

Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS

SEPTEMBER 2022

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

Next CVRMS Meeting

Tues. September 20

7:15 pm

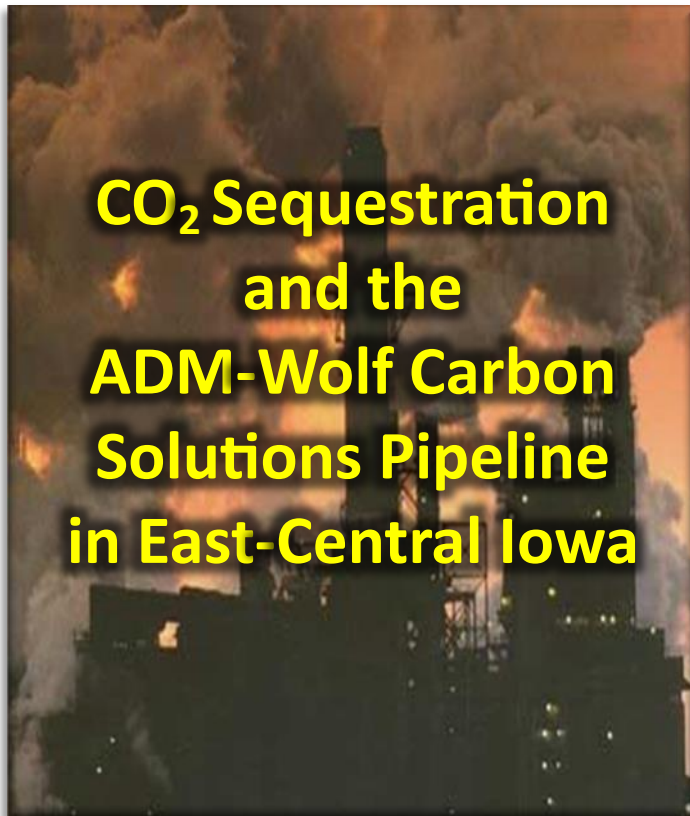
Hiawatha Community Center

101 Emmons St., Hiawatha

featured speaker

Ray Anderson

Cedar Valley Rocks and Minerals Society



Scientists Unearth the Fossilized Remains of the Largest Millipede

Scientists have unearthed the fossilized remains of a millipede known as *Arthropleura* that predates the dinosaurs — and was as long as a car. This monstrous creature could grow up to nine feet long, weighed over 100 pounds, and sported between 32 and 64 legs. It's only the third fossil of its kind ever found and it easily dwarfs the previous two. While scientists had long suspected that *Arthropleura* could grow to enormous sizes,



this is the first solid evidence of just how big they could get. They lived in what is now North America and Europe around 345 to 290 million years ago,^[1] from the Viséan stage of the lower Carboniferous Period to the Sakmarian stage of the lower Permian Period. *Arthropleura* is characterized by a series of well-developed tergites (dorsal exoskeleton) having three lobes like a trilobite, with dorsal surfaces covered by many tubercles. The species of the genus are the largest known land invertebrates of all time, and would have had few, if any, predators.

<https://en.wikipedia.org/wiki/Arthropleura>



CVRMS Monthly Meeting, August 16 — Minutes —

PICNIC AT MORGAN CREEK PARK

At the August 16 Potluck Picnic at Morgan Creek County Park west of Cedar Rapids the CVRMS had no formal meeting. In addition to the good food, many people brought rocks for an informal show and tell session, and then enjoyed an evening of geobingo. This was our first gathering in the new Morgan Creek Park pavilion in the southwest corner of the park off E Avenue. The weather was beautiful, and a good time was had by all.

Respectfully submitted,
Ray Anderson, Acting Secretary



Because of rising costs over the years, the Board voted to propose the following change to our Bylaws:

Article IV

DISBURSEMENT OF SOCIETY FUNDS: *Disbursements needed for Society business up to \$100.00 must be approved by the Executive Committee; any Disbursements over \$100.00 must be approved by the majority vote of the membership, except that the Treasurer shall be authorized to disburse funds necessary to the office, up to \$25.00 without prior approval of the Executive Committee.*

Change to

DISBURSEMENT OF SOCIETY FUNDS: *Disbursements needed for Society business up to \$250.00 must be approved by the Executive Committee; any Disbursements over \$250.00 must be approved by the majority vote of the membership, except that the Treasurer shall be authorized to disburse funds necessary to the office, up to \$25.00 without prior approval of the Executive Committee.*

According to our bylaws: *These Bylaws may be amended by simple majority vote of the membership present at any Regular or Special Meeting. Members must be notified of proposed amendments five days before the meeting. The above proposed change will be voted on at the September meeting.*

CVRMS Board Minutes August 23

MEETING CALLED TO ORDER: 7:09 by Marv at his house. Board Members present. Marv Houg, *President*, Ray Anderson, Dale Stout, Matt Burns, Jay Vavra, Bill Desmarais, Kim Kleckner, and Sharon Sonnleitner.

MINUTES OF PREVIOUS MEETING reviewed. Motion to accept as published by Bill, 2nd by Dale. Minutes approved.

TREASURER'S REPORT: Dale previously emailed copies of Treasures Report to Board Members. Dale discussed the report, then Bill moved to approve, 2nd by Ray. Treasurer's report approved.

2023 SHOW: Contract with Hawkeye Downs signed digitally, but Dale will make payment this week. We will poll membership for approval for show theme "*Wonderful World of Agates*" at September meeting.

AUCTION 2022—OCTOBER 8-9: **Consignor contracts** were sent out. **Food truck** is contracted for Saturday; **Sharon** will prepare and sell *sloppy Joes, chips, etc.* on Sunday. **Marv** will work with Sharon to confirm list of items for flyer. **Kim** will send Sharon photos of auction items for website. **Advertising the show** will include Kim on social media, and Dell to select journals. **Matt** will provide overnight security.

