THE MONTHLY NEWSLETTER OF THE MINERALOGICAL SOCIETY OF THE DISTRICT OF COLUMBIA

The Mineral Minutes

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June 2018

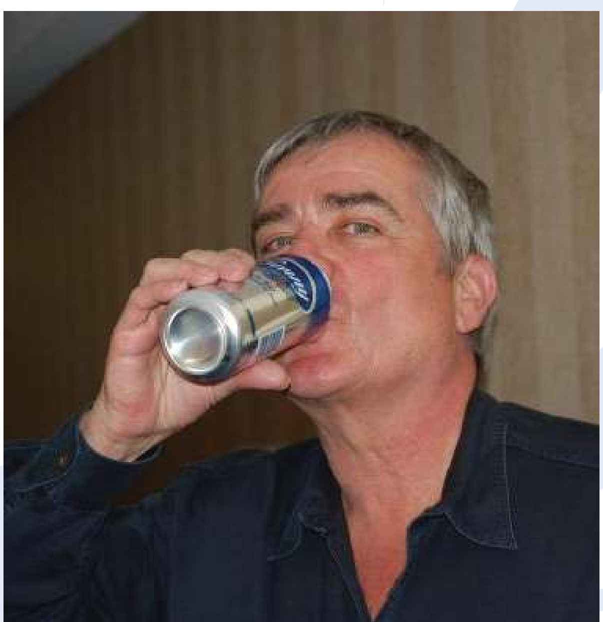
In this Issue:

June Program

"The History of the James Madison University Mineral Museum"

Presented by Dr. Lance Kerns

Our June presentation will be made by Dr. Lance E. Kearns, Emeritus Professor, Mineral Museum Curator, James Madison University (JMU). His presentation, appropriately enough, will be "The History of the James Madison University Mineral Museum."


Dr. Lance Kerns - sorry Lance, this is the highest quality pic to be found online!

Most of us know Dr. Kearns from his generous yearly hosting of our club's visits to the JMU Mineral Sciences labs where he helped us identify our unknown minerals and led us through the remarkable collection of minerals he has assembled at

Prez Says...

by Dave Nanney
MSDC President

May was a blur of bus rides, perfect low humidity, and rhododendron gardens as Leslie and I traveled northern Europe and visited about 50 world class gardens. Might not need to see another rhodo for a very long time, but certainly saw some incredible places.

Many of the places visited were either pure peat soil, meaning you could put a broom stick in the ground and it would sprout, or they were glacier moraine deposits. We saw more granite boulders and dense rock and pebble deposits across many of the places visited. We tried to obtain some German specimens at a mineral shop in old town Bremen, to find they only had local polished flint. Everything else was from worldwide locations already available in our local shows.

But we are back, just in time to have this be a very late submission to Steve for the newsletter, and just in time for Wednesday's visit with Dr. Lance Kern. This will be our last meeting before our summer break, so come and join us.

March Business Meeting Synopsis

By Andy Thompson, Secretary

MSDC club members welcomed back President Dave Nanney and First Lady Leslie who recently returned from their 50th anniversary victory tour of some of their favorite places and friends. Dave called the meeting to order, recognized two MSDC's past presidents who were in attendance. He then welcomed the evening's speaker Denise Nelson, her husband Denny, and visitor Renee Newman, an author who brought along 11 of her interesting books on numerous jewels including diamonds and pearls.

Treasurer John Weidner reported the club now has 32 paid members and the checking account is in the black. The Minutes of the April Business Meeting were approved as published.

Dave asked if there was any "Geology in the News" reports which led to a group discussion of a geyser in Yellowstone whose recent and more frequent eruptions have drawn the attention of visitors and geologists alike. Previously it erupted about once every ten years and now it erupts about 3 times a month.

It was also noted that for anyone who missed Jeff Post's presentation to MSDC at the April meeting, he will be sharing similar information through the Smithsonian Associates Program on 6 August 2018 describing his work.

There were no "Old Business" items needing discussion. One piece of "New Business" was a clarification about future parking spots. In the fall, starting with September, parking will not be available on the museum grounds due to construction. But on-street parking will be available along Constitution Ave from 6:30 pm until 10 pm. For further information, read the signs posted along Constitution Ave. The cost is estimated to be about $8. Also, the next MSDC board meeting will probably be held in June.

