Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

cedarvalleyrockclub.org

CEDAR VALLEY GEMS | DECEMBER 2024 | VOL. 50, ISSUE 12

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

Next CVRMS Meeting

Tuesday December 10

2024 CVRMS HOLIDAY PARTY

Hiawatha Community Center
101 Emmons St., Hiawatha

2017 Holiday Party

Eat at 6:30 pm

More information on page 10

World's Largest Martian Meteorite Goes on Display

The hefty chunk of Mars weighs 32 pounds and measures 10 inches across at its widest point. It was unveiled September 1 at the Maine Mineral and Gem Museum in Bethel, which also houses approximately 6,000 extraterrestrial rocks, including the largest piece of moon. The lump of rock wound up on Earth after a large asteroid or comet blasted it off the Martian surface. *"Martian rocks can fall to Earth as meteorites," said Carl Agee, director of the Institute of Meteoritics at the University of New Mexico. "They are ejected off Mars by large, energetic impact events."* The Martian rock, named **Taoudenni 002**, is *"by far the largest complete uncut Martian meteorite on Earth,"* said Agee. There are around 300 pieces of Martian rock on Earth, totaling around 500 pounds. However, collectors often break them apart to sell them separately, so the actual number of known Martian meteorites on Earth is between 100 and 150. After powerful impacts eject the rocks from Mars, they drift through space and eventually end up on an Earth-crossing orbit around the Sun. A local meteor hunter discovered Taoudenni 002 near a desert salt mine in Mali before world-leading meteorite dealer Darryl Pitt acquired it for the Maine Mineral and Gem Museum in April 2021. *"The meteorite fall was not witnessed, but it was likely recent,"* Agee said. *"In the last few 100 years perhaps,"* due to its well preserved condition, he added. Martian meteorites have specific chemical signatures, and the minerals and elements in Taoudenni 002 perfectly matched the known Martian minerals, Agee said. *"It is a **shergottite**, which is the main type of Martian meteorite,"* Agee said. *"It contains the minerals olivine, pyroxene and shock-transformed feldspar,"* which formed from the Mars impact that ejected it. The meteorites' composition also hinted at how the rock was created. *"It most likely was formed in a volcanic episode on Mars more than 100 million years ago,"* Agee said. Even larger Martian rocks may be hidden on Earth, Agee said, potentially *"buried under a sand dune in the Sahara, or deep in the ice in Antarctica, or perhaps at the bottom of the ocean."* *https://www.livescience.com/worlds-largest-martian-meteorite.html*

CVRMS Meeting November 19 — Minutes —

MEETING CALLED TO ORDER: 7:20 pm by Marv, president, who announced that the board has recently organized the work assignments for the annual Rock Show. He then passed around sign-up sheets for work assignments and reserving display cases for the 2025 Show.

MINUTES FROM LAST MEETING IN NEWSLETTER: Motion for approval; 2nd by Bill. Approved by vote.

TREASURER'S REPORT: Dale presented a report on the CVRMS funds. Total $37,418.10. Ray moved to accept the report, Dale 2nd, vote to accept.

PROGRAM: University of Iowa geoscience Professor David Peate presented a program on the "*Monturaqui crater – the impact of an iron meteorite in the Atacama Desert, Chile."* The program was interesting and informative.

DISCUSSION OF 2024 HOLIDAY PARTY: Party will begin at 6:00 pm here in Hiawatha on December 10. Club will provide meat, potatoes, dressing and gravy and mulled cider. Side dishes and desserts will be Pot Luck (bring your best dishes). Also bring your Table Service. Bus trip slides, games, and rock-show-and-tell for entertainment.

2024 CVRMS ANNUAL MEETING AND ELECTION: Bill Desmarais' term on the Board expired, and he chose not to run for reelection. The Election Committee nominated Laura Halladay for the 2025-2027 Director term. Marv asked 3 times if there were any other nominees for the Directorship. None being heard, a show of hands unanimously elected Laura Halladay to the CVRMS Board of Directors.

2025 AUCTION NOTES: To date about 800 lots have been committed for auction

SUGGESTION FROM KIM K.: If anyone has an opportunity to visit other rock shows, please bring back ideas that could help us improve our show.

MARV PREPARING LIST OF ROCK SHOWS AND AUCTIONS: Marv and others are working on a list of the dates of area rock shows and auctions that they will make available.

MOTION TO ADJOURN: by AJ; 2nd by Dale.

Meeting adjourned 9:04 pm.

Respectfully Submitted.
Ray Anderson, Acting Secretary

CVRMS Board Meeting Nov. 26 — Minutes —

MEETING CALLED TO ORDER: 7:05 pm by Marv Houg at his house. Board members present, Ray Anderson, Marv Houg (president) , Jay Vavra, Matt Burns, Kim Kleckner, and Sharon Sonnleitner. Also present incoming Board member Laura Halladay. Marv welcomed Laura to the Board.

SECRETARY MINUTES FROM LAST MEETING. Ray moved to approve, Sharon 2nd, minutes approved by vote.

TREASURERS REPORT. Dale was not present, so, no report.