SHOW 2023—MARCH 25-26: **Kim** has acquired sufficient materials for door prizes, pebble pit, and silent auction. We have some door prize items and will solicit additional specimens from consignors.

501 C3 STATUS: No progress has been made on attempt to gain tax-exempt status for the club. Kim offered to help. Sharon filled out forms last year.

CVRMS OFFICER INSURANCE: Marv is working on officer liability insurance.

OTHER ITEMS: **Wire wrap class;** Kim talked to Shari Telman who offered to teach a 1.5 hr class on Wire Wrap, with 6 people per class. Kirkwood offers a 1 night, 2 hr class for \$25 - \$30. **Flint Knapping Class;** Matt suggested that Matt Graesch could present a flint knapping class, perhaps before a Tuesday club meeting.

ADJOURNMENT: Motion to adjourn by Kim, 2nd by Dale. Meeting adjourned 8:27 pm.

Respectfully submitted,
Ray Anderson, Acting Secretary



Where are most of Earth's volcanoes?

There are around **1,350 potentially active volcanoes** worldwide, and just over one-third of them are known to have erupted at some point during recorded history. **But where are most volcanoes located?** Most of the planet's volcanoes are located underwater, along the **40,000 miles-long** mid-ocean ridge system. About **80%** of the Earth's magma output comes from volcanoes along these ridges, which are typically **1.8 to 2.5 miles** below the ocean surface, (stretching about 5,600 miles through the eastern Pacific, but also running through all of the major oceans, including 9,900 miles along the middle of the Atlantic Ocean). The vast majority of the volcanoes along this ridge lie underwater. However, many volcanoes have risen above sea level, especially in the Pacific Ocean. This is because the Pacific Ocean is fringed with '*subduction zones*,' which are places around the edges of tectonic plates where one plate slides underneath another. As a result of this tectonic activity, the Pacific is home to the **Ring of Fire**, a **25,000-mile-long, horseshoe-shaped, seismically active belt that is the epicenter of around 90% of the world's earthquakes and 75% of the world's active land volcanoes.** As the old, cold, dense, Pacific oceanic plates *slide underneath the adjacent continental plates*, and as the plates descend back into the mantle, they release water from sediments and minerals that formed at the ocean floor. This water causes the mantle above to melt, producing magma, which rises up from the mantle, through the descending plate and the overlying continental plate, erupting as volcanoes in the Andes of South America, the Cascades of North America, the Aleutians between Alaska and Siberia, and all around the Pacific Ocean. While many additional volcanoes can be found in the Pacific in areas where the plate is moving over mantle



Map of the RING OF FIRE showing some of the more than 1,000 potentially active volcanoes.

<https://www.timeforkids.com/g2/ring-of-fire/>

hot spots, such as the *Hawaiian Island chain*, the *Caroline Island chain*, or *Easter Island*, most of the Earth's volcanoes are located on the Pacific Rim, the **Ring of Fire**.

<https://www.livescience.com/32421-where-are-most-of-earths-volcanoes.html>

Spotlight Gemstone: Sapphire

September's Birth Stone



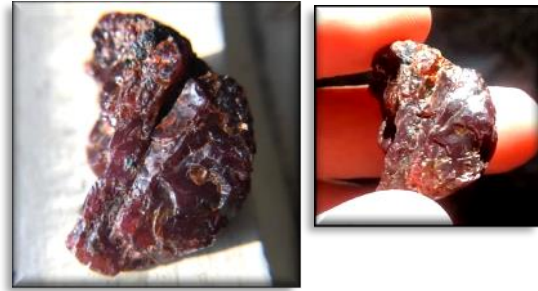
Sapphire, the birthstone for September and the gem of the 5th and 45th anniversaries, is a gemstone variety of the mineral corundum, an aluminium oxide (Al_2O_3). It frequently contains traces of iron, titanium, chromium, copper, or magnesium. Typically associated with the color blue, sapphires can also naturally occur in a wide variety of 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 the road on the right side of the valley called, and where is it??

July's Photo



Last Month's **What in the World** photo showed 2 views of a crystal of the mineral **PAINITE**. Painite is a metal oxide borate [$\text{CaZrAl}_9\text{O}_{15}(\text{BO}_3)$], an extremely rare mineral that sells for **\$50,000—\$60,000 per carat**. Found in Myanmar. the crystal shown in the photos weighed **47.96 CTS** and was for sale for **\$2,300,000**.

ROCK CALENDAR CVRMS EVENTS OF INTEREST

2022

Sept. 20 — CVRMS Monthly Meeting

Hiawatha Community Center 7:15 pm

CO₂ Sequestration and the ADM-Wolf Carbon Solutions Pipeline in East-Central Iowa
by Ray Anderson

Sept. 23-25 — Geode Fest

First Christian Church Parking Lot
3476 Main Street
Keokuk, IA

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

Oct. 1-2 — Worthen Earth Searchers Rock Club **First** Annual Rock Show

Rock Island County Fairgrounds
East Moline, Illinois

Saturday October 1 from 9 am to 5 pm
Live auction from 5:30 to 6:30 pm Saturday night
Sunday October 2 from 9 am to 4 pm

Oct. 2 — Sunday At The Quarry

BMC Raymond Quarry
About 1 mile east of Raymond, Iowa
10:00 am — 4:00 pm

Oct. 8-9 — CVRMS Rock Auction

Amana RV Park and Event Center
Amana, Iowa

Saturday Oct. 8 Auction 9:00 a.m. to about 8:00 pm
Sunday Oct. 9 Auction 9:00 am to about 3:30 pm
(see page 10 for more information)