Dave Nanney noted that this evening's MSDC gathering was unusual in that in attendance were the four Presidents of local mineral clubs, including Bob Cooke of the NVMC, Denise Nelson of GLMSDC, Kenny Reynolds of GLMSMC and Dave of MSDC. With no further business before the club, Dave called for and received a motion and a second to close the business portion of the evening. He turned to Dave Hennessey, V.P. for programs, to introduce the evening's speaker.

A Request from Tom Tucker...

"I am looking for someone who has a run of Lapidary Journals, circa 1970 - 1971, more or less. Unfortunately, there is no index that I know of for the Journal. I'm am looking for part of a column by June Culp Zeitner - a monthly bit she did as "editor", and a response to her in a subsequent "letter to the editor". At least that's the way I remember it. I'll have to look through the issues to find what I seek, which deals with great "crystal" collecting in a cave in New Mexico. The writer of the letter to the editor laments that he went to the cave, and all the crystals were gone. Bummer. It is a fabulous cave, and there are still extraordinary displays of crystals and unusual speleothems." -Contact any Club Officer is you can help Tom out.

Two specimens from Quebul Fine Minerals. Not an endorsement... just need to fill some dead space and who doesn't like looking at beautiful crystals! Credit: Quebul Fine Minerals.

CLUB INFO

MINERALOGICAL SOCIETY OF THE DISTRICT OF COLUMBIA

Meetings are the First Wednesday of the Month (Jan-Jun and Sep-Dec). We meet in the lobby of the Smithsonian National Museum of Natural History at 7:45pm.
WEBSITE http://mineralogicalsocietyofdc.org/
FACEBOOK www.facebook.com/MineralogicalSociety-OfTheDistrictOfColumbia

2018 Officers & Directors

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JMU Mineral Museum. Another highlight of the trip was his providing a selection of mineral specimens and books that were donated to JMU for us to peruse and from which we could choose favorites and provide donations to support student participation in non campus mineralogical events such as the Rochester Mineralogical Symposium.

Dr. Kearns received his B.S. in Geology from Waynesburg College in 1971, his M.S. in Coastal and Marine Processes from the University of Delaware in 1973, and his PhD. in Mineralogy from the University of Delaware in 1977. His professional interests include minerals of the Franklin Marble, Orange Co., New York; minerals and mineral chemistry of the Morefield Pegmatite, Amelia, Virginia; mineralogy of the Buck Hill, Augusta Co., Virginia syenite; mineral and mineral chemistry study of other Augusta Co., Virginia syenites; and other Virginia mineral localities

Dr Kearns provided the following information in response to a request for his personal information:

"My initial interest in minerals came when I was 5 years old. A gentleman friend of the family gave me a collection of five mineral samples. I still have these to this day. I started seriously collecting, displaying, and studying minerals when I was 12 years old. By the time I was 14 years old I had a sizable mineral collection and display, and was giving mineralogy lectures to local clubs and organizations. I was very fortunate that I had parents that would use summer vacation to take me anywhere I wanted to go to collect minerals. Up until the time I moved to Virginia to serve as the new Mineralogist at James Madison University (then Madison College), my major mineralogical interests were with Franklin – Sterling Hill, New Jersey minerals. My PhD research topic was the Mineralogy of the Franklin Marble, Orange County, New York. While working on my PhD, financial concerns necessitated taking a year off to work for DuPont's Coastal Titanium Exploration Team, in search of titanium deposits (rutile, ilmenite, etc.) in the Delaware, New Jersey coastal plain sediments. I have recently (September, 2017) retired from James Madison University after 41 years of service. I am presently Emeritus Professor, and Curator of the JMU Mineral Museum."

Regarding his presentation, Dr. Kearns provided the following: "Many of you are familiar with the JMU Mineral Museum. The collection is presently arranged by chemical classes for the non-silicates and structural subclasses for the silicates, with some extra cases specializing in minerals from Virginia, Elmwood, Tennessee, and Franklin/Ogdensburg florescent minerals. Two other wall cases present a large number of miniature specimens. My presentation will not be specifically about individual minerals. It will be about the determination, the luck, the resources, and the trust of many people and organizations that brought this facility into existence. It was about fulfilling a 40 year dream. I have some good stories to tell, and I will lead you through the past, present, and bright future of the JMU Mineral Museum."

