

Cedar Valley Gems

Cedar Valley Rocks & Minerals Society

Cedar Rapids, Iowa

CEDAR VALLEY GEMS

APRIL 2017

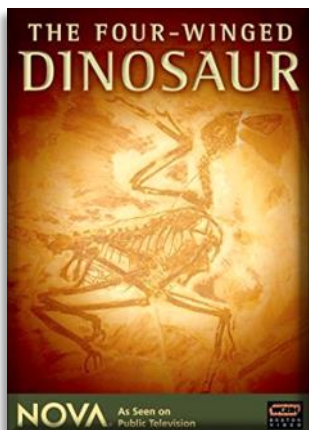
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Ray Anderson, Editor: rockdoc.anderson@gmail.com

Next CVRMS Meeting Tues. April 18

**meeting at the Fairfax Library
313 Vanderbilt St. - Fairfax**

Instead of a speaker at our April meeting we will watch a video produced by the PBS Nova series titled "The Four-Winged Dinosaur." The video discusses the 2002 discovery of a beautiful and bizarre fossil that astonished scientists and reignited the debate over the origin of flight. With four wings and superbly preserved feathers, the 130 million-year-old creature was like nothing paleontologists had ever seen before. Dubbed *Microraptor*, the crow-sized fossil is one of the smallest dinosaurs ever found and one of the



most controversial, challenging conventional theories and assumptions about the evolution of flight. Did it array its arm- and leg-mounted wings in the style of an early 20th-century biplane to produce high lift at low speed? Did it use them to create a single lifting surface for efficient, swift gliding? Did it employ some combination of these two methods? Or were the extra wings useless for flight and likely to have been for some other purpose, such as attracting a mate? To explore this mystery, NOVA interviewed paleontologists and experts in anatomy and aerodynamics. In addition, NOVA commissioned and tested a "flight-ready" wind tunnel model of *Microraptor* complete with feathers and articulating joints. Following the video, Bill Desmarais will lead a discussion of the video.



The final numbers have not yet been compiled, but the 2017 Cedar Valley Rocks and Minerals Society Gem, Mineral, and Fossil Show may have been the most successful ever!! The total attendance was 4,425, including 2,760 adults and 1,665 kids. Although the total attendance did not surpass the 2014 record of 4,963, those attending were apparently in a mood to purchase rock treasures, because all



income figures appear to be at or near record levels. The 26 dealers who were on hand for the 2-day show were all pleased with this year's show, raffle tickets were sold out by mid-afternoon on Sunday, and the Silent Auction was very successful. Special thanks to all of the CVRMS members who helped to get the show set up, manned the booths and sold tickets, and helped with the clean up. The show has been booked for the 4th weekend in March at Hawkeye Downs for the next 3 years, so we can look forward to future successful shows.

CVRMS Board Meeting

Board Minutes – March 28, 2017

Members Present: Marv Houg, Dell James, Sharon Sonnleitner, Jay Vavra, Dale Stout, Rick Austin, Ray Anderson, Bill Desmarais, Dave Roush (guest)

Meeting called to order by Marv at his residence at 7:20 pm.

Show Wrap up Report

A successful show once again. Totals are not complete. General discussion regarding some of the logistical problems: Speakers too low. Chairs were not disbursed to dealers at set up. Speakers announcing the silent auction during programs distracting.

Low attendance at programs. Bill reported that the young people programs went well but need to limit to appropriate age level.

Next year will look into using the room between the buildings where the table are stored, for programs. May need to coordinate with wood carvers. Fluorescent rocks need to be straightened out. Marv received emails from attendees and were complimentary. Catered meal did not have enough meat. The quality of meat was not as good as past. Fried chicken preferred as well as roast beef. Bone dig-no bones for next year. Maybe make it a fossil dig or corals. Marv will talk to Tiffany. Electrical 9 more outlets used than were scheduled. Julie had inquired of Marv whether the club would pay for the 500 little gold vials that the gold panners give out to the kids. They do not charge anything.

Motion made by Jay Vavra that the club conduct a 2018 show. 2nd by Bill. Motion passed. Will present to members for approval. Need to think of topic for next year. Jay suggested a theme around the earth's birthday 4.6 billion years old. Dell said **Happy "Beardthday!"** Other ideas included meteorites, fossils, crinoids. Petition for crinoids to be made state fossil?? This will be brought up at next meeting. Ideas and thoughts encouraged.

Auction

Marv reported that there are currently about 1,000 lots committed with a few still not sure. Zobacs-100, Cruse-50, Birkemeyer-50 Oliver-100, Burns-30, Greenfield-100, Brandl-100, Krohn-150, Vogel-10, Harward-300, Marv-30-50, Blin-40.

New Business

Bill reported on the progress of the weather man Craig Johnson. His talk will be titled **"Weather Forecasting: from Weather Lore to Super Computers."**

The contract has been signed with the Nature Center for May 16, 2017.

Fall bus trip

The only date available is October 21. A 56 passenger bus for \$2,110 total. \$200 needed to confirm by 4/27. Will ask membership at next meeting for approval. Again, it is a trip to the Fryxell Geology Museum at Augustana College and then to Lizzadro Museum in Elmhurst, Illinois.

Motion made to have fall trip made by Ray Anderson, 2nd by Jay. Motion approved.

Other Business

Motion made by Bill, 2nd by Sharon to approve \$100 expenditure for bingo prizes. Motion passed.