Oct. 18 — CVRMS Monthly Meeting

Hiawatha Community Center 7:15 pm
CVRMS Scholarship Activities
Dept. of Earth and Environmental Sciences
The University of Iowa

Oct. 21-23 — MAPS Fossil Show

Orr Building, Illinois State Fair Grounds
Springfield, Illinois

<http://www.midamericapaleo.org/>

Oct. 22-23 - Rocktoberfest - Gem, Mineral & Lapidary Show

Sac & Fox Lapidary Club
Jefferson Co. Fairgrounds,
2606 W Burlington St, Fairfield, Iowa

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

From my early days as a geology student I have been intrigued by kimberlite pipes. These diatremes begin with materials that are deeply buried in the Earth's mantle, perhaps 250 miles or more below the surface. These materials are blasted to the surface, propelled by pressurized CO2 water vapor, at speeds up to 50 miles per hour. They carry with them samples of the materials and minerals present in the mantle, most famously diamonds. However, the associated minerals tell us a great deal about the composition of the mantle and help us develop models of how the Earth formed. We have learned that the carbon that forms the diamonds was organic carbon and was carried down into the mantle on subducting oceanic plates where heat and pressure transformed it to diamonds. Recent research has expanded our understanding of how this organic material, born on the Earth's surface is affecting its mantle. The following article describes some of this research.

The First Explosion of Life on Earth Made an Impact Deep Under The Surface

The Cambrian Explosion, around 541 million years ago, was when life and organisms really got going on planet Earth. Now new research has revealed how that explosion of life has left behind traces deep within Earth's mantle. It is easy to see that the processes in the Earth's interior influence what happens on the surface. For example, volcanoes unearth magmatic rocks and emit gases into the atmosphere, and thus influence the biogeochemical cycles on our planet. What is less obvious, however, is that the



Sample of a kimberlite.

reverse is also true: what happens on the Earth's surface affects the Earth's interior, even down to great depths. This is the conclusion reached by an international group of researchers led by Andrea Giuliani, SNSF Ambizione Fellow in the Department of Earth Sciences at ETH Zurich, in a new study published in the journal *Science Advances*. According to this study, the development of life on our planet affects parts of Earth's lower mantle. In their study, the researchers examined rare diamond-bearing volcanic rocks called kimberlites from different epochs of the Earth's history. These special rocks are messengers from the lowest regions of the Earth's mantle. Scientists measured the isotopic composition of carbon in about 150 samples of these special rocks. They found that the composition of younger kimberlites, which are less than 250 million years old, varies considerably from that of older rocks. In many of the younger samples, the composition of the carbon isotopes is outside the range that

would be expected for rocks from the mantle. The researchers see a decisive trigger for this change in composition of younger kimberlites in the Cambrian Explosion. This relatively short phase, geologically speaking, took place over a period of a few tens of million years at the beginning of the Cambrian Epoch, about 540 million years ago. During this drastic transition, almost all of today's existing animal tribes appeared on Earth for the first time. "*The enormous increase in life forms in the oceans decisively changed what was happening on the Earth's surface,*" Giuliani explained. "*And this in turn affected the composition of sediments at the bottom of the ocean.*" For the Earth's lower mantle, this changeover is relevant because some of the sediments on the seafloor, in which material from dead living creatures is deposited, enter the mantle through plate tectonics. Along the subduction zones, these sediments, along with the underlying oceanic crust, are transported to great depths. In this way, the carbon that was stored as organic material in the sediments also reaches the Earth's mantle. There the sediments mix with other rock material from the Earth's mantle and after a certain time, estimated to at least 200-300 million years, rise to the Earth's surface again in other places, for example in the form of kimberlite magmas. It is remarkable that changes in marine sediments leave such profound traces, because overall, only small amounts of sediment is transported into the depths of the mantle along a subduction zone. "*This confirms that the subducted rock material in the Earth's mantle is not distributed homogeneously, but moves along specific trajectories,*" Giuliani explained. In addition to carbon, the researchers also examined the isotopic composition of other chemical elements. For example, the two elements strontium and hafnium, showed a similar pattern to carbon. "*This means that the signature for carbon cannot be explained by other processes such as degassing, because otherwise the isotopes of strontium and hafnium would not be correlated with those of carbon,*" Giuliani noted. The new findings open the door for further studies. For example, elements such as phosphorus or zinc, which were significantly affected by the emergence of life, could also provide clues as to how processes at the Earth's surface influence the Earth's interior. "*The Earth is really a complex overall system,*" Giuliani said. "*And we now want to understand this system in more detail.*"

<https://www.sciencealert.com/the-first-explosion-of-life-on-earth-left-traces-deep-underground-in-its-mantle>

Woolly Mammoths Survived in North America Until 5,000 Years Ago, DNA Reveals

Woolly mammoths may have survived in North America thousands of years longer than scientists previously thought, vials of Alaskan permafrost reveal. The hairy beasts might have persisted in what is now the Yukon, in Canada, until around 5,000 years ago, 5,000 years longer than experts previously