2025 ROCK AUCTION: Sharon reported 830 lots committed so far, but several usual consignees have not yet reported.

2025 ROCK SHOW: March 22-23, Theme ***ICE AGE.*** Sharon said 5 dealers not yet paid (Doug D. not committed yet). **Ray** has several speakers lined up but has yet to talk to Tiffany and State Archaeologist. **Sharon** said 8 display cases spoken for so far. Ray will speak to Tiffany about displays, and will check with the Corps of Engineers about a table. Several suggestions for raffle prizes were discussed.

NEW BUSINESS: No new program requests. **Board** Assignment of Rock Show Tasks discussed with Sharon sending an upgraded list. **A new** club banner was discussed, with additional discussion to come.

FIELD TRIPS: Matt said none planned until Spring, then probably Sheffield trip. **Thunder Bay** trip still in planning. **Discussion of a trip** to Haunted Ridge, Mo, for quartz crystal plates.

OTHER ITEMS: The Holiday party will be held on December 10th at the Hiawatha City Center. Doors will open at 6:00 pm, eat at 6:30 pm. The meal will be a potluck. **Sharon will** cook turkey and make gravy. **Dell will** do the stuffing and mashed potatoes. **Jeff will** do the ham. **Ray will** project pictures of this year's bus trip. **We need** side dishes, vegetables and desserts. **Bring your own** place settings. **Sharon will** be in charge of games, and **Sharon and Del**l will invent table decorations. **Bring rocks** for show and tell.

MOTION TO ADJOURN: by Jay second by Ray.

Meeting adjourned at 8:45 pm.

Respectfully submitted
Ray Anderson, Acting Secretary

ELECTION OF CVRMS OFFICERS FOR 2025 - 2026

The November 19 CVRMS meeting was our official **Anual Meeting for 2024**, which means that it was time for members to elect club officers. The Nominations Committee submitted Laurra Halladay for a three-year term as **Director** to replace Bill Desmarais. The other two Directors are serving staggered 3-year terms, and other officers have one year remaining on their 2-year terms. CVRMS members present at the November 19, 2024 meeting voted unanimously to elect Laura. The following are the CVRMS Officers and Directors for 2025.

President	Marv Houg
Vice President	Ray Anderson
Treasurer	Dale Stout
Secretary	Dell James
Editor	Ray Anderson
Liaison	Kim Kleckner
Webmaster	Sharon Sonnleitner
Immed. Past Pres.	Sharon Sonnleitner
Director '25	Matt Burns
Director '26	Jay Vavra
Director '27	Laura Halladay

$$ TIME TO PAY $$
YOUR CLUB DUES
A BARGAIN AT ONLY
$15 PER YEAR
Pay at Meeting or Mail To:
Dale Stout, Treasurer
2237 Meadowbrook Dr. SE, Cedar Rapids, IA 52403

Spotlight Gemstones: Zircon, Tanzanite, Turquoise

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

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

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

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

• • *information from Wikipedia*

What in the World?

What in the World is this unusual gemstone?

November's Photo

November's **What in the World** photo showed the intricate and peculiar stone figures that are a unique expression of rock weathering and erosion in Fantasy Canyon near Vernal, Utah. The pinnacles, pillars, arches, and knobs of Fantasy Canon were formed from ancient river channel sediments deposited on the fringe of a vast sub-tropical lake, Lake Uinta, during the Eocene Epoch, 55 to 34 million years ago.

ROCK CALENDAR
CVRMS EVENTS OF INTEREST

2024

Dec. 10 — CVRMS Holiday Party
Hiawatha Community Center
We will eat at 6:30 pm
see page for details

2025

Jan. 21 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Dr. Ray Anderson
The Geology of the Saylorville Spillway
-this time for sure!

Feb. 18 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
University of Iowa Students and Faculty
Program to be announced

Mar. 18 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Cornell College Students and Faculty
Program to be announced

Mar. 22-23 — CVRMS Rock Show
Hawkeye Downs, Cedar Rapids
Show Theme: *The Ice Age*
more information in future newsletters

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

May 15 — CVRMS Monthly Meeting
Hiawatha Community Center 7:15 pm
Program to be announced

Ask a Geologist

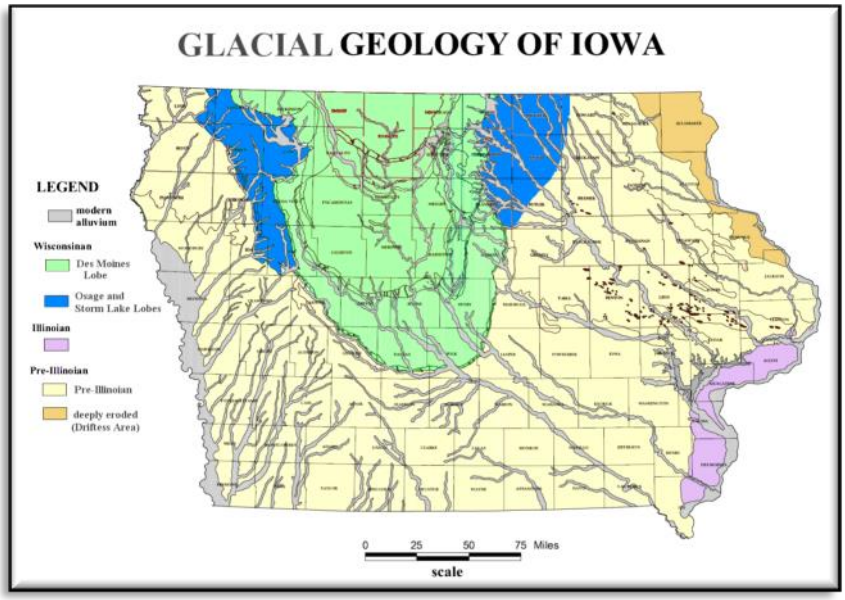
by Ray Anderson aka Rock Doc , CVRMS Vice President