Adjournment

Motion to adjourn made by Jay, second by Rick. Meeting adjourned at 9:35pm

Respectfully submitted,
Dell James

CVRMS Jan. 17 Meeting

Meeting held at Fairfax Library

Call to order at 7:10 p.m. by Marv Houg, President

Introduction of new members, guests; Scott Cleppe, Anna Whittle, Melanie Saul, Cornell Students Jeannie Kort, Carlos Tellez, Elena Skosey-LaLonde,

Minutes of previous meeting reviewed –Motion to accept by Julie, and 2nd by Jeff. Minutes accepted as written.

Treasurer's Report; Dale gave treasurer's report. Checking balance \$27,428.97. Motion to accept by AJ, second by Tom. Report accepted.

Correspondence; Marv received phone call from John McArdle who has a bad case of laryngitis and may not be able to give the MSHA training scheduled for Thursday before show. Marv will let everyone who is signed up know if the class is a go or not. Dale will send out email as well. If you hear nothing, call Marv Thursday AM.

Monthly Program

The Cornell students presented a program regarding their studies in the Bahamas and thanked club for our contribution to the trip. Interesting with lots of questions and answers after. Dr. Ben Greenstein accompanied them and also answered questions.

Door Prize-Winners Jeannie Kort (student) and Scott Cleppe (guest)

Show Report

Recap of things needed. Sign up sheets for duties, desserts for catered dinner. Lots of help needed for tear down.

Auction

Marv reported that we currently have about 1,000 lots. Plenty for a two day auction.

Summer Picnics

During the summer months we have potluck picnics instead of regular meetings.

June Ellis Park Lapidary. Bring stones for polishing or cabbaging. Club members with portable equipment encouraged to provide teaching and equipment.

July Geode cracking at Squaw Creek. Bring geodes or buy from members. Geode crackers are available.

August-Morgan Creek Bingo and always fun.

New Business

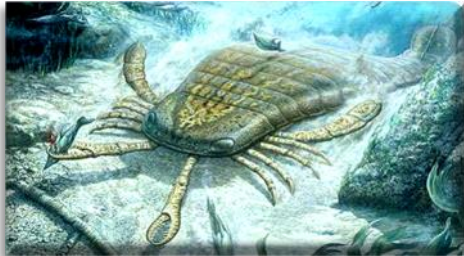
May meeting will be slightly different. Bill Desmarais has lined up a meteorologist, Craig Johnson, who is head of the Iowa Academy of Sciences. Bill will get the specific title of the talk and let us know at the next meeting. Suggestions for the place to have it boiled down to Nature Center or the Marion Library. Anticipate that this will attract the public as well. Discussion involved which place we prefer. In addition, Marv suggested we make it a welcome new members meeting since we gain new members at the show. The club seems to attract new members but not hold them.

Motion made by Dolores Slade to have the May meeting at the Nature Center if it is available. 2nd by Terry Baty. Discussion regarding pros and cons audio better, impressive looking, no time limit like the library. Also whether we can get the Nature Center to help promote the event. Motion carried. Bill will check into the availability and cost.

— continued on p. 5

End-Permian extinction happened in 60,000 years!

The largest mass extinction in the history of animal life occurred 252 million years ago, wiping out more than 96 per-



Sea scorpions (eurypterids) were among the species that disappeared in the Permian mass

cent of marine species and 70 percent of life on land—including the largest insects known to have inhabited the Earth. Multiple theories have aimed to explain

the cause of what's now known as the end-Permian extinction, including an asteroid impact, massive volcanic eruptions, or a cataclysmic cascade of environmental events. But pinpointing the cause of the extinction requires better measurements of how long the extinction period lasted. Researchers at MIT have reanalyzed rock samples collected from five volcanic ash beds at the Permian-Triassic boundary in China. They pulverized rocks samples to separate out tiny zircon crystals containing a mix of uranium and lead. They then isolated uranium from lead, and measured the ratios of both isotopes to determine the age of each rock sample and determined that the end-Permian extinction occurred over 60,000 years, give or take 48,000 years—practically instantaneous, from a geologic perspective. The new timescale, based on more precise dating techniques, indicates that the most severe extinction in history may have happened more than 10 times faster than scientists had previously thought. How do you kill 96 percent of everything that lived in the oceans in tens of thousands of years? Such an exceptional extinction requires an exceptional explanation. The MIT team also found that, 10,000 years before the die-off, the oceans experienced a pulse of light carbon, which likely reflects a massive addition of carbon dioxide to the atmosphere. This dramatic change may have led to widespread ocean acidification and increased sea temperatures by 50 degrees Fahrenheit or more, killing the majority of sea life. Such a CO₂ spike could have been caused by the widespread volcanic eruptions of the Siberian Traps in Russia, that produced 240,000–960,000 cubic miles of lava and covered an area of about 2,700,000 square miles. MIT scientists believe it is possible that a single, catastrophic pulse of magmatic activity triggered an almost instantaneous collapse of all global ecosystems. With this theory in mind, the MIT geoscientists have begun work to establish a more precise timescale for these Permian volcanic eruptions to compare it to the new extinction timeline.

