Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS | SEPTEMBER 2020 | VOL. 46, ISSUE 9

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

Next CVRMS Meeting
Tues. September 15
7:15 pm

<<VIRTUAL MEETING>>

Join the Zoom Meeting
https://us02web.zoom.us/j/81809400356

featured presentation:

PowerPoint & Video Presentation

A Virtual Trip Into Iowa's Coldwater Cave

by

Ray Anderson

also Featuring:

Short Business Meeting

"Show Us Your Favorite Rocks"

"What Have You Have Been Up To?"

Star Hollandite Quartz

Star Hollandite Quartz is a variety of Quartz (silicon dioxide) which has dark grey/black six-pointed *"star"* inclusions of the mineral **Hollandite**. Hollandite [$Ba(Mn^{4+}{}_6Mn^{3+}{}_2)O_{16}$] is an oxide mineral. A monoclinic-prismatic white mineral containing aluminum, barium, iron, lead, manganese, oxygen, silicon, and sodium. It is the barium-manganese (III) endmember of the coronadite group. The mineral was subsequently reclassified as *ferrihollandite* by the International Mineralogical Association in 2012. Star Hollandite is formed when deposits of Hollandite become trapped within Quartz as it crystallizes. When the Hollandite was subjected to high temperatures within the Earth, the Hollandite burst into star formations within the Quartz. This variety of quartz is very rare.
http://www.geologyin.com/2020/08/star-hollandite-quartz.html?

CVRMS August 18 Virtual Meeting

>> CANCELLED <<

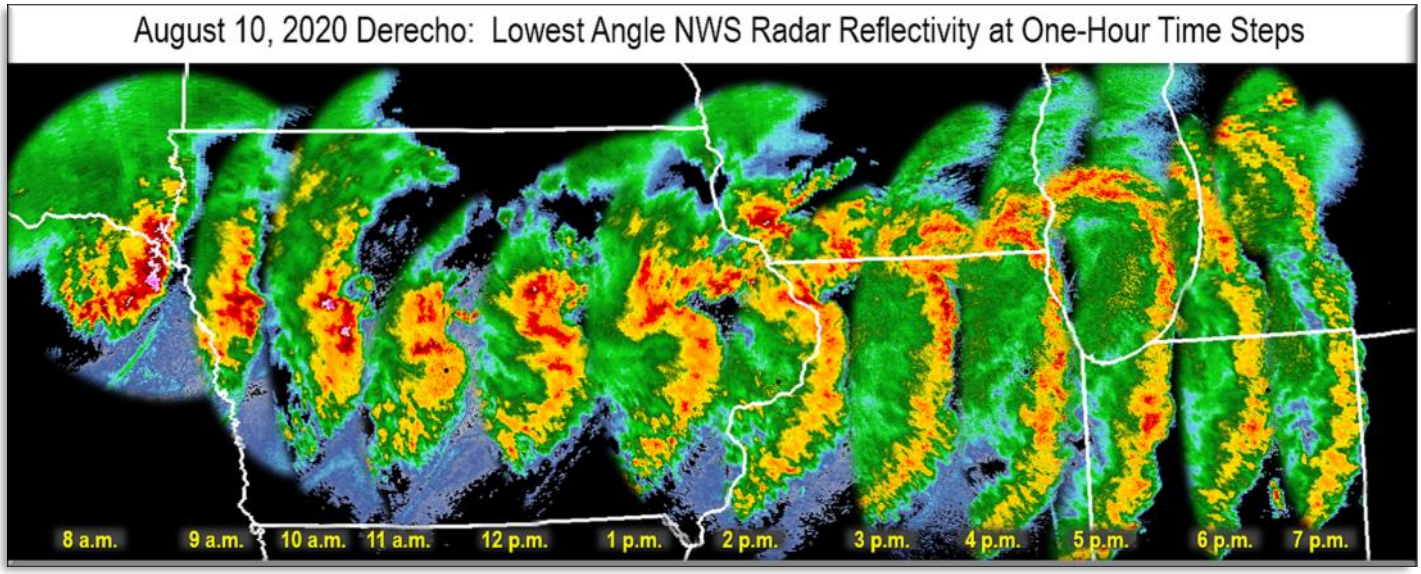
Due to derecho power and internet outages