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

Last month I was contacted by Mark Schmidt who, after a few kind words, asked me to address the questions, *"how many glaciers came into the landscape and how did they affect our landscape?"* I know a little bit about Iowa's glacial history. But a lot more has been learned since I retired from the Iowa Geological Survey in 2013, primarily from the work of two current Survey geologists, Phil Kerr and Steph Tassier-Surine. I was not able to contact them before preparing this answer, but I will ask one of them to bring us up to date on the ice age in Iowa at one of our monthly meetings.

How many glaciers came into the landscape and how did they effect our landscape?

I will assume that this question (*how many glaciers came into the landscape and how did they affect our landscape?)* refers to Quaternary (within the last 2.58 million years) glaciations. Iowa was glaciated some number of times during the Precambrian Cryogenian period (720-630 million years ago) but no rock record remains in the area. The Pleistocene "Ice Ages" began about 2.6 million years ago when centuries of snowfall in central Canada produced incredible thickness of snow east and west of the Hudson Bay area. As thousands of feet of snow accumulated the snow was compressed to ice which episodically flowed like sheets taffy for thousand of years in all directions, especially south, only to slowly melt back as climatic conditions changed. These ice sheets reached thicknesses of up to 2 miles, crushing and grinding the underlying rock, flattening the landscape, and picking up and incorporating huge quantities of clay, silt, sand, rocks, and boulders as they flowed. The earliest period of this ice flow is called the **Pre-Illinoian Stage** and lasted from about **2.6 million to 191 thousand years** ago. During the Pre-Illinoian, numerous ice sheets advanced into and through Iowa, the most extensive advancing about halfway across the state of Missouri (as far as the current Missouri River). As the glaciers retreated (not moving backwards just melting back) they dropped the entrained rocks and other materials as a smooth layer of glacial till. Each subsequent ice advance incorporated much of the previous glacial till that it overrode, making it difficult to know how many ice sheets passed through the state. Fortunately, there was sufficient time between major periods of ice advances for a soil to be developed, and the presence of this ancient soil (or *paleosol*) which, if preserved, marks the top of a till sheet. Current research has identified 4 Pre-Illinoian ice advances in Iowa, but as many as 9 or more are thought to have moved through the state (Missouri geologists have identified 5). During the second major period of glacial advances, known as the **Illinoian Stage (191-130 thousand years ago**), the glacial ice sheets moved south through Wisconsin and Illinois, advancing only once into southeast-most Iowa. The most recent glacial episode, the **Wisconsin Stage (about 100 to 10 thousand years ago)** included 3 major ice advances into Iowa, the **Storm Lake Lobe (46,000–40,000 years ago),** the **Osage Lobe (34,000–29,000 years ago),** and **the Des Moines Lobe (14,000 to 12,000 years ago).** These ice sheets advanced into central Iowa, the last as far south as Des Moines. When these ice sheets retreated they deposited a relatively uniform layer of glacial till leaving behind a flat landscape. Over time rivers eroded their way into the landscape creating the surface relief that we see today. So the oldest glaciated areas display the greatest relief (southern Iowa) and the most recently glaciated the least relief (the Des Moines Lobe). A series of major sand and gravel ridges (moraines) record the edges of Des Moines Lobe ice at times when its retreat stagnated. The entire state of Iowa was glaciated; the area of northeast most Iowa referred to as the *"Driftless Area"* ('drift' is glacial till) was actually glaciated by at least 2 ice sheets, but because of the high relief in the area, most of the till was eroded away. These glacial tills and the wind-blown loess deposits associated with each were the parent materials for the development of Iowa's fertile soils.