<https://phys.org/news/2014-02-end-permian-extinction-years-much-faster-earlier.html>

Spotlight Gemstone: Diamond

April's Birth Stone



On almost all modern birthstone lists, diamond is recognized as the birthstone for April. Diamond is also the gem that marks the 60th and 75th wedding anniversaries. Diamonds are thought to have been first recognized and mined in India, where significant alluvial (river) deposits of the stone could be found many centuries ago along the rivers Penner, Krishna and Godavari. Diamonds have been known in India for at least 3,000 years, and probably 6,000 years. Diamond is the only gem composed of one single element: carbon. Each carbon atom share electrons with 4 other carbon atoms in a face-centered cubic crystal structure called a diamond lattice. Because of the extreme rigidity of this lattice, diamonds can be contaminated by only a very few types of impurities, such boron and nitrogen. Small amounts of defects or impurities (about one per million of lattice atoms) color diamond blue (boron), yellow (nitrogen), brown (lattice defects), green (radiation exposure), purple, pink, orange or red. Diamond also has relatively high optical dispersion (ability to disperse light of different colors). Diamonds are the hardest material on earth (9 on the Mohs hardness scale): 58 times harder than anything else in nature. Most diamonds formed more than a billion years ago, at high temperature and pressure found only at depths deep in the Earth's mantle, about 90 to 120 miles beneath the surface. Diamonds are brought close to the Earth's surface through deep volcanic eruptions by magma, which cools into igneous rocks known as kimberlites and lamproites. They are recovered by mining deep into these "pipes" or from rivers and near-shore deposits that include diamonds that nature eroded from the rocks. Diamonds are graded in quality based on the "4Cs": clarity, color, cut, and carat weight. **Clarity** grades assess the number, size, relief, and position of inclusions and blemishes. The less **color**, the higher the grade. Even the slightest hint can make a dramatic difference in value. **Cut** (proportions, symmetry, and polish) is a measure of how a diamond's facets interact with light. **Carat Weight**, larger diamonds of the same quality are much rarer than smaller ones and are worth more per carat. Although diamonds are made synthetically, their cost of production averages \$2,500 per carat, as compared to a cost of \$40 to \$60 per carat to mine the stones.

What in the World?



What in the World

Created this unusual rock exposure ??



March Photo



Last month's photo showed "**Fracture Control Liesegang Rings**" from Widemouth, Cornwall, England. Liesegang is a term applied to colored bands of cement observed in sedimentary rocks that typically cut-across the bedding. The concentric or ring-like appearance of Liesegang rings distinguish them from other sedimentary structures. They are usually comprised of concentrations of iron oxide cement, and their formation is probably related to periodic precipitation. The formation of Liesegang rings is only poorly understood. Attempts at mathematical descriptions of their formation cannot be treated by standard analytical methods, but utilize reaction-diffusion coupled nonlinear partial differential equations. Deriving the numerical solution of such systems of equations is computationally very demanding, sometimes computationally impossible, even with modern computers. The Liesegang rings in this exposure are controlled by the fractures through which water moved.

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Rock Calendar 2017

CVRMS Events of Interest

Apr. 18 - CVRMS Monthly Meeting

Fairfax Library
313 Vanderbilt St.
Fairfax

Apr. 22-23 - Blackhawk Gem and Mineral Club Show

Mississippi Valley Fairgrounds
2815 West Locust St.
Davenport, Iowa

Apr. 29-30 - Rivervalley Rock Hounds Show

22770 Old Highway 169
Fort Dodge, Iowa

Apr. 30 - BHGMS Rock Show

Center for the Arts
225 Commercial St
Waterloo, Iowa

May 30 - Sac & Fox Lapidary Club Rock Swap

200 N. Main St.
Fairfield, Iowa

Sept. 16-17—CVRMS Rock Auction

Amana RV Park and Event Center
Amana, Iowa

Oct. 21-22 - Des Moines Lapidary Society Show

3000 E Grand Ave
Des Moines, 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 the question. I will also try to respond to all email requests with answers to your questions, regardless of if it is chosen.

Rona asked me "how big a boulder do you want to put in our front yard ? "

Rock Doc replied: "Well, I'd like to get a big one. I'll tell you what a big one is. Back in 1998 a guy named Robert Slayton who lived in Casey, Iowa, decided that he needed a big rock in his front yard. He and his father had been avoiding a big rock in the field they farmed so he decided to dig it up. He dug around the rock for 2 days with his D-6 caterpillar before he hired an excavation company to finish the job.



The rock turned out to be about 14 feet in diameter weighing about 300 tons. Undaunted he decided to move the rock to his house 1½ miles down the road! After 2 weeks of pushing the rock with his D-6 and two larger Caterpillars and pulling with 2 giant Steiger

tractors they got it to the edge of the field. They then had to move it down a gravel road and over 2 bridges. He abandoned the rock for the farming season, then when crops were off in the fall, he again turned his attention to the rock. He built a skid of 1 1/2-in. thick plate steel (8 ft. wide by 25 ft. long) figuring if they pushed the rock to the skid, they'd be able to slide it. The weight of the rock, however, bent the skid so that it dug into the ground like a plow when they tried to pull it. So he doubled the thickness of the skid. This time, it held the rock without bowing. It took a couple of Caterpillars - a borrowed D-8 and his own D-6 - to push the rock onto the skid. He then tried several different ways to move the skid with the rock in place, but without much luck. Chains and cables were no match for the big rock, until he finally found a 200-ft. long ship's anchor chain, with links 2 in. thick and 1 ft. long. With at least 3 in. of frost in the ground and a fresh 2 in. of snow on the gravel road, December 18, 1999, they started the move. With the anchor chain hooked to the skid, they put together a team of "horses" big enough to get the job done. Directly in front of the rock hooked together in single file was a D-8 and a D-7 caterpillar, four older model Steiger 4x4s, and in the lead a brand new Deere 9200. With those seven tractors pulling (close to 3,000 hp in all) and the D-6 and D-8 pushing from behind, they headed down the road - in low gear all around. When it was possible, they pulled the rock off the road onto adjacent fields. They finally made it home with the rock, and when it was over, the rock was put on display in a grove of trees near Slayton's machine shed. Then they built a driveway around the rock so people could come and look it." Rona said I couldn't have one that big.