CVRMS Board Minutes July 25

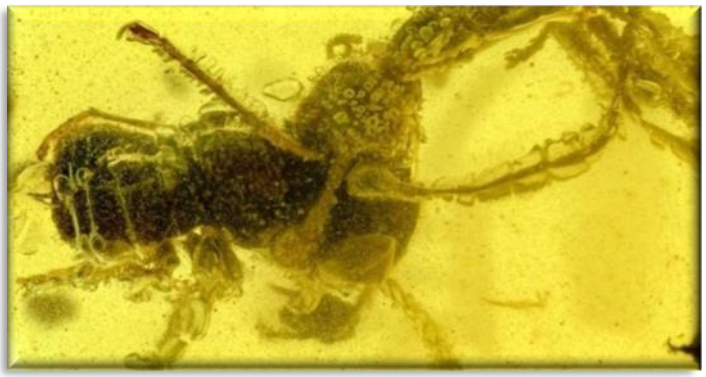
>> CANCELLED <<

Due to derecho internet outages

With the hot, and most of the time, humid weather conditions that come with summer in Iowa the threat of a somewhat rare type of severe thunderstorm event also looms. The event is known as a **derecho**. A derecho (pronounced similar to "***deh-REY-cho***") is a widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. Although a derecho can produce destruction similar to the strength of tornadoes, the damage typically is directed in one direction along a relatively straight swath. As a result, the term "*straight-line wind damage*" sometimes is used to describe derecho damage. By definition, if the wind damage swath extends more than 240 miles and includes wind gusts of at least 58 mph or greater along most of its length, then the event may be classified as a derecho. Derecho development is necessarily tied to the formation of bow echoes. A **bow echo** usually arises from a cluster of thunderstorms, but also may evolve from a single strong storm. Bow echoes most frequently occur when atmospheric winds are relatively strong and unidirectional (i.e., they vary little in direction with height but increase in speed). As the rain-cooled downdraft of a thunderstorm reaches the earth's surface, it spreads horizontally, most rapidly in the direction of the mean atmospheric flow. As the cool, dense air spreads outward, it forces the lighter, warm and moist air surrounding the storm up along the leading edge of the outflow, or gust front. Gust fronts often are marked by a band of ominous, low clouds known as "*arcus*." The rain produced by the newer storms reinforces the cold pool, strengthening the inflow of air from the back side of the developing storm complex and encouraging the downward transport of higher momentum winds from aloft. These processes can enable the system to attain a nearly steady-state condition. This increases the longevity and strength of the entire system and is what allows the storm to travel such a large area over a short amount of time. At this point, the convective system typically exhibits a pronounced bow shape on radar (**see below**). As the thunderstorms continue to increase in coverage, even more rain-cooled air reinforces the cold pool. The line of storms continue to accelerate either as one large bow echo or multiple smaller bow echoes within an overall line. At this point, widespread and persistent wind damage has been occurring for a prolonged period of time. The derecho that ravaged Iowa and much of the Midwest on August 10 caused an estimated **$4 billion** in damages. The greatest damage occurred in eastern Iowa (CR), where the highest wind speeds were recorded, and northwestern Illinois where most of the tornadoes touched down. The highest measured wind speed was 126 mph while the highest estimated from damage was 140 mph, equivalent to a Category 4 hurricane. Both events occurred in **Iowa**. https://www.weather.gov/lmk/derecho



99-Million-Year-Old "Hell Ant" Attack Captured in Amber



Photomicrograph from top view of the hell ant, *Ceratomyrmex ellenbergeri,* restraining its prey, an extinct cockroach relative called *Caputoraptor elegans*, preserved in amber

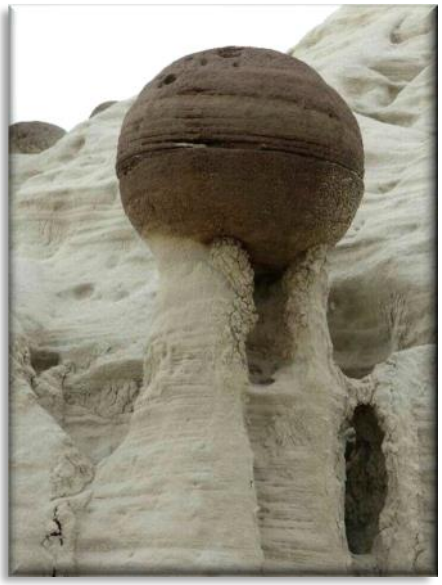
A fossil recently recovered from the age of the dinosaurs is giving scientists the most vivid picture yet of how one of the most enigmatic and fearsome groups of ants to exist once used their uncanny tusk-like mandibles and diverse horns to successfully hunt down victims for nearly 20 million years, before vanishing from the planet. The Chinese Academy of Sciences and University of Rennes in France have unveiled a stunning 99-million-year-old fossil pristinely preserving an enigmatic insect predator from the Cretaceous — a "**hell ant"** (*haidomyrmecine*) — as it embraced its unsuspecting final victim, an extinct relative of the cockroach known as *Caputoraptor elegans*. The ancient encounter, locked in amber recovered from Myanmar, offers a detailed glimpse at a newly identified prehistoric ant species *Ceratomyrmex ellenbergeri,* and presents some of the first direct evidence showing how it and other hell ants once used their killer features — snapping their bizarre, but deadly, scythe-like mandibles in a vertical motion to pin prey against their horn-like appendages. Since the first hell ant was unearthed about a hundred years ago, it's been a mystery as to why these extinct animals are so distinct from the ants we have today. This fossil reveals the mechanism behind what we might call an "*evolutionary experiment*," and although we see numerous such experiments in the fossil record, we often don't have a clear picture of the evolutionary pathway that led to them. Adaptations for prey-capture likely explain the rich diversity of mandibles and horns observed in the 16 species of hell ants identified to date. Some taxa with unarmed, elongate horns such as *Ceratomyrmex* apparently grasped prey externally, while other hell ants such as *Linguamyrmex vladi*, or "**Vlad the Impaler**" discovered in 2017, were thought to have used a metal -reinforced horn on their head to impale prey — a trait potentially used to feed on the internal liquid (*hemolymph*) of insects.
http://www.geologyin.com/2020/08/99-million-year-old-hell-ant-attack.html?

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 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 unusual sphere and where could you find it?

August's Photo

The **What in the World?** Photo from last month was **Ocean Jasper.** a rare type of silicified rhyolite (considered both an agate and a jasper) and is mined at a single location on the Ambolobozo Peninsula of Madagascar. The deposits are found on the coastline (hence the name) and can only be reached by boat and mined during low tide. The deposit formed as a rhyolite flow but has been completely silicified. The rhyolitic eyes or orbs come in an astonishing array of colors and color combinations. The background can be white, pink, green, red, or yellow. Botryoidal formations as well as white and deep green druzy are also common.

