used to identify the possible locations and timings of past volcanic eruptions tied to this process, offering insights that could enable the discovery of diamond deposits and other rare elements needed for the green energy transition. If we are to look for new deposits, it's worth bearing in mind that there are currently efforts by campaign groups to try to eliminate from world markets those diamonds that are used to fund wars (conflict diamonds) or those coming from mines with poor conditions for workers. Diamonds may or may not be forever, but this recent research shows that new ones have been repeatedly created over long periods in the history of our planet. https://www.sciencealert.com/how-diamonds-make-their-way-to-the-surface

Raw diamond crystal in Kimberlite.

Most Massive Animal of All Time May Have Been Found in Peruvian Desert

The bones of a whale that lived 39 million years ago are seriously testing what we thought was possible for the size of vertebrates. The blue whale (***Balaenoptera musculus***) has long been considered the heaviest animal ever to have lived on Earth. But the newly discovered ***Perucetus colossus*** could leave it in the dust. Measurements of its bones suggest that its skeleton could have weighed two **to three times that of the blue whale's**. *"We use the skeletal fraction to estimate the body mass of P. colossus, which proves to be a contender for the title of heaviest animal on record,"* writes a team led by paleontologist Giovanni Bianucci. *"Cetacean peak body mass had already been reached around 30 million years before previously assumed, in a coastal context in which primary productivity was particularly high."* Scientists have wondered for a long time what limits the sizes and masses to which vertebrates can grow. In the ocean, there's a little more wiggle room, with buoyancy counteracting the effects of gravity that place higher stress on the bodies of land animals. And for cetaceans (marine mammals such as whales and dolphins) there's a benefit to being larger: it helps prevent core heat loss in water, which has high thermal conductivity to air. However, a recent study found that even for filter feeding whales, like blue whales, there's an upper size limit. The low metabolic cost of such a feeding strategy allows the whales to coast with a minimum of energy expenditure, but it's limited by prey availability. So *P. colossus* might be a little difficult to get our heads around, given that all our previous studies of maximum size have been based on smaller animals. Its size has been estimated from a number of bones recovered from Southern Peru: 13 vertebrae, four ribs, and part of a hip bone, belonging to a group of the first fully aquatic cetaceans known as the basilosaurids. A close study suggests that the specimen wasn't quite fully grown. Based on a comparison with known whales, Bianucci and his team calculated the size of *P. colossus*, and estimated that its body mass was somewhere between 85 and 340 tons. The biggest blue whale ever measured came in at 199 tons. The bones also showed a high degree of thickening and densification, features often seen in marine mammals to provide natural ballast and allowing them to have larger lungs. The time in which *P. colossus* lived, in the middle of the Eocene, was a particularly rich one for the sort of food that the whale may have eaten, which would have allowed it to grow so large. The researchers believe that the whale was relatively slow, preferred coastal habitats, and lived near the seafloor in shallow waters. Changes in the ecology of the ocean then would have seen the subsequent decline of *P. colossus*. "*This new record supports the hypothesis that basilosaurids hyperspecialized to coastal habitats during the end of the Eocene,*" the researchers write, *"and that the subsequent major drop in the productivity of these environments may have preferentially impacted these whales, giving way for their relatives (the ancestors of present whales and dolphins) that invaded more offshore habitats."* https://www.sciencealert.com/most-massive-animal-of-all-time-may-have-been-found-in-peruvian-desert