Minutes of March meeting (continued from p. 2)

Field trips

Bill Desmarais reported on his research regarding another field trip similar to the Chicago Field museum. He has temporarily lined up for October 21, Saturday, a trip to Augusta College the Fryxell Geology Museum and the Lizzadro Museum at Elmhurst, Illinois. There is a conflict with the Des Moines show being on October 21. Bill will check further for available dates.

Other Business

Paul announced the Fort Dodge show on April 29-30. Waterloo on 4/30. Jeff reported that the Fairfield Club will

not have a traditional show but will have a swap in May. Info available.

Tom announced that we still need a delegate for May 6 Midwest Federation in Brainerd, Minnesota. Anyone interested in attending let Marv know. The club will assist with expense.

Adjournment

Motion to adjourn by Dale, second by Dell. Meeting adjourned at 9:15

Respectfully submitted,
Dell James, Sec.

340 undiscovered meteorite impact sites on Earth

Geologists from the Institute of Earth and Environmental Sciences of the University of Freiburg have published the world's first study on the question of how many meteorite craters there should be on the Earth's surface. A total of 188 have been confirmed so far, and 340 are still awaiting discovery according to the results of a probability calculation published in the journal *Earth and Planetary Science Letters*. Meteorite impacts have shaped the development of the Earth and life repeatedly in the past. The extinction of the dinosaurs, for instance, is thought to have been brought on by a mega-collision at the end of the Cretaceous period. But how many traces of large and small impacts have survived the test of time? In comparison to the more than 300,000 impact craters on Mars, the mere 188 confirmed craters on Earth seem almost negligible. An average of only one to two meteorite craters are discovered each year, most of them heavily eroded. The probability of a meteorite impact on Earth is not fundamentally different than on Mars. However, the Earth's surface changes much more quickly. As a result, the craters remain visible for a much shorter period of time, meaning that many fewer of them are detectable today. The life span of a crater depends on the rate of erosion and its size. Large craters can achieve a life span of several 100 million years, depending on the region in which they are located. On the other hand, large impacts are much rarer than small impacts. The solution was to compare the number of confirmed craters of different sizes, calculate the expected frequency of the impacts on the basis of the known probabilities, and combine this information to infer the rates of erosion. The scientists were surprised that there are not many craters of above six kilometers in diameter left to discover on the Earth's surface. In the case of smaller craters, on the other hand, the scientists found the current list to be far from complete. They predict that about 90 craters with a diameter of 3.5 to 0.5 miles and a further 250 with a diameter of 0.5 to 0.2 miles are still awaiting discovery. The Decorah Impact Structure in northeast Iowa is an example of a 3 mile diameter crater that was only discovered about 10 years ago. While there are undoubtedly still a number of undiscovered larger craters buried deep under sediments, they are much more difficult to detect and confirm. [http://](http://www.geologypage.com/2015/07/340)

www.geologypage.com/2015/07/340

Chinese Roadworkers Un-Earth Nest of Forty-Three Fossilized Dinosaur Eggs

Construction workers unearthed 43 fossilized dinosaur eggs during road repair work in Heyuan city in the southern Chinese province of Guangdong in October of last year. The city, which calls itself the "Home of Dinosaurs," won a Guinness World Record for the world's largest collection of dinosaur eggs at its museum in 2004. Huang Zhiqing, deputy director of the Heyuan Museum, told CNN that it was the first time the fossils have been discovered in the bustling city center. Major road repair work was halted as a team of researchers and construction workers jumped down into a ditch to dig out the fossils. Nineteen of the eggs are completely intact, with



the largest measuring as much as 5 inches in diameter, Huang said. Researchers said they will continue to examine the fossils to determine which dinosaur species they belong to. Most of the eggs in the museum's existing collection belong to *oviraptorid* and duck-billed dinosaurs, which roamed the earth 89 million years ago. Nearly 17,000 dinosaur eggs have been uncovered in the city since the first group of fossils was found in 1996 by children playing at a construction site.



Heyuan city boasts the largest number of fossil dinosaur eggs in the world.