Rock Calendar
CVRMS EVENTS OF INTEREST
2020

Sept. 15—CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
******CANCELLED ******

INSTEAD
<< VIRTUAL MEETING >> on ZOOM
see page 1 for details

Sept. 19-20—CVRMS Rock Auction
Amana RV Park and Event Center
Amana, Iowa
******CANCELLED ******

Sept. 27-29 - Geode Fest and Rock Show
Chaney Creek Boat Access
Illinois Highway 96 N
Hamilton, Illinois
******CANCELLED ******

Oct. 3 - Bill's Big Bus Boogy
CVRMS Annual Bus Field Trip
U. of Wisconsin Geology Museum
& Burpee Museum
******POSTPONED ******
to be rescheduled in 2021

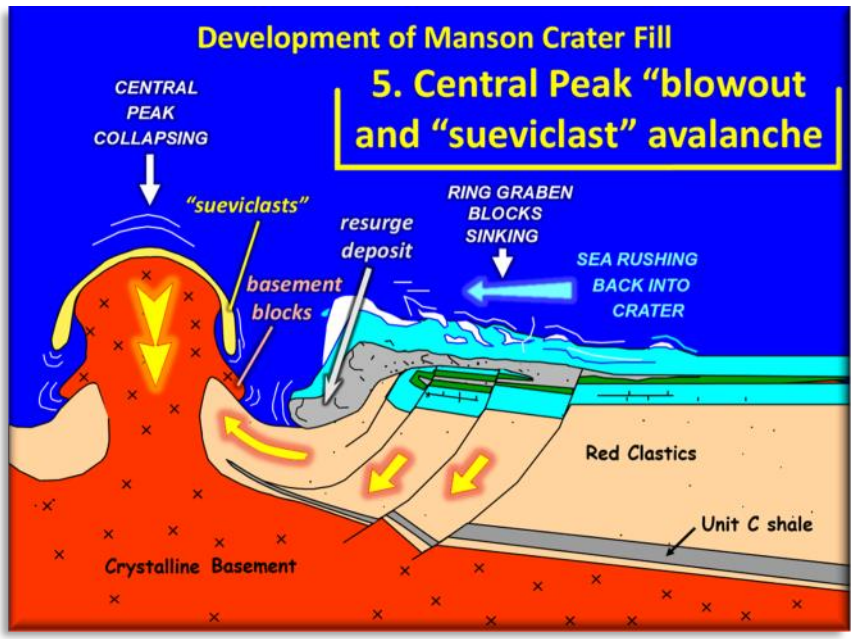
Ask a Geologist

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.

An old colleague asked me the other day, *"what geologic problem are you working on these days?"*

So I thought I would tell all of you too. Most of you know that the investigations of the Manson Impact Structure was one of my favorite projects while I worked as a geologist at the Iowa Geological Survey. Since I left the Survey, the town of Manson has drilled several additional wells in town in their attempts to develop a second town water well. Information from these new test wells, along with previous test wells drilled just before I retired, has allowed me to better understand the nature of the Manson Crater's central peak. The development of the central peak of complex impact structures like Manson is not well understood. By examining these well data, I have been putting the Manson central peak history together. Here's the short story. When the meteor hit at Manson 74 million years ago, the potential energy of a rock about 1½ miles in diameter weighing about 50 million tons and moving at about 45,000 mph (*about 25 times the speed of a bullet*) was instantaneously released *(energy equal to about **10 times** the energy in the simultaneous explosion of all of the nuclear weapons on Earth at the height of the cold war!)* The explosion blew a hole 13 miles in diameter and 5 miles deep and lifted up the crater edge about 1½ miles above the landscape. When the energy diminished, the uplifted crater rim collapsed into the crater and drove downward, pushing up the crater center like the drop of water that pops up from a splash. Except, instead of water, this drop was made of giant chunks of granites and gneisses from the Iowa basement with molten rock from the crater floor on top. The peak quickly rose to several miles above the original landscape before it slowed, mushroomed at the top, and the molten crater floor began to flow off into the crater. I called this material "**sueviclastics**" (*because it is made up of impact melt (suevite) and flows and looks like a volcanic pyroclastics – hence sueviclastics)*. At about the same time, gravity began pulling down on the giant column of broken granitic blocks, and the pressure from the top pushing down blew out the sides of the column, sending blocks into the crater. The blocks fell on the top of the Red Clastic sandstones that were sliding in from the collapsing crater rim. The melted crater floor "sueviclastics" came down on top of the granite blocks and they both slid out into the crater. I didn't mention that when the meteor hit, that area of Iowa was covered by the Cretaceous Seaway, and the explosion vaporized, blew, and pushed the sea back for many miles then buried the surrounding landscape with material ripped off the land surface, called a "surge deposit." Well, as the explosion energy waned, and the central peak began to collapse, the sea water began to rush back into the area like a giant tsunami. As it cascaded in, the tsunami incorporated the surge deposit materials creating a giant slurry wave "**resurging**" back towards and then over the edge of the crater. About half way across the crater floor the resurge materials moving towards the crater center encountered the granite blocks and sueviclastics moving the other direction. The resurging slurry wave overwhelmed the granite and sueviclastics, filling the crater and burying the finally stabilized central peak. Over the next about 50 million years the crater was buried by about 850 feet of late Cretaceous shales and limestones and Tertiary mudstones before the seas finally retreated from the region. The now emergent landscape began to erode, with about 1000 feet of material stripped away, exposing the resurge material inside of the crater (eroding it away outside) and an area of the central peak melted crater floor and underlying granite blocks. Rainwater eventually infiltrated the voids around the lobes of central peak granite blocks. The sides of the central peak were sealed by the clay-rich resurge materials, so the peak became essentially a giant barrel of fresh water. Some of the water flowed out into the voids in the granite blocks that poured into the crater from the blown-out peak walls. The water in voids of these flows of granite blocks was sealed in below by the resurge materials and on the top by the impervious sueviclastics (essentially chunks of rock sealed in glass). And there the water sat for a couple of million years until well drillers in Manson discovered it 1000 feet below the prairie a hundred years ago. Now the town is trying to find another lobe of saturated central peak boulders nearby. So I am happy every time they drill a new test well; I get more information about the formation of the Manson central peak.