\

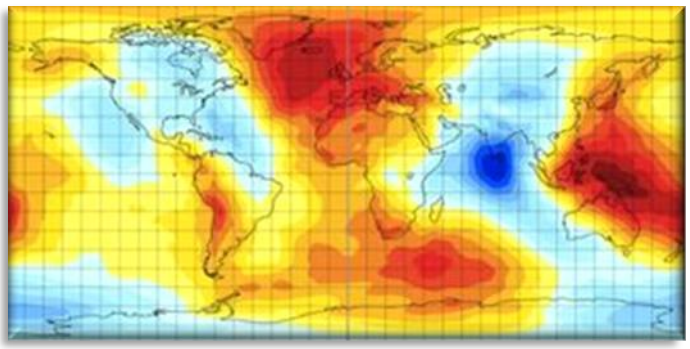
Meet the World's Rarest Mineral. It Was Found Only Once

Deep in the Myanmar Mogok region, a tiny reddish-orange crystal sat unnoticed. To the untrained eye, it seemed like many other stones—polished by water, overlooked by miners seeking sapphires. But this unassuming gem, later named **kyawthuite**, is unlike anything else on Earth; or at least, anything else that we know of. It is the rarest mineral known to science, with only a single specimen ever discovered

Kyawthuite is a transparent deep orange colored gemstone having a chemical formula of Bi3+Sb5+O4, with traces of tantalum. Further research revealed that the rarest mineral contains trace levels of vanadium and chromium as well as a trace amount of OH/H2O. The Raman spectrum is similar to that of synthetic Bi3+Sb5+O4. Kyawthuite. is brittle stone with a conchoidal fracture. It belongs to monoclinic system with an adamantine luster. Structural analysis showed that it is isostructural with clinocervantite (a crystal containing Sb(III) and O), and also an antimony-analogue of clinobisvanite (a crystal containing Sb(V) and O). It has three directions of perfect cleavage and shows very slight pleochroism. It was found by gemstone prospectors in the year 2010, as a water worn crystal in alluvium, likely originated from a pegmatite, in the Chaung-gyi valley, near Mogok, Burma (Myanmar). Only one sample of the naturally occurring form of this mineral has been found, making it not only the rarest mineral but also the rarest gemstone. Dr. Kyaw Thu, a Burmese mineralogist-petrologist-gemologist and owner/operator of the Macle Gem Trade Laboratory purchased the rough stone and faceted the stone to a single gemstone weighing 1.61 cts. In December 2015, the International Mineralogical Association recognized it as the first ever discovered gemstone in the world and the stone was named as "Kyawthuite." The Stone is currently being exhibited at the Natural History Museum of Los Angeles County in the United States. https://www.giigemlab.com/wp-content/uploads/2023/07/Kyawthuite-1702.pdf

Rutilated Quartz

The Indian Ocean **"gravity hole"** is the site of the deepest dent in Earth's gravitational field. It's a circular ocean region with a gravitational pull that's so weak, sea levels are 348 feet lower there than elsewhere on Earth. Discovered in 1948, the origins of this giant gravity hole, or geoid low, as it is technically called, remained a mystery until recently. The hole spans 1.2 million square miles and sits 746 miles southwest of India.

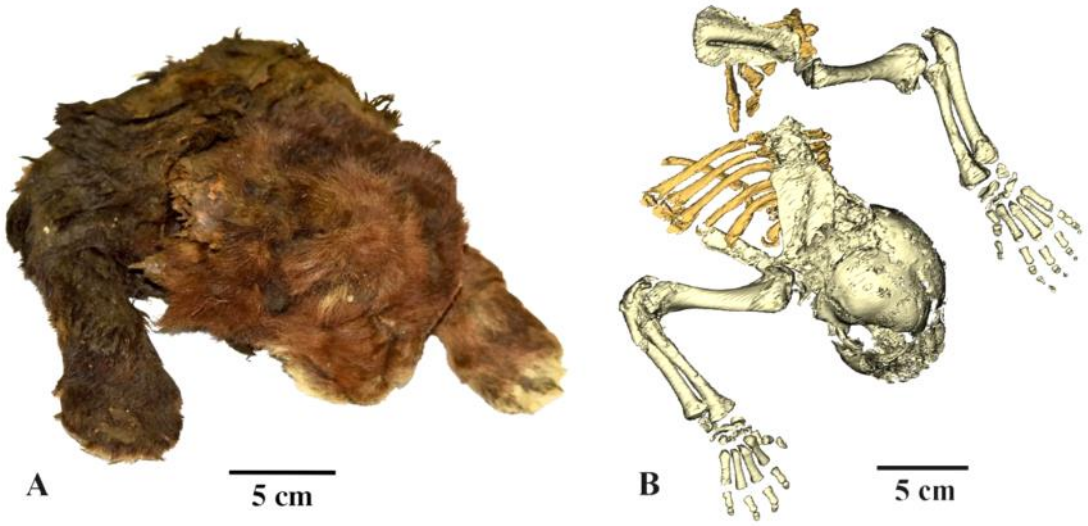


A map showing how water elevation and distribution would change due to gravity if the effects of tides and currents were removed.