<http://www.geologypage.com/2016/10/chinese-roadworkers-unearth-nest-forty-three-fossilised-dinosaur-eggs.html>

Misunderstood Worm-Like Fossil Finds its Place in the Tree of Life

One of the most bizarre-looking fossils ever found — a worm-like creature with legs, spikes and a head difficult to distinguish from its tail — has found its place in the evolutionary *Tree of Life*, definitively linking it with a group of modern animals for the first time. The animal, known as *Hallucigenia* due to its otherworldly appearance, had been considered an ‘evolutionary misfit’ as it was not clear how it related to modern animal groups. Researchers from the University of Cambridge have discovered an important link with modern velvet worms, also known as onychophorans, a relatively small group of worm-like animals that live in tropical forests. The results were published in the advance online edition of the journal *Nature* in 2014. The affinity of *Hallucigenia* and other contemporary ‘legged worms’,



Fossil *Hallucigenia sparsa* from the Burgess Shale
Credit: M. R. Smith / Smithsonian Institute

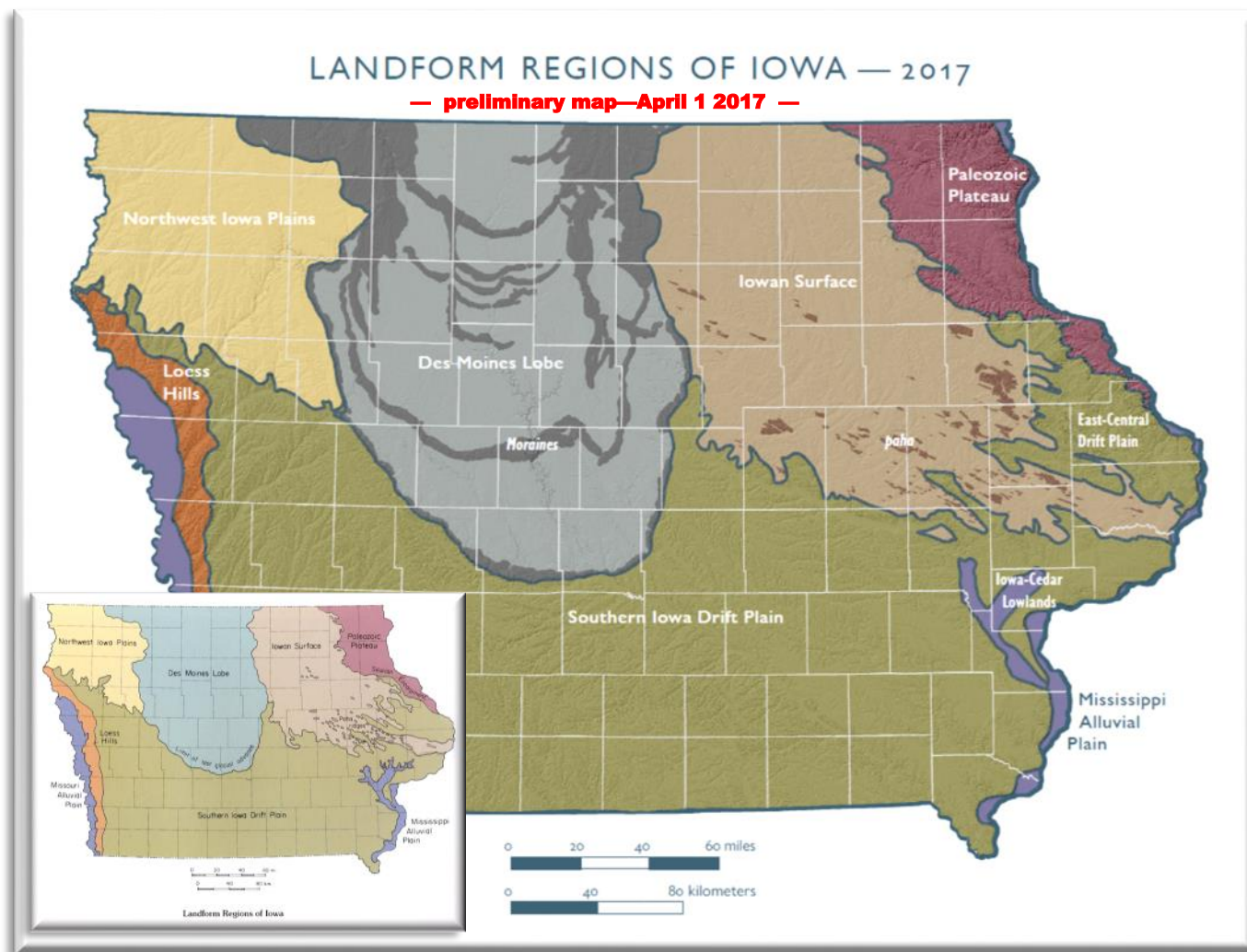
collectively known as lobopodians, has been very controversial, as a lack of clear characteristics linking them to each other or to modern animals has made it difficult to determine their evolutionary home. What is more, early interpretations of *Hallucigenia*, which was first identified in the 1970s, placed it both backwards and upside-down. The spines along the creature’s back were originally thought to be legs; its legs were thought to be tentacles along its back; and its head was mistaken for its tail. *Hallucigenia* lived approximately 505 million years ago