Scientists Solve Mystery of Dinosaur Mass Grave

The abundance of allosaur fossils in the **Cleveland-Lloyd Dinosaur Quarry** has puzzled palaeontologists for decades. Over 15,000 bones have been discovered and it's believed thou-

Cleveland-Lloyd Dinosaur Quarry

sands more still lay in the ground, and now a new study may have found the cause. The Cleveland-Lloyd Dinosaur Quarry is the densest collection of Jurassic dinosaur fossils. Unlike typical Jurassic bone beds, it is dominated by the famous predatory dinosaur Allosaurus. Since its discovery in the 1920s, numerous hypotheses have been proposed to explain the origin of the quarry. Were the dinosaurs poisoned? Did they die due to drought? Were they trapped in thick mud? A new study published in the peer-reviewed journal *PeerJ* introduces modern techniques to better understand the landmark site's history, suggesting that the quarry represents numerous mortality events which brought the dinosaurs to the site over time, rather than a single fatal event. This study reveals that the small bone fragments were created during drought periods by weathering and erosion of bones disintegrating at the surface. During flood periods, however, the carcasses of Allosaurus and other dinosaurs washed in and rotted in a small pond, creating an environment in which fish, turtles, and crocodiles could not survive, and other dinosaurs would not eat the carcasses. The data generated from new and innovative methods, including chemical analyses and the study of microscopic bone fragments, suggest that dinosaur bones were introduced to the deposit after death. This would also explain the unusual lack of typical pond fossils at the site, as well as the near lack of gnaw marks on bones and calcite and barite concretions found on bones excavated from the quarry. The new hypothesis helps paleontologists understand the setting of the quarry, and to begin to unravel the mystery that led to this unique, Allosaurus -dominated bone bed. The Cleveland-Lloyd Dinosaur Quarry remains one of the most rewarding and fascinating destinations for getting a first-hand glimpse into the lives (and deaths) of the dinosaurs – and it's open to the public. https://www.geologyin.com/2017/12/scientists-solve-mystery-of-dinosaur.html?

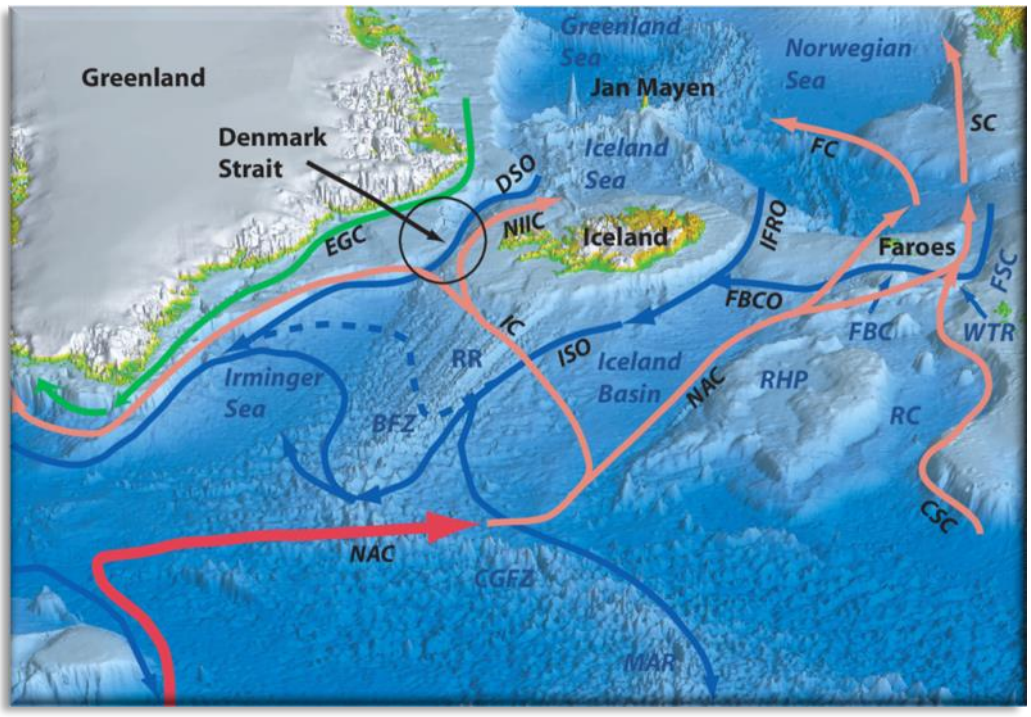
Fool's Gold May Be Valuable After All

In a breakthrough new study, scientists and engineers at the University of Minnesota have electrically transformed the abundant and low-cost non-magnetic material iron sulfide, also known as "*fool's gold*" or **pyrite**, into a magnetic material. This is the first time scientists have ever electrically transformed an entirely non-magnetic material into a magnetic one,

and it could be the first step in creating valuable new magnetic materials for more energy-efficient computer memory devices. The research is published in ***Science Advances.*** "*Most people knowledgeable in magnetism would probably say it was impossible to electrically transform a non-magnetic material into a magnetic one. When we looked a little deeper, however, we saw a potential route, and made it happen*," said Chris Leighton, the lead researcher, and his colleagues at the University of Minnesota. They had been studying pyrite for more than a decade for possible use in solar cells. Unfortunately, scientists and engineers hadn't found a way to make the material efficient enough to realize low-cost, earth-abundant solar cells. "*We really went back to the iron sulfide material to try to figure out the fundamental roadblocks to cheap, non-toxic solar cells*," Leighton said. "*Meanwhile, my group was also working in the emerging field of magnetoionics where we try to use electrical voltages to control magnetic properties of materials for potential applications in magnetic data storage devices. At some point we realized we should be combining these two research directions, and it paid off*." Leighton said their goal was to manipulate the magnetic properties of materials with a voltage alone, with very little electrical current, which is important to make magnetic devices more energy-efficient. In the study, the researchers used a technique called electrolyte gating. They took the non-magnetic iron sulfide material and put it in a device in contact with an ionic solution, or electrolyte. They then applied as little as 1 volt (less voltage than a household battery), moved positively charged molecules to the interface between the electrolyte and the iron sulfide, and induced magnetism. Importantly, they were able to turn off the voltage and return the material to its non-magnetic state, meaning that they can reversibly switch the magnetism on and off. "*We were pretty surprised it worked,*" Leighton said. "*By applying the voltage, we essentially pour electrons into the material. It turns out that if you get high enough concentrations of electrons, the material wants to spontaneously become ferromagnetic, which we were able to understand with theory. This has lots of potential. Having done it with iron sulfide, we guess we can do it with other materials as well.*" http://www.geologyin.com/2020/08/fools-gold-may-be-valuable-after-all.html?