Various theories have tried to explain its existence since geophysicists first detected its trace, but the answer only came in 2023 with a study published in the journal *Geophysical Research Letters.* Researchers used 19 computer models to simulate the motion of Earth's mantle and tectonic plates over the past 140 million years, and then teased out the scenarios giving rise to a geoid low similar to the real-life one. The study indicated that the Indian Ocean gravity hole formed after the death of an ancient ocean called Tethys, which existed between the supercontinents Laurasia and Gondwana. Tethys sat on a chunk of Earth's crust that slipped beneath the Eurasian plate during the breakup of Gondwana 180 million years ago. As this happened, shattered fragments of the crust sank deep into the mantle. Around 20 million years ago, as these fragments landed in the lowermost regions of the mantle, they displaced high-density material originating from the "*African blob,*" a compact bubble of crystallized magma, 100 times taller than Mount Everest, that is trapped beneath Africa. Plumes of low-density magma rose to replace the dense material, diminishing the overall mass of the region and weakening its gravity. Scientists are yet to confirm these model predictions with earthquake data, which could help to verify the existence of low-density plumes beneath the hole. Meanwhile, researchers are realizing more and more that Earth's magma is full of strange blobs, including some that were thought to be missing and have turned up in unexpected places. And it's not just Earth, explorations of Mars, too, have revealed blobs of all shapes and sizes lurking below the planet's surface. https://www.livescience.com/planet-earth/rivers-oceans/indian-ocean-gravity-hole-the-dent-in-earths-gravitational-field-created-by-the-death-of-an-ancient-ocean

35,000-Year-Old Saber-Toothed Kitten With Preserved Whiskers Pulled from Permafrost in Siberia

Researchers have pulled the mummy of a newborn saber-toothed cat that died at least 35,000 years ago from Siberia's permafrost — and the kitten still has its whiskers and claws attached. A new analysis of the kitten's stunningly-preserved head and upper body shows it was just 3 weeks old when it died in what is now Russia's northeastern Sakha Republic, also known as Yakutia. Scientists found pelvic bones, a femur and shin bones encased in a block of ice together with the mummy. The circumstances of the animal's death are unknown. It is extremely rare to find well-preserved remains of saber-toothed cats, and this one belongs to the species ***Homotherium latidens***, according to a study published in the journal *Scientific Reports*. Saber-toothed cats of the extinct genus *Homotherium* lived across the globe during the Pliocene (5.3 million to 2.6 million years ago) and early Pleistocene (2.6 million to 11,700 years ago) epochs, but evidence suggests this group became less widespread toward the end of the Pleistocene (the last ice age). *"For a long time, the latest presence of Homotherium in Eurasia was recorded in the Middle Pleistocene [770,000 to 126,000 years ago],"* researchers wrote in the study. *"The discovery of H. latidens mummy in Yakutia radically expands the understanding of distribution of the genus and confirms its presence in the Late Pleistocene [126,000 to 11,700 years ago] of Asia."* The small, deep-frozen mummy shows *H. latidens* was well-adapted to ice age conditions, according to the study. The researchers compared the carcass to that of a modern 3-week-old lion (*Panthera leo*) cub and found the saber-toothed kitten had wider paws and no carpal pads, pads on the wrist joint that act as shock absorbers in today's felines. These adaptations enabled saber-toothed cats to walk with ease in snow, while thick, soft fur observed on the mummy shielded the predators against polar temperatures.



Researchers reconstructed the kitten's skeleton using a 3D computer model.

The comparison with the lion revealed that saber-toothed cats had a larger mouth, smaller ears, longer forelimbs, darker hair and a much thicker neck. Researchers already knew from studying the skeletons of adult *Holotherium* that these saber-toothed cats had short bodies and elongated limbs, but the new research shows these features were already present at the age of 3 weeks. Radiocarbon dating of the mummy's fur suggested the kitten has been buried in permafrost for at least 35,000 years, and possibly 37,000 years. The carcass was pulled from the banks of Yakutia's Badyarikha River in 2020, and its discovery has enabled researchers to describe, for the first time, physical characteristics of *H. latidens*, including the texture of these cats' fur, the shape of their muzzle and the distribution of their muscle mass. Remarkably, the mummy still had sharp claws and whiskers (or vibrissae) attached to it. However, "*the mummy eyelashes were not preserved,*" the researchers noted in the study. The new analysis identified the species the mummy belongs to and its most striking features, but its authors are already working on a new paper. *"The anatomical features of the find will be discussed in more detail in a subsequent paper,"* they wrote. https://www.livescience.com/animals/extinct-species/35-000-year-old-saber-toothed-kitten-with-preserved-whiskers-pulled-from-permafrost-in-siberia