Dr. Kearns is a true friend to our mineralogical hobby and I am happy to report that his wife, Cindy, another good friend to the hobby, will be joining us as well. Cindy recently completed her PhD (Congratulations!), so it will be two Dr. Kearns for the price of one.

Please join us in taking Lance and Cindy to dinner on June 6th before the club meeting. We will be meeting at 6:00 pm at Elephant & Castle Restaurant, 1201 Pennsylvania Ave, NW, Washington, DC, about 2 blocks from the Smithsonian Institution National Museum of Natural History (NMNH) where our club meeting is held. If you plan to come to dinner, please send an e-mail to me (davidhennessey@comcast.net) and let me know so I can try to get the number right for the reservation - but do not hesitate to come to dinner if you forget to e-mail. We can always make room for more around the table. If you cannot make it to dinner, we will meet in the NMNH lobby at 7:30 pm and head up to the Cathy Kerby Room for Lance's presentation.

April Program: "Poland Treasures - Amber and Salt"

Presented by Denise Nelson

By Andy Thompson, Secretary

Dave Hennessey introduced Denise Nelson as the evening's presenter. Denise is a certified gemologist and President of a sister mineral club, GLMSDC. Her theme, "Poland's Treasures: Amber and Salt" stems from her three-week tour of Poland and other countries, which, in some ways, was for her a return home. Having grown up as a teenager in Austria and, having made many visits to Vienna's Natural History Museum with her grandmother, her exposure to its gem and other displays helped set her on a course for life.

Denise began her presentation by showing a map of the Polish Baltic Sea coastline and by describing its bitter cold winters. Using the map, she showed the path taken in January of 1945 by the Wilhelm Gustoff ocean liner with its 10,000-plus multi-national passengers who were fleeing from an advancing enemy army. A submarine sank the ocean liner and due to the ice cold Baltic waters there were few survivors thereby making the tragedy the worst maritime disaster in history.

The Prime Source for Collecting Amber

The evening's amber tour focused on Poland's Baltic Sea city of Gdansk (AKA Danzig), the world's Mecca for amber. Thirty to sixty million years earlier, Denise noted, that area was the site of a plenteous pine forest whose species has since become extinct. The sap drippings from those trees subsequently became the high-quality amber for which the Gdansk region has been internationally famous.

She provided a photographic tour of the sea coast and noted the amber is typically found in the rocky areas rather than the beach. However, collecting can be dangerous as novices sometimes pick up yellow concretions of World War II phosphorous they mistake for amber. Once pocketed, the ammunition remnant can spontaneously catch fire and burn the collector's skin.

Additional major caveats mentioned for collectors include tourism traps such as:

- An abundance of fake stones made of reconstituted, heated, painted or dyed amber
- Inflated pricing especially when purchasing while in close geographic proximity to amber mines, where asking prices are often double the going price in the city of Gdansk or even at the annual Tucson, Arizona mineral show
- Abundant fake amber made of plastic and polymer fabrications, some of which have barely visible manufacturing seams which are never present on real amber
- Fabrications having deep orange color, a high glossy finish and seemingly organic inclusions, all of which can be signs of artificial heat treatment
- Natural Baltic amber rarely has inclusions which are more common in South American amber.
- The Polish government has taken steps to crack down on man-made, fake amber items and to support the pride and value of the national treasure of real amber. Gdansk amber, being tens of millions of years older than that found in other countries such as Mexico, Columbia, South America and tree resin, is stronger and so easier to carve. The Mexican Chiapas amber and Columbian copal, although true forms of amber resin, are not nearly as old as Baltic amber, are more fragile and tend to have more organic inclusions. So buyer beware.

History of Amber

With regard to the history of amber, Denise noted that the Romans loved it and their intaglio, the carved forms of gems or amber, was a popular form of jewelry. The J. Paul Getty Museum in Los Angeles, Denise noted, has an excellent collection of Roman carved amber. The Vikings also appreciated amber and used flat, thin squares of amber, sewed onto clothing, as a form of insulation from the cold. The Knights Templar in the 12th century promoted the international trade of amber which extended from Gdansk in the north to the tip of the boot on the Italian peninsula. The sea-faring traders of Venice also played a large role in amber's dissemination.