One of Earth's Largest "Waterfalls" Is in The Ocean, And We Just Found Its Main Source

Victoria Falls is said to be the largest waterfall on Earth, and Angel Falls the highest, but no matter how impressive they might look to us, both these natural wonders fall far short of the true victors. The largest and most powerful waterfalls we know of are actually surrounded by water, deep beneath the lapping waves. Tucked between Iceland and Scotland, the Faroe Bank Channel Overflow (FBCO) is one the mightiest of its kind. This narrow, super-deep passage connects the Norwegian sea to the North Atlantic Ocean via a continuous flow of water so cold and dense, it sinks right to the bottom. As this heavy river crosses one of the deepest parts of the Greenland-Scotland Ridge, it creates a massive undersea cascade, with water plummeting roughly 2,756 feet, right into the Atlantic. It's one of the most researched spots in our ocean, monitored closely since 1995, and yet we've only just discovered the most powerful current that feeds it. Up until now, the Faroe Bank Channel overflow was thought to come mainly from a stream of cold water running along the western side of the channel. And for a while, at least, that may have been true. Today, however, new research suggests most of the Faroe waterfall is actually driven by a silent, eastern stream, which shoots cold water into the channel via a deep, jet-like ocean current. The neighboring Denmark strait, tucked between Iceland and Greenland and parallel to the Faroe channel, is home to [the world's largest known waterfall](), [three times the height of Angel Falls]().



As its cold waters meet up with the Faroe overflow on the other side of Iceland, these fast-moving waters create a powerful flow that spills into the deep north Atlantic. Together, these two key arteries play a crucial role in ocean circulation, specifically contributing to the [Atlantic meridional overturning circulation]() (AMOC). The AMOC has two pathways, one that runs deep, carrying cold water from higher latitudes to the Atlantic, and the other that runs shallow, transporting warm and saline Atlantic waters to the north. This circulation is a major regulator of the global climate system, and yet we still don't know enough about it. Gathering new measurements from moorings and vessels, as well as data from current monitoring systems, researchers created a high-resolution ocean circulation model to figure out where most of the water at the Faroe overflow is actually coming from. Instead of turning directly into the Faroe-Shetland Channel, which is the quickest way to the Faroe overflow, researchers found it appears to trace another more circuitous path. Regardless of the warmer water that flows overhead, this other current appears to travel almost to Norway before turning south and heading towards the waterfall and away from the continent. The round-about path is also influenced by wind conditions, which suggests that certain atmospheric conditions can enhance its strength. In the 2000s, for instance, this eastern channel was anomalously strong. In fact, this is what tipped scientists off. During those years, the direct channel to the Faroe overflow was at a record low, while the overflow itself was at an all-time high. Some other channel, it seemed, had to be feeding the waterfall, showing for the first time that the Faroe Bank Channel Overflow is, regardless of upstream pathways, primarily fed by a strong (and what seems to be a permanent) current jet. But while this channel might be permanent, its strength can absolutely change. The authors say different wind conditions in the Nordic Sea appear to cause water flowing through the Faroe channel to be drawn from different routes and depths. In the 1990s, for instance, the Faroe overflow was weaker than normal and its primary source of water came from the north of Iceland along the western, more direct route. Now, for some reason, that's changed. We clearly need to know more about this major gateway to the Atlantic. https://www.sciencealert.com/one-of-earth-s-largest-waterfalls-is-actually-found-deep-in-the-sea-and-we-just-discovered-its-main-source

Lake in Caldera of Kilauea Volcano Warns of Explosive Future

A lake has formed in the belly of Kilauea volcano in Hawaii since it last erupted in 2018. The water in it has been bubbling since then and is known as the world's hottest body of water with temperatures ranging from 176° to 185° F. The crater is over 1800 feet deep, said the US Geological Survey that is closely monitoring it. But scientists are baffled because few volcanic lakes reach above 176°F. They believe it might be a sign of upcoming hazards, such as steam-blast explosions. Between 2010 and 2018, a large lava lake bubbled and spattered within Kilauea's summit caldera. Then in May 2018, as part of a broader eruption that poured lava from fissures to the east, the lake swiftly drained and part of the caldera floor collapsed. This left a hole nearly as deep as One World Trade Center in New York City. But that was not all Pele had in store. For about a year, the much-deeper and wider Halema'uma'u crater was relatively quiet. But in July 2019, helicopter pilots began to notice water pooling into a pond in the lowest part of the crater. Water levels have risen steadily ever since, and it is now about 100 feet deep with an area larger than five football fields and a rusty brown sheen on its surface due to chemical reactions taking place in the water. After the caldera collapse, the terrain surrounding the lake changed dramatically, including the formation of a new 450-foot cliff north of the crater. The explanation for the new pond is simple. "*We have a drill hole a little more than one kilometer south of the crater where we measure the level of the water table,*" explained Don Swanson, a volcanologist at the U.S. Geological Survey's Hawaiian Volcano Observatory. "*We know that the crater floor dropped a little more than 230 feet below the water table in 2018. Any time that you punch a hole below the level of the water table, water is eventually going to come in and fill that hole*." One of the key factors that controls explosive volcanic eruptions is how much water and other gases get caught up within the magma. If magma has a lot of dissolved gases and steam, pressure builds and explosive eruptions can result. If not, lava tends to flow gently from fissures in the ground—as has been the case at Kilauea for the past 200 years. Calm eruptions are the exception, not the norm. Over the past 2,500 years, Kilauea has erupted explosively about 60 percent of the time, noted Swanson. "*We have been misled by how calm it has been. If this was 1720 rather than 2020, then we would we would not have seen a lava flow for more than 200 years, and we may have thought Kilauea was always an explosive volcano.*" Only time will tell if the volcano is in the process of reverting back to an explosive period. http://www.geologyin.com/2020/08/deadly-lava-lake-is-bubbling-in-hawaiis.html?