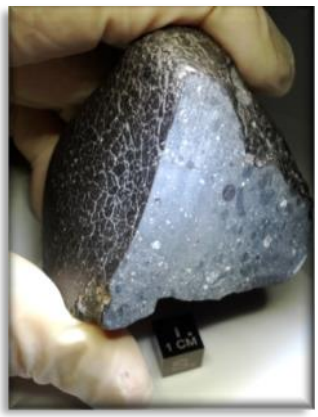


Artist's concept of *Perucetus colossus*

Some Meteorites Are Mysteriously Magnetic, And We Finally Know Why

One of the striking things about iron meteorites is that they are often magnetic. The magnetism isn't strong, but it holds information about their origin. This is why astronomers discourage meteorite hunters from using magnets to distinguish meteorites from the surrounding rock, since hand magnets can erase the magnetic history of a meteorite, which is an important scientific record. Magnetic meteorites occur because they form in the presence of a magnetic field. The iron grains within the meteorite are aligned along the external magnetic field, which gives the meteorite its own magnetism. For example, the Martian meteorite known as **Black Beauty** gained its magnetism from the strong magnetic field of young Mars. Some meteorites are magnetic but shouldn't have formed in a strong magnetic field. Iron meteorites are typically categorized by chemical composition, such as their ratio of nickel to iron. One type, known as IVA, is known to be fragments of smaller asteroids. Small asteroids don't have strong magnetic fields, so IVA meteorites shouldn't be magnetic, but many of them are. There's a new study showing how that's possible. Small asteroids form through what is known as the rubble pile method. Small chunks of iron-rich rock aggregate over time, building up to become an asteroid. For a body to generate a strong magnetic field, there needs to be liquid iron to create a dynamo effect, and since small asteroids don't experience this, they can't have magnetic fields. Or can they? Asteroids are also subject to collisions over time. It's these collisions which break off fragments that become the meteorites we find on Earth. But the authors show that impacts can create a magnetic dynamo within an asteroid. If a colliding body is not big enough to shatter the asteroid, but large enough to melt a layer of material near the surface, then a chain of events can occur. When a cold rubble core is surrounded by a molten layer, the core is heated up. Lighter elements evaporate out of the core and migrate toward the surface, which churns the layers to generate convection. The convection of iron generates a magnetic field, which imprints itself on parts of the asteroid. Later collision then creates magnetic fragments, some of which reach Earth. So the magnetism of IVA meteorites comes not from the original formation of their parent asteroid, but rather from later collisions that stirred up their core. Knowing this, researchers can gain a better understanding of the history of our solar system, and how things such as planetary drift might have triggered more frequent asteroid collisions. Yet another reason not to look for meteorites with hand magnets. The very act of finding a meteorite could also erase the history of its collisions.

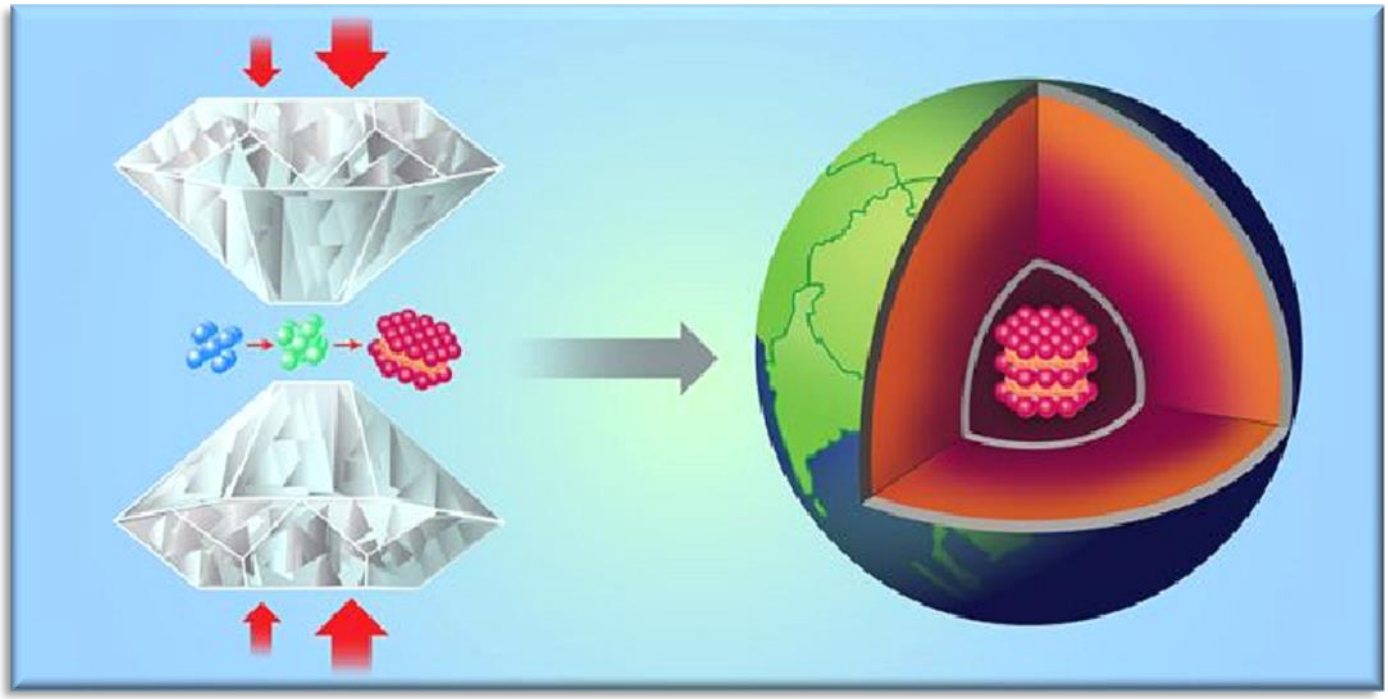
https://www.sciencealert.com/some-meteorites-are-mysteriously-magnetic-and-we-finally-know-why