estimated, a new study suggests. That conclusion comes from snippets of mammoth DNA that were found in vials of frozen dirt that had been stored and forgotten in a laboratory freezer for a decade. "Organisms are constantly shedding cells throughout their life," said study lead author Tyler Murchie. For instance, He explained that a person sheds roughly 40,000 skin cells per hour, on average, meaning we are constantly ejecting bits of our DNA into our surroundings. That's also true of other life-forms; nonhuman animals, plants, fungi, and microbes are constantly leaving microscopic breadcrumb trails everywhere. Soon after being discarded, the vast majority of the DNA bits are consumed by microbes. The fraction of the shed DNA that does remain might bind to a small bit of mineral sediment and be preserved. Though only a tiny proportion of what was initially shed remains centuries later, it can nevertheless provide a window into a vanished world teeming with strange creatures. "In a tiny fleck of dirt is DNA from full ecosystems." Murchie analyzed soil samples taken from permafrost in the central Yukon. Many of the samples dated to the Pleistocene-Holocene transition (14,000-11,000 years ago), a period marked by rapidly changing climatic conditions in which many large mammals (saber-toothed cats, mammoths, mastodons, etc.) vanished from the fossil record. The DNA fragments samples were small; however, on average, he was able to isolate roughly 2 million DNA fragments per sample. By analyzing DNA from soil samples of known ages, he indirectly observed the evolution of ancient ecosystems over this turbulent period. The soil samples, which span a period of time from 30,000 years ago to 5,000 years ago, revealed that mammoths and horses likely persisted in this Arctic environment much longer than previously thought. Mammoths and horses were in steep decline by the Pleistocene-Holocene transition, the DNA data suggest, but they didn't disappear all at once due to changes in climate or overhunting. The new study is the first to determine that small populations of mammoths coexisted with humans on the mainland of North America well into the Holocene, as recently as 5,000 years ago. <https://www.livescience.com/woolly-mammoths-in-north-america-longer>

Oldest Known Volcanic Rock Predates Earth's Formation

With its greenish-brownish color, *Erg Chech 002 (EC 002)* might not appear extraordinary at first glance, but it is the **oldest known volcanic rock on Earth and in our solar system.** This *meteorite* was discovered in May 2020 by meteor hunters in the Erg Chech region of the Algerian Sahara desert. Looking at the decay rate of manganese and chromium, two research teams dated the meteorite at **4.5650 to 4.5666 billion years.**



Fragment of Erg Chech 002 meteorite

The rock formed just 700,000 years after the formation of our solar system, predating Earth's formation by 20 million years. Of the roughly 65,000 meteorites so far documented on Earth, only around 4,000 contain what is known as differentiated matter. This means they came from celestial bodies large enough to have experienced

magmatic activity. Unlike other meteorites dating back to the early phases of our solar system, with a **basaltic, silica-poor (showing low SiO₂ levels)** composition likely formed on a larger planetary body, EC 002 shows an **andesitic, silica-rich composition.** On Earth, andesite is a rock formed during volcanic eruptions. EC 002 likely formed in a volcanic eruption on a smaller asteroid. Heated up by the radioactive decay of isotopes like aluminium 26, the asteroid experienced partial melting of its inner homogenous matrix. As a result, silicon became concentrated in pockets of molten rock. The silica-rich magma then migrated to the asteroids' surface, cooling down and solidifying to form a crust of volcanic rocks. Almost nothing survives of those early differentiated asteroids, as they went on to form the building blocks of larger bodies or planets or were simply destroyed. EC 002 was likely ejected into space during an impact, avoiding a similar fate. The fragment traveled for the next four and a half billion years through the void, finally crossing Earth's orbit. Then, eventually, it impacted the ground just a few centuries ago. <https://www.forbes.com/sites/davidbressan/2022/08/01/oldest-known-volcanic-rock-predates-earths-formation/?sh=68ca9879417c>

7 Million Years Ago, Our Earliest Relatives Took Their First Steps on 2 Feet

The oldest known human-like species likely walked on two legs as far back as 7 million years ago, a new study finds, and the discovery sheds light on what first set humans apart from our ape relatives. Researchers analyzed a thigh bone (*femur*) and a pair of forearm bones (*ulnae*) from *Sahelanthropus tchadensis*, which may be the oldest known hominin (a relative of humans dating from after our ancestors split from those of modern apes.) First unearthed in Chad in north central Africa in 2001, the remains are about 7 million years old. Examination of the femur and ulnae indicated that *S. tchadensis* not only walked on two feet but also climbed trees, adding evidence that this enigmatic species was bipedal, as an earlier analysis of its skull anatomy suggested. Many traits set humans apart from chimpanzees and bonobos, our closest living relatives, such as our big brains, upright postures, opposable thumbs and largely hairless bodies. However, it remains uncertain which of these features began splitting the chimp and bonobo lineage apart from that of hominins, a separation that previous research suggested began happening between 6 million and 10 million years ago. The partial skull of *S. tchadensis* that the scientists found revealed that the species was probably close to a chimpanzee in size and structure. Although its brain also appeared chimp-size, its face and teeth more closely resembled those



Skull of *Sahelanthropus tchadensis*, and an artist's reconstruction.