One of Denise's favorite amber museums she visited on her 3-week driving tour was the Muzeum Bursztynv (Amber Museum) in Gdansk. Originally used as a prison in the medieval period, its basement now houses the oldest amber specimens, while the upper levels of the tower structure display a time-line continuum of the newer amber items. Denise's photos illustrated the wide range of skillfully carved and highly detailed amber items such as jewelry, chalices, boxes, flowers, faces, animals, and even a fancy guitar. Although the majority of Baltic amber rarely has organic inclusions such as insects or vegetation, the Muzeum has gathered many such items. Its most prized possession is a large piece of amber with the inclusion of a lizard. Artistic designers prefer to use amber offset with silver rather than gold because gold does not provide an appealing visual contrast.

The Wieliczka Salt Mine

Salt is the second Polish treasure Denise and Denny explored during their three-week European tour. Given that salt was for centuries treasured as more valuable than gold, and essential for preserving meats and dairy products. The premier mine which enriched the entire region is located near the southern border of Poland, at the opposite end of the country, and practically due south of Gdansk. The salt mine is located directly beneath the town which gives the Wieliczka mine its name and is near and a little southeast of Cracow (Krakow).

By means of abundant photos, Denise shared the wonder of this world-famous mine which opened in the 13th century and was commercially viable until the late 20th century. Now that commercial mining has ceased, the mine-turned-museum has drawn over a million tourists a year. Throngs of adult visitors and school children are eager to descend the 900 steps to see the grand ballroom with its spectacular crystal chandeliers entirely made of salt, carved rooms for displaying ancient and modern museum pieces, chapels and statues, bas reliefs of biblical stories, and a horse- driven large treadmill wheel which for centuries powered the elevator for bringing the salt rocks up to the surface. With the advent of refrigeration, salt prices dropped and the complex shifted from commercial mining to tourism. Given the monumental nature of this mine, Denise strongly recommended everyone to consider putting it on their list of "must visit" destinations.

After leaving Poland, the Nelsons continued heading south en route to Vienna, Austria and passed through the Czech town of Kutna Hora where they visited the century-old silver and lead mine museum. It also displayed abundant mineral specimens such as pyrite and garnet, etc. South of Vienna, they stopped at Maissau whose Amethyst World Museum holds an interesting lesson in the value of mineral education. The amethyst vein in the mine was not commercially viable long-term, so instead of shutting down the mine, the towns' leaders turned it into an educational site so children and the general population could see how amethyst appears in nature, practically side by side with mineral displays and explanations.

While visiting the churches of some of these smaller ancient towns, she found something she never saw in other churches in Europe, namely statues of miners. Although none sported haloes commonly found in church paintings and statues, clearly miners were held in the highest respect.

Having concluded the formal presentation, Denise fielded a number of questions concerning salt mining and she explained the two methods for mining. The first was carving out and hauling the rock chunks of salt to the surface. The second was to flush out the mine's brine water, pump it to the surface and spray it over twigs and the ground so it could dry out and crystalize for harvesting as table salt or for other uses.

She also brought numerous samples of amber bracelets and jewelry, including, to the surprise of many audience members, lots of fake amber. Denise explained that as an appraiser, she is responsible for being able to identify many forms of fabricated and fake items. She showed many examples of clues collectors can look for when considering amber purchases, such as looking for feint traces of a tell-tale seam which would indicate the beads or specimens were artificial and fabricated.

Dave Hennessey thanked Denise for her interesting presentation which the audience applauded with gratitude for sharing her expertise and exploration of Poland's amber and salt treasures.

Understanding the Mineral Resources of the Midcontinent Rift.