during the Cambrian Explosion, a period of rapid evolution when most major animal groups first appear in the fossil record, and were found in the Burgess Shale in Canada’s Rocky Mountains. Looking like something from science fiction, *Hallucigenia* had a row of rigid spines along its back, and seven or eight pairs of legs ending in claws. The animals were between 0.2 and 1.5 inches in length, and lived on the floor of the Cambrian oceans. A new study of the creature’s claws revealed an organization very close to those of modern velvet worms, where layers of cuticle (a hard substance similar to fingernails) are stacked one inside the other, like Russian nesting dolls. The same nesting structure can also be seen in the jaws of velvet worms, which are no more than legs modified for chewing. Most believe that modern animal groups arose fully formed during the Cambrian Explosion. But evolution is a gradual process: today’s complex anatomies emerged step by step, one feature at a time. Fossils like *Hallucigenia* can demonstrate how different animal groups built up their modern body plans. While it had been suspected that *Hallucigenia* might be an ancestor of velvet worms, definitive characteristics linking the animals was difficult to find, but their claws had never been studied in detail. Through analyzing both the prehistoric and living creatures, the researchers found that claws were the connection that proved their relation. Cambrian fossils continue to produce new information on origins of complex animals, and the use of high-end imaging techniques and data on living organisms further allows researchers to untangle the enigmatic evolution of earliest creatures. An exciting outcome of this study is that it alters our current understanding of the evolutionary tree of arthropods (the group including spiders, insects and crustaceans). Most gene-based studies suggest that arthropods and velvet worms are closely related to each other; however, the results of this study indicate that arthropods are actually closer to water bears, or tardigrades, a group of hardy microscopic animals best known for being able to survive the vacuum of space and sub-zero temperatures (leaving velvet worms as distant cousins). The peculiar claws of *Hallucigenia* are a smoking gun that resolves a long and heated debate in evolutionary biology, and may even help to understand other problematic Cambrian critters.

Modified from <http://www.geologypage.com/2014/08/misunderstood-worm-like-fossil-finds-its-place-in-the-tree-of-life.html>

What's New In Iowa Geology ??

Iowa Survey Readies Updated Map of Iowa's Landform Regions

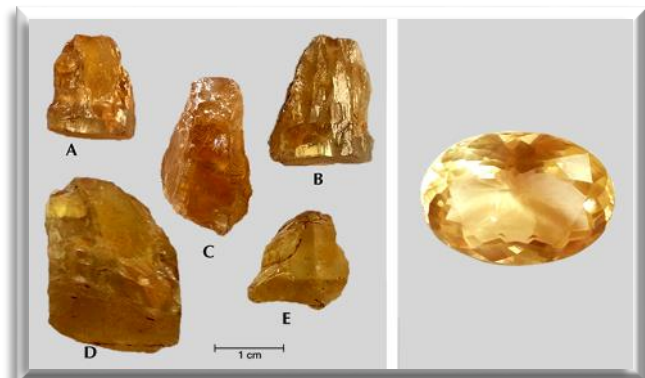


An updated version of the map of “Landform Regions of Iowa –2017” is in the final stages of preparation and will be printed soon, reported IGS geologist Stephanie Surine. She was good enough to send me an advance copy to include in this newsletter. Although this version is not the final version of the map that the survey will be printing, it shows all of the revised regional contacts and includes the moraine regions of the Des Moines Lobe (modified from the work of Tim Kemmis). It now identifies the areas where the glacier stagnated during its retreat (in darker gray). All landform region contacts have been remapped and modified appropriately, and the new map is displayed on a background showing the shaded LIDAR elevation of the land surface, producing an almost 3d effect. Compared to the previous landforms map (inset) a new landform sub-region was delineated in eastern Iowa, the East-Central Drift Plain, a sub-region that includes shallow dolomite bedrock, wind-aligned sand and loess deposits, and significant local relief.

The area of Alluvial Plains in Louisa, Muscatine, and Johnson counties that was once identified as “Lake Calvin” has been simplified and limited primarily to the valleys of the Iowa and Cedar rivers. A simplified explanation of the landscape features will be published on the back of the completed map. We will be waiting for the Survey to publish the completed version of this beautiful and informative map.



In the summer of 2015, gem-quality danburite was found in an alluvial deposit of ruby, sapphire, spinel, and tourmaline at the foot of the marble mountains of An Phu in the Luc Yen area of Vietnam's Yen Bai Province. This danburite is notable for its honey yellow color and excellent transparency. Danburite, with an ideal formula of $\text{CaB}_2\text{Si}_2\text{O}_8$, crystallizes in the orthorhombic system. It has a structure composed of a framework of corner-sharing Si_2O_7 linked with B_2O_7 groups by eight-coordinated Ca atoms. First discovered in Danbury, Connecticut (United States), gem-quality danburite has also been found in Japan, Madagascar, Mexico, Myanmar, Russia, Sri Lanka, Switzerland, and Tanzania. Danburite, however, remains an exceptionally rare gemstone. The geology of the Luc



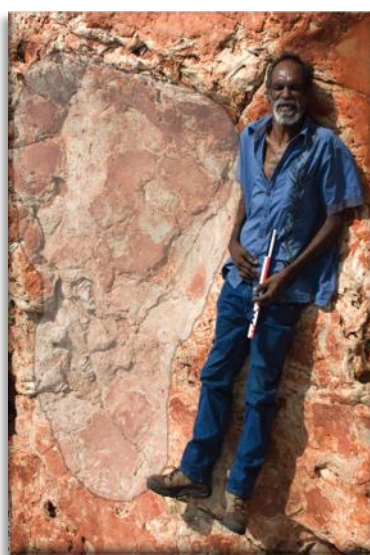
Five rough danburite crystals, in sizes up to 2.5 cm, were found at the Bai Cat deposit in Luc Yen, Vietnam. Crystal C, weighing 26.3 ct in rough form, was cut into the 4.6 ct faceted oval on the right.