of hominins, suggesting it may have been a close relative of the last common ancestor of humans and chimps, the researchers said. Judging by the thick, prominent brow ridges of the skull, the specimen, which the researchers nicknamed "Toumaï," was probably male. (In the local Goran language, "Toumaï" means "hope of life." It is a name often given to babies born close to the dry season in the vast, flat, windy Djurab Desert of northern Chad where the fossil was unearthed.) Perhaps the most interesting feature that Toumaï shares with other hominins is the anatomy of the opening at the base of the skull where the spinal cord emerges. In four-legged animals, this opening is normally located toward the back of the skull and is oriented backward. However, in *S. tchadensis*, this opening is positioned near the middle of the skull and is oriented downward. This suggests that *S. tchadensis* was bipedal, meaning it walked on two legs, Daniel Lieberman, a human evolutionary biologist at Harvard University, wrote in a commentary published in *Nature*. Toumaï lent support to the idea that bipedalism may have helped set the earliest hominins apart from their relatives. However, until now, aside from this skull, researchers knew of *S. tchadensis* only from a few jaw fragments and some teeth. Without more bones from the rest of the body, some researchers reserved judgment as to whether *S. tchadensis* was a biped. In the new study, the researchers analyzed three more fossils they associated with *S. tchadensis*, the femur and two ulnae. The scientists originally recovered these arm and leg bones at the same time and site as the other *S. tchadensis* fossils. The team associated these remains with *S. tchadensis* because no other large primate was found in the area, although they said it was impossible to know whether the fossils belonged to Toumaï. The researchers analyzed both the outside shapes of the bones and their internal microscopic structures. Next, they compared these data with corresponding details from living and fossil species, including chimpanzees, gorillas, orangutans, extinct apes from the same epoch, modern humans, ancient humans, and hominins such as *Orrorin*, *Ardipithecus* and australopithecines (*Australopithecus* and kin). The base of the femur's neck appeared to be oriented slightly toward the front of the body and flattened, and the upper part of the thigh bone was also slightly flattened, all traits previously seen in known bipedal hominins. Moreover, the sites at which the muscles of the buttock attach are robust and human-like. And the cross-sectional shape of the thigh bone suggests it could resist the kind of sideways-bending forces seen during walking on two legs. All of these findings in the femur suggested that *S. tchadensis* was usually bipedal, perhaps on the ground, or maybe also in the forest canopy. The study concluded that the Chadian species has a set of selected anatomical features that clearly indicate that our oldest known representatives were practicing bipedalism, on the ground and on the trees. In contrast, the left and right forearm bones are chimpanzee-like and well adapted to climbing trees; they possess highly curved shafts that suggested the presence of powerful forearm muscles, and the shape of the elbow joints hinted that they could cope with high forces when flexed. The femur did not preserve the joints at either end, so the key features needed to prove bipedalism were missing. However, the key finding is that the earliest hominins were bipeds of some sort, reinforcing the evidence that the evolution of bipedalism is what set the human lineage on a separate path from the apes. But, like our closest living chimpanzee relatives, early hominins still retained abilities to climb trees. The researchers detailed their findings in the online journal *Nature* on August 24.

https://www.livescience.com/when-human-ancestors-first-walked-upright?utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D

Astronomers plan to fish an interstellar meteorite out of the ocean using a massive magnet

Astronomers are planning a fishing trip to land an extraterrestrial interloper on Earth: A small meteorite from another star system that crashed into the Pacific Ocean with energy equivalent to about 121 tons of TNT. The team, from Harvard University, hopes to find fragments of this interstellar rock, known as CNEOS 2014-01-08, which slammed into Earth on January 8, 2014. Recovering a fragment would represent the first contact humanity has ever had with material larger than dust from beyond the solar system. Researchers identified the object's interstellar origin in a 2019 study with 99.999% confidence, but it wasn't until May 2022 that it was confirmed by the U.S. Space Command. There are no known witnesses to the object striking Earth. The meteorite entered the atmosphere about a hundred miles off the coast of Papua New Guinea in the middle of the night, and exploded with about 1% the energy of the Hiroshima bomb. Measuring just 1.5 feet wide, CNEOS 2014-01-08 now appears to have been the first interstellar object ever discovered in our solar system. Previously, an oblong object called **Oumuamua** held that title. Discovered in 2017 during the Pan-STARRS sky survey, the space rock zipped through our solar system at nearly 57,000 mph. Oumuamua's discovery was followed in 2019 by comet 2I/Borisov, the first interstellar comet, which was spotted by an amateur astronomer in Crimea. CNEOS 2014-01-08 is thought to be from another star system because it was traveling at 37.2 miles per second relative to the sun. That's too fast for it to be bound by the sun's gravity. The **Galileo Project** is a \$1.6 million expedition to lower a magnet similar in dimensions to a king size bed at 1.3 degrees south, 147.6 degrees east, the U.S. Department of Defense's location of the meteorite's resting spot. That's about 186 miles north of Manus Island in the Bismarck Sea in the southwest Pacific Ocean. Leaving from Papua New Guinea, the Galileo Project's ship would use a magnetic sled on a longline



The meteorite fragments are thought to be 186 miles north of Manus Island (marked in red) in the Bismarck Sea in the southwest Pacific Ocean.

winch, which will be towed along the seabed at 1 mile for 10 days. It's hoped the magnet can recover tiny fragments of the meteorite, measuring as small as 0.004 inches across. However, it's unclear when the astronomers will be able to mount their expedition. The Galileo Project already has \$500,000 committed; a further \$1.1 million is required to make it a reality.

<https://www.livescience.com/interstellar-asteroid-fishing-expedition>

Mineral From Deep Inside Earth Found on Surface for First Time: It Shouldn't Be There

Scientists have discovered for the first time a new mineral encased within a diamond from over 375 miles deep within the Earth's lower mantle, which they say should've fallen apart before reaching the surface. Earth's lower mantle is the area between the planet's core and crust. This was a very unlikely discovery as minerals usually fall apart before they reach the Earth's surface, unable to retain their structure outside of a high-pressure environment, say the researchers, including those from the University of Nevada in Las Vegas (UNLV), US. The newly discovered mineral - named **davemaoite** - could survive such tremendous pressure change because it was encased within a diamond, says the team's study published on Thursday in the journal *Science*. "I think we were very surprised. We didn't expect this," UNLV mineralogist and study co-author Oliver Tschauner, said in a statement. "For jewelers and buyers, the size, color, and clarity of a diamond all matter, and inclusions – those black specks that annoy the jeweler – for us, they're a gift," Dr Tschauner added. **Davemaoite**, the scientists say, is a **calcium silicate compound, CaSiO₃-perovskite** that showed up as infinitesimal small dark specks in a diamond unearthed in the 1980s. It arrived on the surface decades ago in Botswana via



Davemaoite (black inclusions) in a diamond

the Orapa mine, the world's largest diamond mine by area. A gem dealer later sold the diamond in 1987 to a mineralogist at the California Institute of Technology in Pasadena. Dr Tschauner and his team then got their hands on the diamond, and analyzed its interior structure using a new suite of scientific tools. They named the new mineral "davemaoite" after