Black Beauty meteorite

Physicists Just Synthesized Crystals Of The Material We Think Is in Earth's Core

Using an anvil made of diamond, physicists have successfully squeezed iron into the form we think it has deep in the center of Earth. It's called hexaferrum, or epsilon iron (ϵ-Fe), and it's only stable at extremely high pressures. Scientists think the majority of the iron in Earth's core takes this form, and a detailed understanding of its properties could help us understand why the very center of our planet seems to have directional variations in its texture – a property known as anisotropy. There's just one problem in this quest to understand Earth's core. Here on the surface, in a nice, relatively low atmospheric pressure regime, conditions in the core are difficult to replicate. But we can create high-pressure conditions for brief pulses of time, using diamond anvils and heat. "We report here the synthesis of ϵ-Fe single crystals in diamond anvil cells and subsequent measurement of single-crystal elastic constants of this phase up to 32 GPa at 300 Kelvin with inelastic X-ray scattering," writes a team led by physicist Agnès Dewaele of the University of Paris-Saclay in France. The challenge lay in converting the atmospheric pressure phase of iron called ferrite, or alpha iron. Usually, when high pressure is applied to ferrite in an attempt to crush it into hexaferrum, it fractures into tiny crystals that are unsuitable for detailed analysis, which frustrates efforts to study its elastic properties. So, Dewaele and her colleagues approached the problem stepwise. They placed crystals of ferrite in a diamond anvil in a vacuum heater, and increased the pressure to 7 gigapascals (that's around 70,000 times the atmospheric pressure at sea level) and the temperature to 800 Kelvin (527 degrees Celsius, or 980 Fahrenheit). This produced an intermediate phase of iron that occurs at high temperatures in atmospheric conditions called austenite, or gamma iron. Austenite has a different structure to ferrite, and the austenite crystals the team made changed into the hexaferrum phase far more smoothly at pressures between 15 and 33 gigapascals at 300 Kelvin. Then, they used a synchrotron beamline at the European Synchrotron Radiation Facility to probe the hexaferrum and analyze its properties. What we



A diagram illustrating the compression of iron in a diamond anvil to produce hexaferrum. (APS/C. Cain; S. Deemyad/University of Utah)

know of Earth's core is largely reconstructed based on seismic data. Acoustic waves created by planetary tremors propagate differently through different materials; this is how we know that Earth's core is layered like a jawbreaker. But for a more detailed understanding, we need to know what the material in the core actually is, and how it responds to acoustic waves. The work of Dewaele and her team showed that hexaferrum's elasticity is directionally dependent; waves propagate faster along one particular axis. This anisotropy persists during pressure changes, too, which suggests that it's also how hexaferrum behaves in the up to 360 gigapascal environment of the inner core. This is consistent with observations of how seismic waves travel through the planet. The findings suggest that the team's techniques could make an excellent probe for understanding the extreme conditions at the center of our world.

https://www.sciencealert.com/physicists-just-synthesized-crystals-of-the-material-we-think-is-in-earths-core

2023 Auction Venue - Amana, Iowa

The CEDAR VALLEY ROCKS & MINERALS SOCIETY Presents

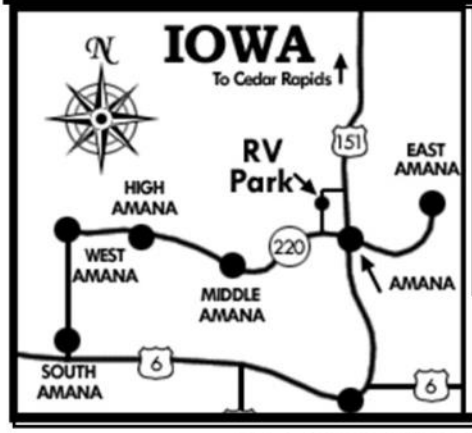
A TWO-DAY ROCK and MINERAL AUCTION

Amana RV Park and Event Center, 3850 C St, Amana, Iowa 52203

Saturday, September 9 – 9:00 a.m. - 7 p.m.?