Baby Teeth Reveal Surprisingly Long Lifespans of Small Jurassic Mammals

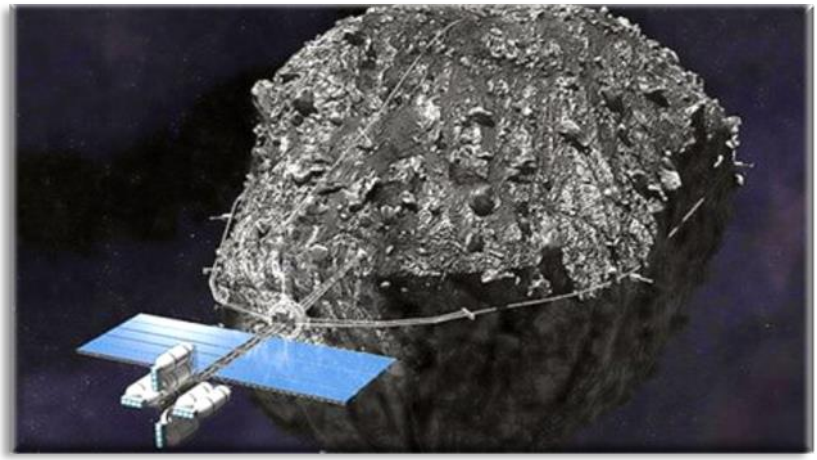
A team of paleontologists combing through Scotland's fossil-rich and misty Isle of Skye discovered the remains of a small, but exciting, early mammal. The mouse-sized creature called a Krusatodon was replacing its baby teeth with its adult teeth when it died and was a juvenile. Its ancient teeth-changing indicates that small early mammals may have had longer lifespans and development periods than their modern counterparts of a similar size. The findings were published in July 24 in the journal *Nature*. The specimens in this new study date back to the Middle Jurassic–about 166 million years ago. At this time, mammaliaformes (early mammals and their closest extinct relatives) were really starting to come into their own. One of the most common mammal orders at this time were the **docodontans,** who lived from Middle Jurassic to the Early Cretaceous. They are known for some distinct sets of chompers and are not a far cry from their living ancestors. Most of them ate insects and lived around the undergrowth where they were safe from predators, like a dinosaur's clomping feet and sharp jaws. They would have been most active at dawn, dusk, and during the night. However, the docodontans are especially interesting because we know from their fossils that some of them grew larger (around the size of a polecat) and could also climb trees, swim, and dig. They also ate a much wider range of foods, thanks to having the first very complex shaped teeth. In other words they were evolutionary innovators for their time period. Modern mammals typically grow rapidly as juveniles and stop growing by adulthood. Mammaliaformes generally weighed less than three ounces or so, but also had longer lifespans and slower growth rates than today's small-bodied mammals. For scientists, understanding where this pattern emerged has been a challenge due to a lack of juvenile fossils. In 2016, a Krustodon fossil was discovered that intrigued paleontologists, and it was a juvenile. The team analyzed the growth increments within the teeth of the specimens and an adult. They found that the adult was about seven years old when it died, while the juvenile was 7 to 24 months old when it died. The juvenile was also in the process of replacing its baby–or primary–teeth with its adult teeth. Based on the length of the teeth and the forelimb and thigh bone circumferences, they estimate that the mature Krusatodon was between the size of a pygmy tree shrew (about two ounces) and a degu (roughly 5.5 ounces). The juvenile was roughly between 51 and 59 percent of the body mass of the adult. The team believes that Krusatodon development was likely prolonged and took place over a longer period of time and part of a much longer maximum lifespan than living animals of a similar adult body size. The team believes that mammal growth sped up later in the Jurassic, but are still not certain. They will need to find more fossils of younger mammals to determine this and piece together a better timeline. https://www.popsci.com/science/jurassic-mammal-teeth

Earth's Plate Tectonics Traced Back to 'Tipping Point' 3.2 Billion Years Ago

Earth's surface is ever-changing, with tectonic plates grinding and shifting, building mountain ranges, pulling apart sea floors and causing dramatic earthquakes. Now, new research adds to the growing body of evidence that these dynamics started 3.2 billion years ago. While there is controversy within the geoscience community about exactly when Earth became more than just a blob of hot, undifferentiated rock, the new study suggests that this transition happened about 1.3 billion years after the planet formed. *"Three-point-two billion is the tipping point," according to* study co-author Zheng Xiang Li, a geodynamicist at Curtin University in Australia. In 2020, Li and his colleagues reported there was a shift in the chemistry of the rocks that formed in the mantle about 3.2 billion years ago, hinting that a *"remixing*" process took place. This process would have involved minerals being transported from the crust down into the mantle, and mantle rocks moving up to the surface, the fingerprints of plate tectonics. Other researchers have also seen evidence of a shift at this same time period; for example, a 2020 study in the journal *Science* Advances found magnetic evidence for large-scale plate motion 3.2 billion years ago. But there is still debate about when and how these processes started, Li said. In the new study, he and Luc Doucet, a geochemist at Curtin University, along with their colleagues, focused on large lead-zinc deposits in Australia. The scientists used the ratios of molecular variations of uranium, thorium and lead as a clock to measure events that happened deep in Earth's history. The deposits in Australia span from 3.4 billion years ago to 285 million years ago, study co-author Denis Fougerouse of Curtin University said in a statement. The new analysis again pointed at 3.2 billion years as a turning point, Li said. Before then, Earth had differentiated into the "*layer cake"* pattern of core, mantle and crust that is still seen today. This layering was driven by gravity, with heavier elements sinking to the core and lighter elements rising to the crust, Li said. However, 3.2 billion years ago, these layers started to remix, with plate tectonics driving slabs of crust back into the mantle, and forces such as volcanism bringing mantle elements up to the surface. The researchers also found that the initiation of this process was complicated and not necessarily timed exactly the same all across the planet. The new findings, reported in the August edition of the journal Earth-Science Reviews, show that researchers need to recalibrate the uranium-thorum-lead dating system to capture these nuances. *"If we don't deal with it carefully, we might have tens of millions or hundreds of millions of years of error in the age,"* Li said. The researchers are now using computer simulations to understand how plate tectonics likely started 3.2 billion years ago. The cooling of the planet from a magma ocean to something more temperate and solid may have played a major role, Li said.
https://www.livescience.com/planet-earth/geology/earths-plate-tectonics-traced-back-to-tipping-point-32-billion-years-ago