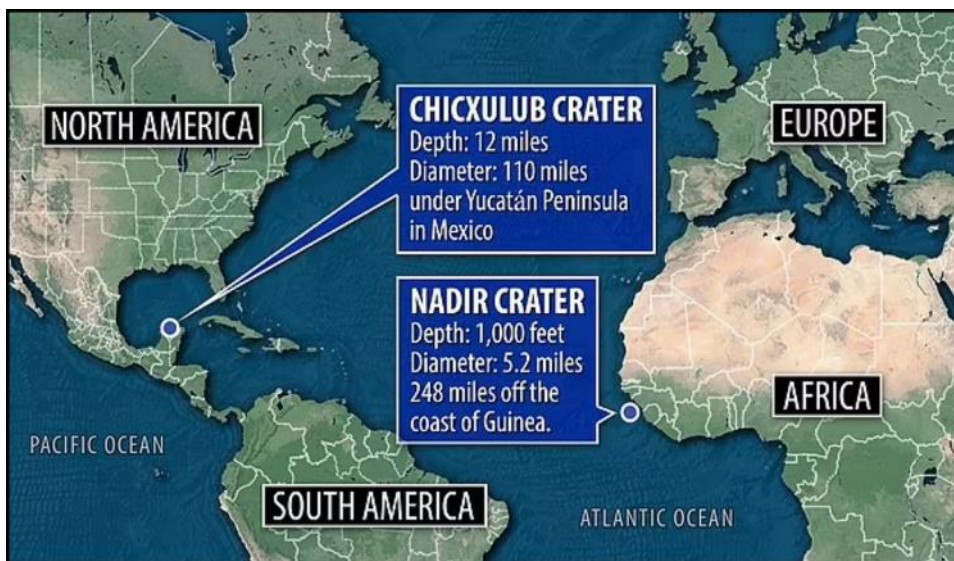
Ho-kwang "Dave" Mao, a geophysicist who developed many of the techniques that Dr Tschauner and his team use today. In the deep mantle, the researchers say, davemaoite takes on a role similar to that of garnet in the upper mantle with a chemistry that allows the minerals to host many elements that are incompatible in upper-mantle minerals. They found that the structure of davemaoite enables it to host major heat-producing elements, including uranium, and thorium which affect heat generation in Earth's lower mantle. The scientists say the mineral may have formed between 400 and 600 miles below the Earth's surface, adding that the discoveries of more such minerals will allow geologists to model the evolution of the Earth's mantle in greater detail. They say the finding also marks one of two ways in which highly pressurized minerals are found in nature, either from deep within Earth's interior or inside meteorites.

<https://www.independent.co.uk/news/science/davemaoite-interior-earth-mineral-mantle-b1958475.html>

A Mysterious Crater Found in The Ocean May Be A New Clue to The Dinosaurs' Fate

The ocean floor is famously less explored than the surface of Mars. And when a team of scientists recently mapped the seabed, and ancient sediments beneath, they discovered what looks like an asteroid impact crater. Intriguingly, the crater, named "Nadir" after the nearby volcano Nadir Seamount, is of the same age as the Chicxulub impact, caused by a huge asteroid which wiped out the dinosaurs and many other species at the end of the Cretaceous period, around 66 million years ago. The finding, published in *Science Advances*, raises the question of whether the new crater might be related to Chicxulub crater. If confirmed, it would also be of huge general scientific interest as it would be one of a small number of known marine asteroid impacts and so provide new insights into what happens during a marine impact. The crater was identified using "seismic reflection" as part of a wider project to reconstruct the tectonic separation of South America from Africa during the Cretaceous period. Seismic reflection works in a similar manner to ultrasound data, sending pressure waves through the ocean and its floor and detecting the energy that is reflected back. This data allows geophysicists and geologists to reconstruct the architecture of the rocks and sediments. Scrolling through this data at the end of 2020, researchers came across a highly unusual feature. Among the flat, layered sediments of the Guinea Plateau, west of Africa, was what appeared to be a large crater, a little under **6.2-miles wide** and several hundred feet deep, buried below several hundred feet of sediment. Many of its features are consistent with an impact origin, including the scale of the crater, the ratio of height to width, and the height of the crater rim. The presence of chaotic deposits outside of the crater floor also looks like 'ejecta' (material expelled from the crater immediately following a collision). They considered other possible processes that could have formed such a crater, such as the collapse of a submarine volcano or a pillar (or diapir) of salt below the seabed. An explosive release of gas from below the surface could also be a cause. But none of these possibilities were consistent with the local geology or the geometry of the crater. After identifying and characterizing the crater, researchers built computer models of an impact event to see if they could replicate the crater and its impact history. The simulation that best fits the crater shape is for an asteroid **1300 feet** in diameter hitting an ocean that was **2600 feet deep**. The consequences of an impact in the ocean at such water depths are dramatic. It would result in a **2600**

-foot thick water column, as well as the asteroid and a substantial volume of sediment being instantly vaporized by a large fireball visible hundreds of miles away. Shock waves from the impact would be equivalent to a magnitude **6.5 or 7 earthquake**, which would likely trigger underwater landslides around the region. A train of tsunami waves would form. The air blast from the explosion would be larger than anything heard on Earth in recorded history. The energy released would be approximately a thousand times larger than that from the recent Tonga eruption. It is also possible that the pressure waves in the atmosphere would further amplify the tsunami waves far away from the crater. One of the most intriguing aspects of this crater is that it is the same age as the giant Chicxulub event, give or take one