Sunday, September 10 – 9:00 a.m. – 3 p.m.?

Viewing Hours: Fri., Sep. 8, from 5:00 to 7:30 p.m.; Sat. at 7:30 a.m.; Sun at 8:00



APPROXIMATELY
1,400 LOTS
From Several Collections

LOTS of Minerals & Rough and Lake Superior Agates

Many Excellent Specimens

HOT FOOD AVAILABLE
CAMPING AVAILABLE
(www.amanarvpark.com)

THE FOLLOWING IS A PARTIAL LIST OF ITEMS TO BE AUCTIONED

EQUIPMENT WILL SELL AT 2:00 ON SATURDAY

ROCKS & MINERALS

AGATE: Bubblegum (SD), Botswana (some uncut), Brazilian (polished thick slabs & whole), Crazy Lace (Mexico), Fire, Graveyard Plum, Keswick, Lake Superior (several hundred lbs), Madagascar Dendritic (Mad River), Mexican, Mexican Black Lace, Mexican Moss, Montana Moss, Pidgeon Blood, Prairie (SD), Rainbow (Lge slab), Vaquilla
Afghan Lapis
Amethyst, Thunder Bay
Apache Tears (polished)
Australian Opal
Cave Stalactites
Dendritic Slabs, E. IA
Dragon Egg
Fluorescent Minerals: Calcite, Willemite, etc.
Fordite
Geode, 2 Lge, 1 Lge Snowball
Geodes, Kahoka (1 is 6")
Geodes, Keokuk, whole and cracked
Geodes, some botryoidal, some red-rind
Gold Ore
Iridescent Calcite, Knoxville IA
Jade, WY
Jasper
Kunzite
Maryellen Jasper, MN
Mexican Coconuts, some sawed and hollow
Mexican Opal: cantera, jelly, fire
Mica
Millerite, Carthage IL & Ollie
Miscellaneous slabs
Moroccan Material, polished
Ocean Jasper
Optical Quartz
Oriental Gold
Polished Stones
Quartz with MuscoviteRhodochrosite
Scepter Quartz
Selenite, Mexico
Septarian Nodules (cut, not polished)
Sodalite
Thomsonite, MN
Zeolites from India

FOSSILS

Ammonites
Coprolite
Insects
Limb Casts, Eden Valley, WY
Petrified Coral, 14"
Petrified Wood, polished slabs, Indonesia
Petrified Rainbow Sponge, WY
Petrified Wood, UT
Shark Teeth
Texas Springs Pink Limb Casts, NV
Trilobites, Morocco

JEWELRY

Bolo ties
Cabs
Faceted Stones
Findings
Miscellaneous Jewelry
Silver

EQUIPMENT (sells at 2:00 on Sat.)

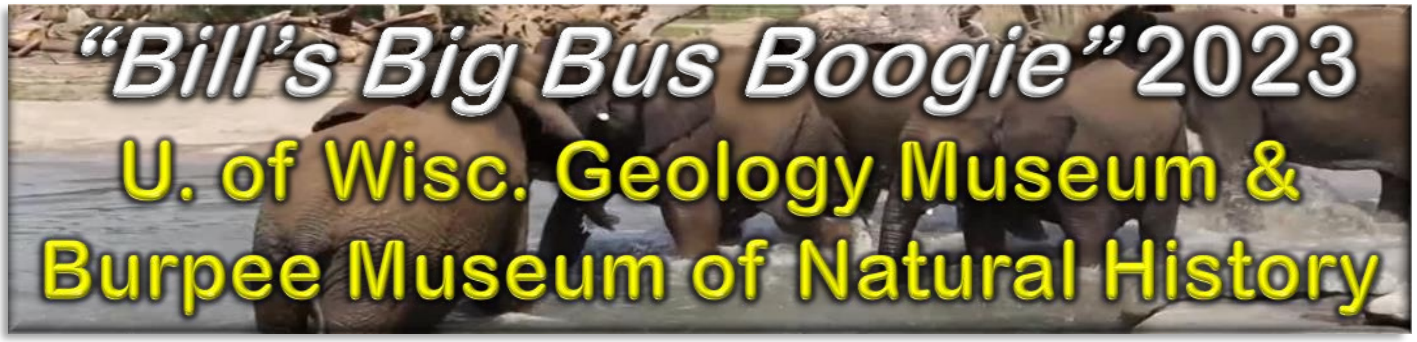
Faceting Machine
Sears Craftsman Tool Cabinet
Tools
Tumbler (small, new in box)

MISC.