Are Asteroids Really Worth a Fortune? Here's What We Know

Popular media love talking about asteroid mining using big numbers. Many articles talk about a mission to Psyche, the largest metallic asteroid in the asteroid belt, as visiting a body worth $10,000,000,000,000,000,000, assumedly because their authors like hitting the '0' key on their keyboards a lot. But how realistic is that valuation? And what does it actually mean? A paper funded by Astroforge, an asteroid mining start-up based in Huntington Beach, and written by a professor at the Colorado School of Mine's Space Resources Program takes a good hard look at what metals are available on asteroids and whether they'd genuinely be worth as much as the simple calculations say that would be. The paper divides metals on asteroids into two distinct types, those that would be worth returning to Earth and those that wouldn't. Really, the only metals judged to be worthy of returning to Earth are the platinum-group metals (PGMs), which are known for their extraordinarily high cost, relatively low supply, and high usefulness in a variety of modern-day technology. That includes catalytic converters, which is why they are commonly the target of thieves. The other category would be metals used for in-space construction, such as iron, aluminum, and magnesium. While these might not be economically viable to send back to Earth because of their relatively low prices on our home planet, they are useful up in space for constructing large structures, such as space stations or solar power arrays. However, given the chicken-and-egg problem of not having any demand for these space-sourced metals because they are so expensive, it is hard to quantify how much they are worth. Its competition (i.e. launching the material from Earth), is priceable though, and at $10,000 / kg, plus $100 / kg for a common material such as iron. Those prices aren't anywhere near the $500,000 / kg that a PGM such as rhodium has ever back on Earth, but it could still make mining asteroids for iron economically viable if the material is used in space. So what do all those calculations mean for the actual value of the asteroids that we might mine? First and most importantly, recent research suggests that asteroids made out of 'pure metal' such as Psyche is assumed to be, are likely pure fiction. While that might not be great news for any single benign asteroid worth a lot, the other part of that research is that even asteroids that were originally thought to be relatively low in metal content actually have reasonable quantities that could be economically extracted. To prove the point, the paper looked in detail at a series of meteorite studies, which are the equivalent of left-over asteroids, and compared the 'grades' of 83 different elements with ores found on or near the Earth's surface. Since remote sensing has difficulty distinguishing between some of those elements, meteorite samples that can be subjected to advanced analysis techniques are our best bet at accurately calculating the chemical composition of asteroids, other than the few samples of in-tact asteroids that have been returned so far. That data showed that PGMs, while lower in concentration than considered initially (because of an assumption in a foundational paper on the composition of asteroids), are still in much higher concentrations than the equivalent terrestrial ores. In particular, a material known as a refractory metal nugget (RMN) could have concentrations of PGMs orders of magnitude higher than anything found on Earth or other types of asteroidal material. RMNs are primarily found in a calcium aluminum inclusion (CAI) structure, mainly on L-type asteroids. L-types are relatively uncommon asteroids with a reddish tint, but we haven't yet visited them. They might be made up of more than 30 percent CAIs, though, in which case, they could contain a significant amount of extractable PGMs without additional processing. However, RMNs themselves are very small, at the micron to sub-micron range, making them extremely hard to process in the first place. So, bulk extraction from asteroidal regolith could range up to hundreds of ppm, which is already a few orders of magnitude greater than their concentration in Earth's regolith. When looking at the metals for use in space, they are about as abundant as initially predicted, but they face challenges in processing them out of their oxidized states. Typically, this requires some high-energy procedure, such as molten regolith electrolysis, to break off the elemental metal, which is needed for further processing. Again, there's the chicken and egg problem of having a power source that is large enough to perform these processes, but building it would require the material that would require the power source. Eventually, that problem will disappear if companies like AstroForge have their way. Remember that the company funded this study, and its two co-founders and Kevin Cannon, the professor at CSM, were co-authors. The company plans to launch its next mission, a rendezvous with near-Earth asteroids, to try to tell if they're '*metallic*' in January. Perhaps that mission will help contribute to our growing understanding of the composition and value of the asteroids surrounding us. https://www.sciencealert.com/are-asteroids-really-worth-a-fortune-heres-what-we-know



2024 CVRMS HOLIDAY PARTY—DEC. 10

Part of the spread for the 2023 Holiday Party, overseen by Marv, our chief elf.

bring rocks for show and tell

Bill's Big Bus Boogie 2024 slide show
Calkins Natural Area & the Grotto

Donations Will Be Collected for
Linn County Food Bank
& HACAP

Party will be held at our regular meeting site
Hiawatha Community Center
101 Emmons Street, Hiawatha
on Tuesday December 10

2023 Holiday Party attendees enjoying their meal. (photos from the 2023 bus trip run in the background)

Doors will open at 6:00 pm
Eat at 6:30 pm
CVRMS will provide
Turkey, Baked Ham (thanks Jeff)
Stuffing, Mashed Potatoes, Gravy,
Hot Apple Cider, and Punch