million years, at the boundary between the Cretaceous and Paleogene periods 66 million years ago. Again, if this really is an impact crater, might there be some relationship between them? The researchers proposed three ideas as to their possible relationship. The first is that they might have formed from the break-up of a parent asteroid, with the larger fragment resulting in the Chicxulub event and a smaller fragment (the "little sister") forming the Nadir crater. If so, the damaging effects of the Chicxulub impact could have been added to by the Nadir impact, exacerbating the severity of the mass extinction event. The break-up event could have formed by an earlier near-collision, when the asteroid or comet passed close enough to Earth to experience gravitational forces strong enough to pull it apart. The actual collision could then have occurred on a subsequent orbit. Although this is less likely for a rocky asteroid, this pull-apart is exactly what happened to the Shoemaker-Levy 9 comet that collided with Jupiter back in 1994, where multiple comet fragments collided with the planet over the course of several days. Another possibility is that Nadir was part of a longer-lived "impact cluster", formed by a collision in the asteroid belt earlier in Solar System history. This is known as the "little cousin" hypothesis. This collision may have sent a shower of asteroids into the inner Solar System, which may have collided with the Earth and other inner planets over a more extended time period, perhaps a million years or more. Finally, of course, this may just be a coincidence. Scientists expect a collision of a Nadir-sized asteroid every 700,000 years or so. For now, however, The researchers could not definitively state that the Nadir crater was formed by an asteroid impact until they recovered samples from the crater floor, and identified minerals that could only be formed by extreme shock pressures. To that end, the researchers recently submitted a proposal to drill the crater through the International Ocean Discovery Program. As with the main impact crater hypothesis, they could only test the little sister and little cousin hypotheses by accurately dating the crater using samples.

<https://www.sciencealert.com/a-mysterious-crater-found-in-the-ocean-may-be-a-new-clue-to-the-dinosaurs-fate>

2022 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, October 8 – 9:00 a.m. - 7 p.m.?
Sunday, October 9 – 9:00 a.m. – 3 p.m.?
Viewing Hours: Fri., Oct. 7, from 5:00 to 7:30 p.m.; Sat. at 7:30 a.m.; Sun at 8:00

	<p>APPROXIMATELY 1,300 LOTS</p> <p>From Several Collections</p> <p>LOTS of Equipment, Minerals, Rough, Fossils, Equipment, Books</p> <p>HOT FOOD AVAILABLE CAMPING AVAILABLE (www.amanarvpark.com)</p>	
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THE FOLLOWING IS A PARTIAL LIST OF ITEMS TO BE AUCTIONED

EQUIPMENT WILL SELL AT 2:00 ON SATURDAY

ROCKS & MINERALS

- AGATE: Bahia, polished; Botswana rough;
- Casa Grande (cut); Coldwater; Fire rough;
- Green tree rough; Laguna; Lake Superior;
- Madagascar Dendritic (Mad River Agate); Mexican lace rough; Turritella
- Amethyst, standing, crystals, clusters, buttons
- Apophyllite
- Barite, Linwood Mine
- Buckets of Rough
- Cactus Quartz
- Calcite, iridescent (Knoxville IA)
- Calcite, Linwood Mine
- Citrine
- Emerald in matrix
- Fluorescent Specimens (Willemite, Calcite, Franklinite), Trotter Dump Franklin N.J
- Fluorite, octahedrons & specimens
- Geodes, Tobasco, Ocho
- Geodes, uncracked and cracked
- Herkimer Diamonds
- India Zeolites
- Jade
- Labradorite Palm-stones
- Misc. slabs
- Mixed Minerals
- Ocean Jasper slabs, rough
- Quartz
- Rhodochrosite Sphere
- Ruby (corundum xls)
- Selenite, wands, cubes, xls
- Solution Quartz, Jeffrey Quarry, ARStilbite
- Thomsonite

- Thundereggs, cut
- Tourmaline, black

EQUIPMENT (will sell at 2:00 on Sat.)

- 4 ft. Setup for Tumbler Barrels
- Air Compressor
- Assorted Parts
- Belt Sander
- Blower Fan
- Combo Units, some with Saws (6)
- Drop Saws (3)
- Electric Solder Machine
- Kiln
- Motors
- Polish
- Sand Blasters, 1 mini, 1 large, 1 small table-top
- Saws, 6" to 20" (5 or 6)
- Spin Caster
- Tumbler (2-barrel Lot-O-Tumbler)
- Tumbler Barrels
- Tumbler Frames
- Tumbler, 4-5 lb.
- Vacuum Pumps
- Vibro-Tumbler, 2-barrel
- Wood Display
- Wood Spool Polisher in Case
- Wooden Storage Drawers

BOOKS

- The Fabulous Keokuk Geodes
- The Wilmington Coal Flora

FOSSILS

- Arizona Petrified Wood Piece, 100 lbs+
- Petrified Wood, full rounds
- Blue Forest Petrified Wood, polished
- Trilobite, Acadoparadoxides, Morocco

MISC.

- Magnetic Bracelets
- Plastic "5-dram" jars with lids (new)
- Rock & Gem magazines
- Septarian Spheres

JEWELRY

- Belt Buckle findings
- Bolo Ties and findings
- Jade Butterfly Broaches
- Jewelry Findings