Chrysoberyl: One of the World's Most Exotic and Expensive Gems

The mineral or gemstone **chrysoberyl** is an aluminate of beryllium with the formula $BeAl_2O_4$. Despite the similarity of their names, chrysoberyl and beryl are two completely different gemstones, although they both contain beryllium. Chrysoberyl is the third-hardest natural gemstone, at 8.5 on the Mohs scale.

Chrysoberyl specimen with " *star* " form.

Chrysoberyl belongs to the **orthorhombic** crystal system, forming with tabular crystals in slender prisms. Crystal twins and triplets are quite common. Common chrysoberyl is colored by iron, while **color change** varieties obtain their color through chromium. An interesting feature of its crystals are the cyclic twins called *trillings.* These twinned crystals have a hexagonal appearance, but are the result of a **triplet of twins** with each "twin" oriented at 120° to its neighbors and taking up 120° of the cyclic trilling. If only two of the three possible twin orientations are present, a "V"-shaped twin results. Common chrysoberyl occurs in a variety of light colors, including green to yellow and golden-yellow to yellowish-green, along with various shades of brown and red. Chrysoberyl is colored by iron, while color change chrysoberyl (alexandrite) is colored by chromium. The mineral chrysoberyl is very rare but periodically found as an accessory mineral in granite pegmatites, aplites, and mica schists. It is also described in altered zones around the margins of ultramafic rocks where they have been intruded by Be-rich granite pegmatites. Because of its favorable hardness and relatively high specific gravity, it may also be found as a placer mineral downstream from these hosts. Chrysoberyl is best known for its use as a gem. There are multiple varieties of gem chrysoberyl, each with its own name and unique physical properties. The three main varieties of chrysoberyl are: **ordinary yellow-to-green chrysoberyl**, **alexandrite**, and cat's eye or **cymophane**.

Alexandrite is a strongly pleochroic (dichroic) gem, will exhibit emerald green, red and orange-yellow colors and tend to change color in artificial light compared to daylight. The color change from red to green is due to strong absorption of light in the yellow and blue portions of the spectrum. Typically, alexandrite has an emerald green color in daylight but exhibits a raspberry red color in incandescent light. Chrysoberyl usually shows no fluorescence.

Cymophane is popularly known as cat´s eye. This variety exhibits pleasing chatoyancy or opalescence that reminds one of an eye of a cat. When cut to produce a cabochon, the mineral forms a light-green specimen with a silky band of light extending across the surface of the stone. The finest quality cat´s-eye has a sharp silvery white line across the stone that appears to open and close as the stone is rotated and exhibits a strong "milk and honey" effect (the stone on one side of the eye appears lighter than the other). http://www.geologyin.com/2020/03/chrysoberyl-one-of-worlds-most-exotic.html?

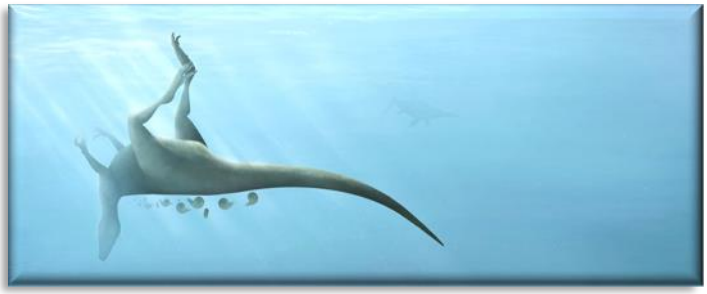
A Stupendously Huge Raft of Volcanic Rock Has Floated Across The Ocean to Australia

A gigantic fleet of floating rocks, spewed up from an underwater volcano in the Pacific Ocean, floated across the waves for thousands of miles. Eventually, it made it all the way to Australia, then started on a new project: revitalizing the world's largest (and very threatened) coral reef system. This unlikely chain of events may sound somewhat incredible, but it's an entirely true story – one that has played out dramatically over the last year, while highlighting the surprising, largely unseen ways in which Earth's natural environmental systems intersect with one another. Stranger still, it's not the first time this has happened. An eruption in 2001 from the same submarine seamount – a nameless volcano, simply dubbed **Volcano F** or **0403-091**, located near the Vava'u islands in Tonga – produced a similar rocky flotilla, which also voyaged on the currents to Australia over the space of a year. When this phenomenon occurs, it creates what's called a pumice raft – a floating platform composed of countless chunks of buoyant and highly porous volcanic rock. Each one of these small rocks attracts marine organisms, including algae, barnacles, corals, and more. These tiny travelers end up hitching a ride across the ocean, and they can help seed and replenish endangered coral systems at their ultimate destination: for many, the Great Barrier Reef. "*Each piece of pumice has its own little community that has been transported across the world's oceans – and we have had trillions of pieces of this pumice floating out there following the eruption*," says geologist Scott Bryan from the Queensland University of Technology in Australia. "*Each piece of pumice is a home, and a vehicle for an organism, and it's just tremendous. The sheer numbers of individuals and this diversity of species is being transported thousands of kilometers in only a matter of months is really quite phenomenal.*" Bryan knows a thing or two about these pumice migrations. He's been studying the volcanic rafts for 20 years, investigating the 2001 eruption, its 2019 successor (which started washing up on Australian shores in April), and other underwater eruptions as well. His most recent study, published last month, examined the 2012 eruption of the Havre Seamount, also in the South Pacific – estimated to be the largest underwater volcano eruption ever recorded, broadly equivalent to the most powerful volcanic eruption on land in the 20th century. That event produced a gigantic raft of pumice rock that ended up dispersing over an area twice the size of New Zealand – in addition to littering the seafloor with giant chunks of pumice the size of vans. "*We don't understand why some pumice sinks during the eruption at the location and others can float for many months and years on the world's oceans*," Bryan says, but further analysis could fill in the gaps. "*This will help us understand the mechanisms and dynamics of these explosive eruptions and understand better why these eruptions produce potentially hazardous pumice rafts.*" Potentially hazardous is right. Last year's eruption from Volcano F produced some stunning video of what it looks like to sail into these gargantuan rafts, which resemble giant oil slicks, only made of up undulating rocks that seem to go on forever. For now, though, researchers are hopeful Volcano F's latest delivery will do some good for the Great Barrier Reef off Australia's coastline, which is besieged by coral bleaching as the world's oceans heat up due to climate change. While the organisms carried on the flotilla of rock can help replenish reef ecosystems, scientists are eager to emphasize they are not a silver bullet. "*Pumice rafts alone won't help mitigate directly the effects of climate change on the Great Barrier Reef,*" Bryan says. "*This is about a boost of new recruits, of new corals and other reef-building organisms, that happens every five years or so. It's almost like a vitamin shot for the Great Barrier Reef*." And possibly much further afield too. The 2019 pumice raft – which a year ago measured approximately 20,000 football fields in size – can now be found all the way along the Australian east coast from Townsville in Queensland's north to northern New South Wales: spreading out over more than 800 miles of coastline. It's a massive dispersion, stemming from a single event far beyond the horizon, and one which serves to remind us of the links between what perhaps only seem like disparate marine ecosystems. "*This shows that the Great Barrier Reef has connections to coral reefs that are thousands of kilometers further east,*" Bryan says. "*In terms of the health of the Great Barrier Reef, it's also important that these distant reefs are taken care of.*" https://www.sciencealert.com/a-gigantic-raft-of-volcanic-rock-drifted-across-the-ocean-all-the-way-to-australia