Books
Fossil Fish Table
Hawkeye Pearl Button Factory, (artifact), Mississippi river shellfish muscle button blanks
Iridescent shell pieces (paua?)
Plastic Bags
Polished Stones for Gem Trees
Rock & Gem magazines
Rock Bowl
Seashells
Septarian Spheres, with stands

I.D. will be required to obtain buying number. Cash, credit card (2.75% convenience fee) or good check. Two forms of I.D. required for all checks.
7% tax added to all sales. Buyers who provide proof of tax permits are exempt.
No items removed until settled for on day of sale. Not responsible for accidents, theft or damage.
Announcements day of sale take precedence over advertising.

CONTACTS: Marvin Houg • 319-350-9435 • m_houg@yahoo.com Sharon Sonnleitner • 319-310-0085 • sonnb@aol.com https://cedarvalleyrockclub.org



The 2023 edition of **"Bill's Big Bus Boogie"** adventure is on again after a 3-year COVID break. This year's trip will take CVMRS members on a bus field trip to the **University of Wisconsin Geology Museum** in Madison, Wisconsin, and the **Burpee Museum of Natural History** in Rockford, Illinois, on **Saturday, September 30, 2023**.

The sign-up sheet for members interested in participating in the trip will be available at club meetings. For additional information contact **Bill Desmarais** at desmarais_3@msn.com or phone **319-365-0612.**

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

2023 Bills Big Bus Boogie
will leave from Cedar Valley World Travel
6100 7th St SW, Cedar Rapids
Sat. Sept. 30 - **6:00 a.m. SHARP** and **return ~ 6:00 p.m.**
monitored parking available

September CVRMS Meeting will be the Last Chance to Sign Up

2022 & 2023 Officers, Directors, and Committee Chairs

President	Marv Houg (m_houg@yahoo.com)	(319)364-2868
Vice President.	Ray Anderson (*rockdoc.anderson@gmail.com*)	530-2419
Treasurer	Dale Stout (*dhstout55@aol.com*)	365-7798
Secretary	Dell James (cycladelics@msn.com)	446-7591
Editor	Ray Anderson (rockdoc.anderson@gmail.com)	337-2798
Liaison	Kim Kleckner (ibjeepn2@gmail.com)	560-5185
Imm. Past Pres.	Sharon Sonnleitner (sonnb@aol.com)	396-4016
Director '23	Jay Vavra (vavrajj@gmail.com)	538-3689
Director '24	Bill Desmarais (desmarais_3@msn.com)	365-0612
Director '25	Matt Burns (mlburnsmars@gmail.com)	329-4046
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. Meetings are held at the Hiawatha Community Center in the Hiawatha City Hall, 101 Emmons St., Hiawatha IA. The December meeting is a potluck dinner held on the 1st Tuesday at 6:30. June, July, and August meetings are potlucks held at 6:30 p.m. at area parks on the 3rd Tuesday of each month

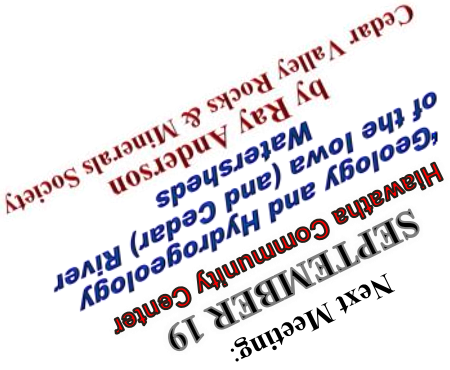
CEDAR VALLEY ROCKS & MINERAL SOCIETY

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



Ray Anderson, Editor
2155 Prairie du Chien Rd. NE
Iowa City, Iowa 52240-9620