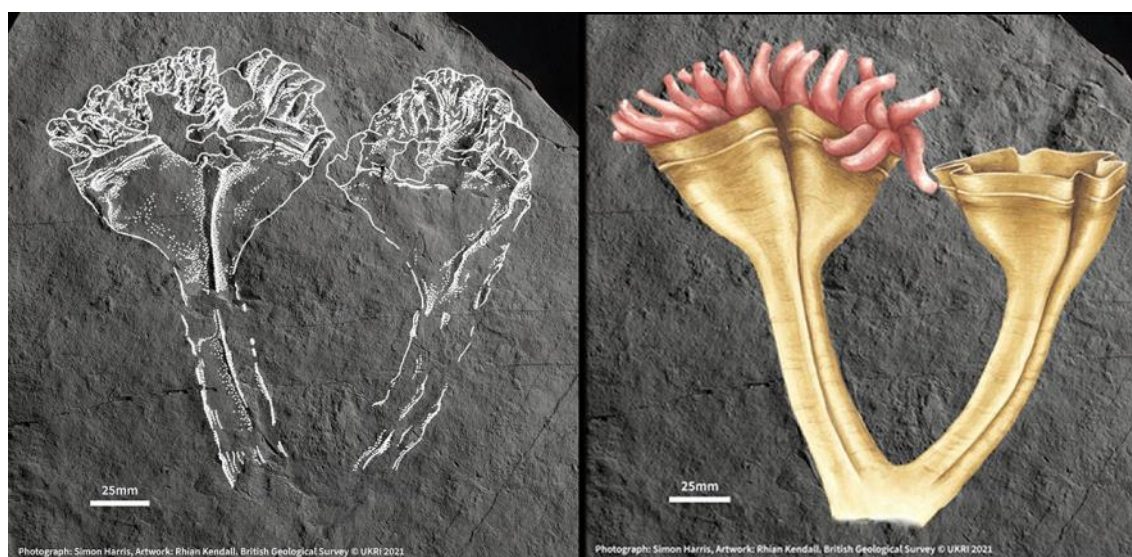
I.D. will be required to obtain buying number. Cash, credit card (2.75% convenience fee) or good check. Two forms of I.D. required for all checks. 7% tax added to all sales. Buyers who provide proof of tax permits are exempt. No items removed until settled for on day of sale. Not responsible for accidents,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

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<https://www.cedarvalleyrockclub.org/auction.html>

This 560-Million-Year-Old Fossil Is Earth's Earliest Known Animal Predator

Amongst thousands of impressions in a large rock surface, one stood out from the crowd. The imprint of a tough tubular exoskeleton topped with waving tentacles, now frozen in time, looked strikingly familiar, unlike any of its neighbors. It looked just like a relative of corals, anemones, and jellyfish from a sediment layer dated 20 million years before Cnidaria like these were thought to exist. "It's *nothing like anything else we've found in the fossil record at the time*," said paleontologist Frankie Dunn from the Oxford University Museum of Natural History. "Most other fossils from this time have extinct body plans and it's not clear how they are related to living animals. This one clearly has a skeleton, with densely packed tentacles that would have waved around in the water capturing passing food, much like corals and sea anemones do today." The discovery itself was made back in 2007 when researchers from the British Geological Society removed debris from a slab of rock at the Bradgate formation in



Left-outline overlaying the *Auroralumina attenboroughii*'s fossil imprint,
Right-artist's impression of the 560 million-year-old predator.

in Charnwood Forest, a well-known fossil site just outside of Leicester, England. The rock itself is already regarded as truly ancient, dating to around **557 to 562 million** years old. It was a time of truly odd creatures, long before the rich biodiversity of the **Cambrian Explosion** assembled body plans we're now more familiar with. The researchers took a cast of the textured rock for study. Amid the thousands of impressions depicting an assortment of ancient life forms, one looked less alien than the rest. In fact, it looked a little too much like life we'd see today. Resembling something we might see snaring a passing crustacean on a modern coral reef, the 20-centimeter-long cnidarian now represents the earliest example of a predator. "The 'Cambrian Explosion' was remarkable. It's known as the time when the anatomy of living animal groups was fixed for the next half a billion years," explained Dunn. "Our discovery shows that the body plan of the cnidarians [corals; jellyfish; sea anemones, etc.] was fixed at least 20 million years before this, so it's hugely exciting and raises many more questions." The **Ediacaran Period** is notable for its sparse but strange, very alien fossils that have no resemblance to anything currently living. The new find supports the theory that this time period is also the dawn of modern animals. The seeds of at least one animal group we know today were first planted then, just in time to really flourish and diversify during the prolific Cambrian age. So Dunn and his colleagues named the fossilized animal's genus **Auroralumina**, meaning dawn lantern for its resemblance to a burning torch. To the delight of Sir David Attenborough, who hunted for fossils nearby as a boy, they gave it the species name **attenboroughii**. This strange but familiar creature shares characteristics common with early Cambrian cnidarians; however, unlike them, its tough exoskeleton is smooth rather than ornamented. "It's the earliest creature we know of to have a skeleton," says Dunn. "So far we've only found one, but it's massively exciting to know there must be others out there, holding the key to when complex life began on Earth." *Auroralumina attenboroughii*'s large size, compared to other known relatives, may mean it doesn't have the free-swimming medusa stage of its lifecycle like jellyfish and corals do, the team suspects. Anemones also lack this stage; they're sessile animals always remaining stuck in place. The researchers believe this lonely little predator may have been swept into deeper water from a shallower home on the flank of a volcanic island by a deluge of volcanic ash. It lies at an odd angle compared to its neighbors in death, who were all flattened and forevermore preserved in that direction when the deluge hit.

<https://www.sciencealert.com/new-dawn-lantern-fossil-found-to-be-the-earliest-known-animal-predator>

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Club meetings are held the 3rd Tuesday of each month from September through November and from January through May at 7:15 p.m. Meetings are held at the Hiawatha Community Center in the Hiawatha City Hall, [101 Emmons St., Hiawatha IA](http://101EmmonsSt.com). The December meeting is a potluck dinner held on the 1st Tuesday at 6:30. June, July, and August meetings are potlucks held at 6:30 p.m. at area parks on the 3rd Tuesday of each month

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

**Next Meeting:
SEPTEMBER 20
Hiawatha Community Center
CO₂ Sequestration and the ADM-Wolf Carbon
Solutions Pipeline in East-Central Iowa
featured speaker:
Ray Anderson—CVRMS**



Ray Anderson, Editor
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