Yen mining area is dominated by metamorphic rocks, mainly granulitic gneisses, mica schist, and marble, which are sometimes intruded by granitic and pegmatitic dikes. Danburite crystals have been found associated with ruby, sapphire, spinel, and tourmaline in the Bai Cat placer deposit, which is surrounded by a series of marble mountain chains. One mountain about 5 km away, An Phu, contains a ruby mine (May Thuong) on one side and a spinel mine (Cong Troi) on the opposite side. While all of Luc Yen's primary formations of ruby, sapphire, and spinel were favored by metamorphic conditions, its tourmaline originated from pegmatite bodies. The geologic environment of Luc Yen was very suitable for the formation of danburite, which could be related to pegmatite veins. A similar geologic condition has previously been reported for danburite from the Anjanabonoina pegmatite deposit in Madagascar. The pegmatites from both areas are often hosted by marble and locally contain coarse-grained green K-feldspar, tourmaline, and smoky quartz.

<https://www.gia.edu/gems-gemology/winter-2016-danburite-luc-yen-mining-area-vietnam>



The largest dinosaur footprint ever found has been discovered in Jurassic rocks in the Walmadany area of Australia. Thousands of 130 million-year-old dinosaur footprints are embedded in a



15 mile stretch of coastline in Western Australia that can be studied only during low tide, when the sea — and the sharks and crocodiles that inhabit the region — can't hide them. Since no equipment could be left out when the tide came in, the researchers used drones to map the area with digital photography and laser scans. They spent more than 400 hours out on the coast, but what they found was a real treasure. "Nowhere else has as many types of dinosaurs represented by tracks than

Walmadany does," said Steve Salisbury, a paleontologist at the University of Queensland and the lead author of the study published last month in the [Journal of Vertebrate Paleontology](#).

Included among those many dinosaur tracks is the largest dinosaur footprint ever found. At approximately 5 feet, 9 inches, the track was made by a giant sauropod, a long-necked herbivore. But there's far more there than one giant footprint. "We see a unique dinosaur fauna that includes things like stegosaurus and some of the biggest dinosaurs to have ever walked the planet, gigantic sauropods," Salisbury said. This was the first evidence of stegosaurus found in Australia. There are also tracks from meat-eating theropods that walked on two feet and left three-toed prints. "The three-toed prints have a



special significance: In local lore, the tracks belong to Marala, or 'the Emu Man,' who journeyed through the region, creating laws that dictated how people should behave". See a drone video of the site at [The University of Queensland/Vimeo](#).

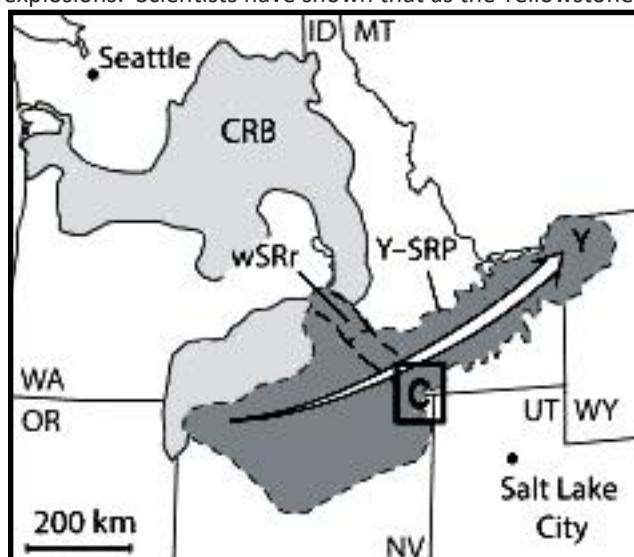
http://www.businessinsider.com/largest-dinosaur-footprint-sauropod-australia-2017-3?utm_content=bufferbe3e3&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer-ti

New evidence for oceans of water deep in the Earth

Researchers from Northwestern University and the University of New Mexico report evidence for potentially oceans worth of water deep beneath the United States. Though not in the familiar liquid form, the ingredients for water are bound up in rock deep in the Earth's mantle, and the discovery may represent the planet's largest water reservoir. Scientists have long been trying to figure out just how much water may be cycling between Earth's surface and interior reservoirs via the plate tectonic process. The researchers have found deep pockets of magma located about 400 miles beneath North America, a likely signature of the presence of water at these depths. The discovery suggests water from the Earth's surface can be driven to such great depths by plate tectonics, eventually causing partial melting of the rocks found deep in the mantle. This discovery of the missing deep water that scientists had spent decades looking for, published in *The Journal Science*, could help explain the vast amount of liquid water on the surface of our habitable planet as part of a whole-Earth water cycle. Scientists have speculated that water is trapped in a rocky layer of the Earth's mantle located between the lower mantle and upper mantle, at depths between 250 miles and 410 miles. But this is the first direct evidence that there may be water in this area of the mantle, known as the "transition zone," on a regional scale. The region extends across most of the interior of the United States. Melting of rock at this depth is remarkable because most melting in the mantle occurs much shallower, in the upper 50 miles. If there is a substantial amount of H₂O in the transition zone, then some melting should take place in areas where there is flow into the lower mantle, and that is consistent with what they observed. If just one percent of the weight of mantle rock located in the transition zone is H₂O, "that would be equivalent to nearly three times the amount of water in our oceans", the researchers said. This water is not in a form familiar to us, it's not liquid, ice, or vapor. This water is trapped inside the molecular structure of minerals in the mantle rock. The weight of 250 miles of solid rock creates such high pressure, along with temperatures above 2,000 degrees Fahrenheit, that a water molecule splits to form a hydroxyl radical (OH), which combines with olivine to produce ringwoodite, a high-pressure phase of Mg₂SiO₄, polymorphous with the olivine phase forsterite (a magnesium iron silicate). Water can constitute more than one percent of the weight of the ringwoodite's crystal structure, and under conditions of the deep mantle, that could be a lot of water. <http://www.geologypage.com/2014/06/new-evidence-for-oceans-of-water-deep-in-the-earth.html>