Sailing through the pumice raft. ***Click on picture to view video.*** .

Palaeontologists Discover a New Species of Dinosaur on The Isle of Wight

Say hello to a new theropod dinosaur species, *Vectaerovenator inopinatus*. Discovered after a series of serendipitous fossil finds on the Isle of Wight in the UK, it's thought to date from around 115 million years ago, during the Cretaceous period. The Latin name of the new dino roughly refers to *'unexpected air-filled hunter from the Isle of Wight'*, which gives you some idea of



Artist's impression of the dinosaur's final moments

how and where it was found and how palaeontologists were able to figure out what they were dealing with. All four discovered fossils are hollow or "*air-filled*", which points to the delicate structure of the animal and places it in the theropod group, alongside other dinosaurs such as the *Tyrannosaurus rex* and the ancestors of modern-day birds. "*We were struck by just how hollow this animal was – it's riddled with air spaces,"* says palaeontologist Chris Barker, from the University of Southampton in the UK. *"Parts of its skeleton must have been rather delicate."* "*The record of theropod dinosaurs from the mid-Cretaceous period in Europe isn't that great, so it's been really exciting to be able to increase our understanding of the diversity of dinosaur species from this time."* The four key fossil pieces in the new research were found on the shores of Shanklin in the Isle of Wight. The fossil finders are also named as co-authors on a new paper about the findings that is due to be published soon. Using comparative anatomy techniques, Barker and his colleagues were able to identify the type of dinosaur they were dealing with, as well as what set it apart from other species. However, with only four pieces to go off of, the researchers are looking for additional material to be more certain that *Vectaerovenator inopinatus* was once a living, breathing creature – thought to have been up to 13 feet in size. If you find yourself walking on Shanklin beach, keep your eyes open: not only could you help shed light on a section of the European dinosaur record that we know very little about, you might discover something entirely new. "*It looked different from marine reptile vertebrae I have come across in the past*," says regular fossil hunter James Lockyer, from Lincolnshire in the UK, who found one of the fossils on a visit to the Isle of Wight. "I was searching a spot at Shanklin and had been told and read that I wouldn't find much there. However, I always make sure I search the areas others do not, and on this occasion it paid off."

https://www.sciencealert.com/palaeontologists-discover-a-new-species-of-dinosaur-on-the-isle-of-wight

Here's How Exploding Stars Forged The Calcium in Your Teeth And Bones

Up to half the calcium in the Universe (including our bones and teeth) is thought to come from **exploding supernova stars,** and researchers have now been able to get unprecedented insight at how these ultra-rare, calcium-rich supernovae reach the end of their lives. The never-before-seen look at how these stellar explosions throw out so much calcium was carried out using

deep space X-ray and infrared imaging, and fills in quite a few of the gaps in our scientific knowledge about the process. Drawing together contributions from 67 authors across 15 countries, the resulting study suggests that the calcium-rich supernovae start off as compact stars that quickly lose mass at the end of their lives, giving off an outer layer of gas that exploding materials then collide with. The supernova in question, SN 2019ehk, was first spotted by amateur astronomer Joel Shepherd in the Messier 100 (M100) spiral galaxy about 55 million light-years away from Earth. Very soon after the discovery, most of Earth's major telescopes were following it (with transient events like this, speed is crucial). What astronomers weren't expecting was the luminosity of the X-ray light that SN 2019ehk was giving off. Scientists quickly realized they were looking at a flood of high-energy X-rays flowing from the star and hitting the outer shell of gas, providing key clues to the materials that it was shedding and how much of the material there was. The readings from the dying star helped scientists to work out what was happening: the reactions between the expelled materials and the outer gas ring were producing intensely hot temperatures and high pressures, leading to a calcium-producing nuclear reaction as the star tries to shed its heat and energy as quickly as possible. Most massive stars create small amounts of calcium during their lifetimes, but events like SN 2019ehk appear to be responsible for producing vast quantities of calcium, then exploding, and dispersing it through interstellar space within galaxies. Ultimately this calcium makes its way into developing planetary systems, and into our bodies in the case of our Earth. The explosion at the center of the new study is responsible for the most calcium ever seen emitted in a singular observed astrophysical event.

https://www.sciencealert.com/here-s-how-the-calcium-in-your-teeth-and-bones-was-at-least-partially-forged-in-exploding-stars