POTLUCK for Side Dishes and Desserts
(*bring Your Best Dishes!)*
and bring your own Table Service

World's Largest Gold Deposit Found, Worth Over $80 Billion

A deposit of high-quality gold ore containing around 1,000 metric tons of the precious metal has been discovered in central China, according to Chinese state media. Valued at approximately $83 billion, the discovery could be considered the largest and most lucrative reservoir of gold ever uncovered, surpassing the 900 metric tons estimated to lie within

the mother of all gold reserves, South Deep mine in South Africa. The Geological Bureau of Hunan Province announced the detection of 40 gold veins within a depth of 1.2 miles in the northeast Hunan county of Pingjiang. These alone were thought to contain 300 tons of gold, with 3D modeling suggesting additional reserves may be found to a depth of about 10,000 feet. "*Many drilled rock cores showed visible gold*," says bureau prospector Chen Rulin. Core samples suggest every metric ton of ore could contain almost 5 ounces of gold, an extraordinary level of quality considering ore excavated from underground mines is considered high grade if it contains more than 0.3 ounces. China already dominates the world's gold market with reserves considered to be in excess of 2,000 tons earlier in 2024, its mining industry contributing around 10 percent of the global output. Announcements of the findings have contributed to a further increase in the already skyrocketing gold price as demands for the resource continue to rise amid global uncertainty. Just how many bonanzas of the valuable ore remain yet to be discovered around the world is unclear, with experts divided on whether we've reached peak gold. Forged in the furnaces of embracing stars long before Earth was formed, our planet's glittering veins are a finite resource that takes eons to precipitate into an easily mineable form. Based on these latest findings, we might be far from exhausting economically viable reserves. Core samples taken around the periphery of the Hunan site hint that the deposit may extend even further than initial predictions, making the reservoir beneath its soil a true dragon's haul. https://www.sciencealert.com/worlds-largest-gold-deposit-found-worth-over-us80-billion

Incredible Fossil Preserves a Crocodile From 12 Million Years Ago

Paleontologists unveiled on Wednesday the fossil of a young marine crocodile dating back 10 to 12 million years that was discovered in a Peruvian desert. The fossil of the gharial, or fish-eating –

Artists illustration of the Cenozoic crocodile *Piscogavialis*

crocodile, nearly 10 feet long, was discovered late 2023 in perfect condition in Peru's Ocucaje desert, around 190 miles south of the capital Lima. *"This is the first time we found a juvenile of this species, that is to say, it had not reached its maximum size yet. It died before that,"* vertebrate paleontologist Mario Gamarra told a news conference. The skull and jaws of these specimens differed from that of today's crocodiles and alligators, according to Gamarra, who headed the reconstruction of the fossil. *"They had an elongated snout and their diet was entirely piscivorous, feeding on fish,"* said Gamarra. *"The closest current relative to this crocodile would be the Indian gharial,"* he added. The discovery was

The fossil of a juvenile Cenozoic crocodile of the genus *Piscogavialis* unveiled at the Ministry of Energy and Mines auditorium in Lima on November 27, 2024.

made jointly by Peru's Geological, Mining and Metallurgical Institute and the La Union school Peru's Ocucaje desert is rich in fossils, such as four-legged dwarf whales, dolphins, sharks and other species from the Miocene period, between 5 and 23 million years ago, that were previously discovered there.
https://www.sciencealert.com/incredible-fossil-preserves-a-crocodile-from-12-million-years-ago

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

Next Meeting:
TUESDAY DEC. 10
Hiawatha Community Center
2024 CVRMS Holiday Party
- pay club dues -

2024 & 2025 Officers, Directors, and Committee Chairs

President	Marv Houg (m_houg@yahoo.com)	(319)350-9435
Vice President	Ray Anderson (rockdoc.anderson@gmail.com)	530-2419
Treasurer	Dale Stout (dhstout55@aol.com)	365-7798
Secretary	Dell James (cycladelics@msn.com)	270-6854
Editor	Ray Anderson (rockdoc.anderson@gmail.com)	530-2419
Liaison	Kim Kleckner (ibjeepn2@gmail.com)	560-5185
Imm. Past Pres.	Sharon Sonnleitner (sonnb@aol.com)	310-0085
Director '24	Bill Desmarais (desmarais_3@msn.com)	365-0612
Director '25	Matt Burns (mlburnsmars@gmail.com)	329-4046
Director '26	Jay Vavra (vavrajj@gmail.com)	538-3689
Sunshine	Dolores Slade (doloresdslade@aol.com)	351-5559
Hospitality	Karen Desmarais (desmarais_3@msn.com)	365-0612
Webmaster	Sharon Sonnleitner (sonnb@aol.com)	310-0085

Club meetings are held the 3rd Tuesday of each month from September through November and from January through May at 7:15 p.m. Meetings are held at the Hiawatha Community Center in the Hiawatha City Hall, 101 Emmons St., Hiawatha IA. The December meeting is a potluck dinner held on the 2nd Tuesday at 6:30. June, July, and August meetings are potlucks held at 6:30 p.m. at area parks on the 3rdTuesday 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