12 Early Catastrophic Yellowstone Eruptions

Before the hotspot that created Yellowstone National Park's incredible geysers, fumaroles and mud pots arrived in what is now northwestern Wyoming, it made a rowdy passage through southern Idaho. Recent research has looked at that ancient geological history in greater detail and identified 12 major eruptions in Cassia Hills area of southern Idaho, one of which was a super eruption similar in scale to Yellowstone's explosions. Scientists have shown that as the Yellowstone



Gray is elevated terrain; CRB—Columbia River basalts (lt gray); Y-SRP—Yellowstone–Snake River Plain volcanic province (dk gray); white arrow shows NE migration of the Yellowstone hotspot track; Y—Yellowstone; wSRr—western Snake River rift; C shows area of Cassia Hills eruptions.

hotspot moved across Idaho, explosive volcanic eruptions were fewer than originally believed, but they were bigger (some of the largest in North America history). Scientists drilled more than 6,000 feet deep, but couldn't find the bottom of the area's eruptive flows. One of those eruptions, called Castleford Crossing, took place about 8.1 million years ago, burying an area of at least 8,700 square miles in lava and volcanic ash to a depth of more than 4,400 feet. Based on their calculations, that would have meant that the Castleford Crossing eruption was about 8.6 in magnitude on the volcanic explosivity index (VEI), larger than Yellowstone's last super eruption (VEI 8). Given the dramatic explosions that took place, people may wonder why the Snake River Plain isn't pockmarked with volcanic calderas like Yellowstone's. The simple answer is that they've been filled in by other lava flows and sediments that have gathered in the low-lying topography of the Snake River Plain. <https://phys.org/news/2016-03-evidence-cassia-hills-idaho-reveals.html>

430-Million Year Old Scorpion from Ontario, the Oldest Known??

Research on extraordinarily complete and well-preserved fossil aquatic scorpions from the 430 million year old Eramosa Formation Konservat-Lagerstätte in Ontario demonstrates that a key prerequisite for living on land – the ability to walk unsupported



by water – appeared surprisingly early in the fossil record. Assigned to the species *Eramoscorpilus bruceensis*, these new specimens were called the oldest known scorpions from North America and among the oldest in the world in a manuscript published online 14 January 2015 in the *Royal Society Journal Biology Letters*. Their legs, intriguingly similar to those of a modern scorpion, end in a short foot that could have been placed flat on the ground, providing a weight-bearing surface which, combined with the legs' sturdy attachment to the body, would have allowed the animal to support its own weight without the buoyancy of water. The presence of other fossils of animals that lived only in the sea indicates that these new scorpions must have spent most of their time under water; however, the fossils occur on rock surfaces that show ripples suggestive of brief exposure to air. The scorpions are preserved in a splayed posture suggesting that they represent empty moulted exoskeletons rather than carcasses of an animal that died. A possible explanation is that the scorpions took advantage of this leg structure to venture briefly into a temporarily exposed area in order to moult, where they would be safe from predators such as large eurypterids and cephalopods, and then returned to deeper water. The fossil scorpions range in size from about 1 to 6 inches long, representing several different age classes. The specimens all originated from the Bruce Peninsula and came to the ROM in a variety of ways: one was found in a quarry spoil heap by a young fossil hunter, others were spotted by quarry workers, and several other were discovered in quarried stone delivered to landscaping projects far from their origin. "This extraordinary find contributes to our understanding of how scorpions moved from the sea onto land," says Janet Waddington, Departmental Associate in the ROM's Department

of Natural History. "It is the enthusiasm and generosity of amateur fossil collectors that allows us to study and publish these findings, which are vital to the ROM's collections and research." It should be noted that the eurypterids discovered in the Winneshiek Lagerstätte (deposited in the Decorah Impact Structure) pre-date the Ordovician St. Peter Sandstone and have been estimated to be between 461 and 485 million years old, predating those found in Ontario.

<http://www.geologypage.com/2015/01/research-reveals-spectacular-430-million-year-old-ontario-scorpion.html>

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Club meetings are held the 3rd Tuesday of each month from September through November and from January through May at 7:00 p.m., temporarily at a location to be announced. The December meeting is a Christmas dinner held near the usual meeting night. June, July, and August meetings are potlucks held at 6:30 p.m. at area parks on the 3rd Tuesday of each month.

CEDAR VALLEY ROCKS & MINERAL SOCIETY

CVRMS was organized for the purpose of studying the sciences of mineralogy, geology, and paleontology and the arts of lapidary and gemology. We are members of the Midwest (MWF) and American (AFMS) Federations. Membership is open to anyone who professes an interest in rocks and minerals.

Annual dues are \$15.00 per family per calendar year. Dues can be sent to:

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