Collapsed Cliff Reveals 313 Million-Year-Old Fossil Footprints in The Grand Canyon

A chance discovery during a hike in Grand Canyon National Park in 2016 ended up revealing strange footprints left by something that also walked there once, long, long ago. So long ago, in fact, that these ancient tracks – left approximately 313 million years

Manakacha Formation (Lower Pennsylvanian) trackway and an illustration of an early amniote that may have made them.

ago – are by far the oldest vertebrate tracks in Grand Canyon, (which is known for its abundant fossil tracks). They are significant because they are among the oldest tracks on Earth of shelled-egg-laying animals, such as reptiles, and are also the earliest evidence of vertebrate animals walking in sand dunes. Not bad for a lucky find on a hiking trail. But the circumstances behind the discovery, made on a path called Bright Angel Trail, are even more serendipitous than they seem. The fossil footprints were found on the side of a boulder that fell off a nearby cliff, exposing a stratigraphic cross section of the Manakacha Formation, originally deposited approximately 315 million years ago. If the cliff had never collapsed, the boulder would never have been encountered by hikers on the trial, and the ancient marks may have escaped notice for eternity. Thanks to these chance events, however, researchers have now had the opportunity to analyse these very old trackways, and learn a bit about what kind of animal left them, back when this rocky surface was the slope of a sand dune. Two separate tracks can be seen, left by **basal amniotes** – very early specimens of *tetrapod* (four-limbed) vertebrates, and in this case, possibly from the base of the reptile evolutionary tree. The first set of tracks reveal a distinctive, sideways-drifting pattern of footprints, interpreted as the track maker employing what's called a lateral-sequence gait, while diagonally ascending the dune slope. In this kind of movement, the legs on one side of the animal move in succession before the legs on the other side do the same (left rear leg, left fore leg, right rear leg, right fore leg). Living species of tetrapods – dogs and cats, for example – routinely use a lateral-sequence gait when they walk slowly. These tracks document the use of this gait very early in vertebrate history. Whether the gait was due to the steepness of the slope or the force of the wind is unclear, but the tracks, which are also the first tetrapod marks ever found in the Manakacha Formation, reveal that basal amniotes dwelled in sand dune regions even in this ancient era. The second group of tracks is different, representing a later set of claw marks that suggest the animal (possibly the same species) was directly moving up the slope, rather than the diagonal ascent of the first animal. While it's impossible right now to determine exactly what kind of animal this was, the researchers say the marks bear a passing resemblance to *Chelichnus* – an ambiguous and debated set of fossil tracks found in Scotland, dating to the Permian period, and first mistaken for tortoise tracks. Outside of these marks, it's possible this ancient species that once strode through the Grand Canyon, has never been discovered or detected in the fossil record.
https://www.sciencealert.com/ancient-animal-tracks-found-on-grand-canyon-boulder-fragment-are-oldest-of-their-kind

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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 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

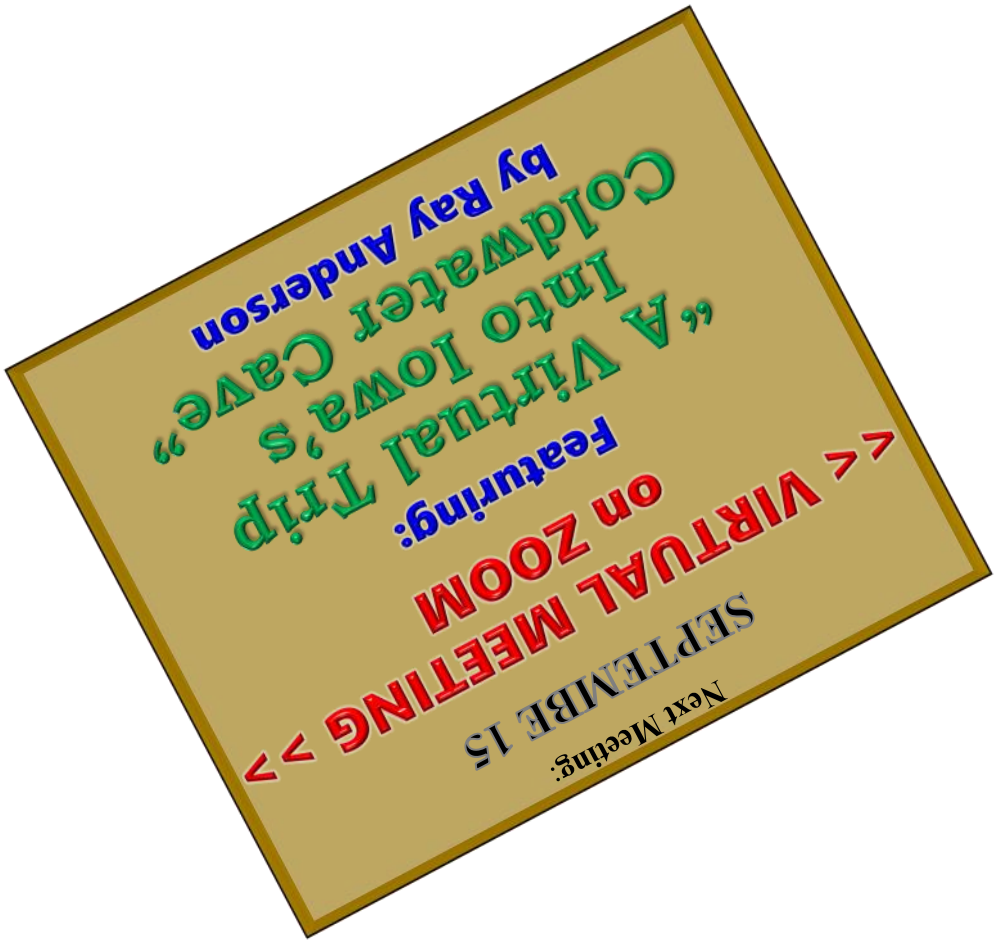
CEDAR VALLEY ROCKS & MINERAL SOCIETY

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



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