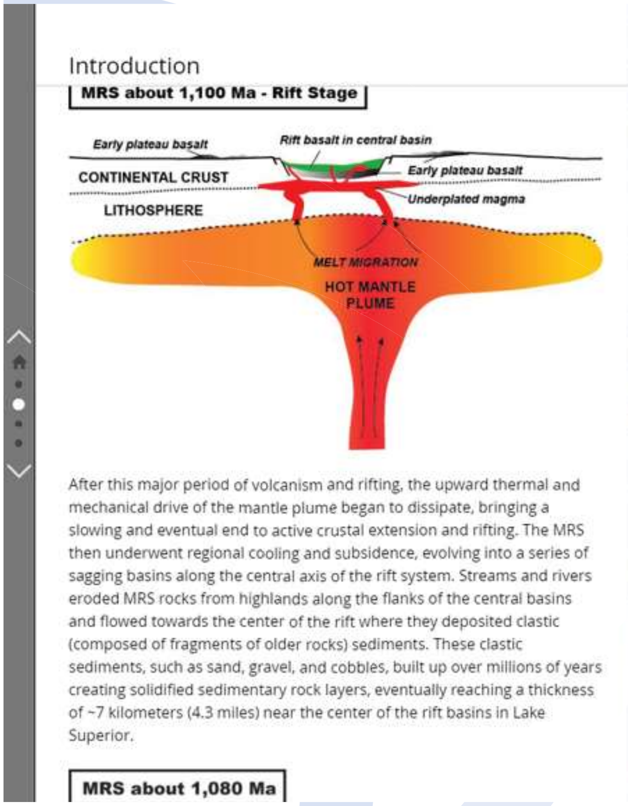
From the USGS Website

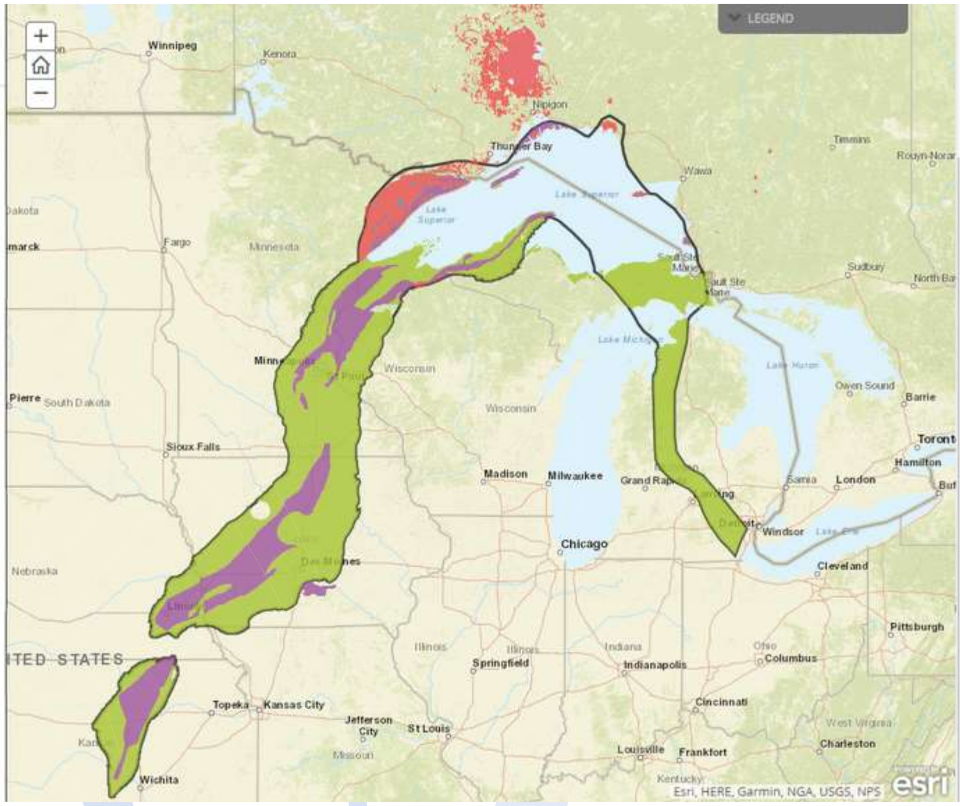
An Ohio University geologist who first proposed the now-accepted supercontinent cycle theory in the 1980s has rallied to the cause of one of those supercontinents, Pannotia, that is in danger of being overlooked.

The first great geologic expeditions of the United States set off in the mid-1800s, equipped with mules, rifles, and early scientific instruments. Their goal: to uncover the great mineral wealth of the United States and learn about its earliest geologic history.

Meet the Midcontinent Rift, one of the most geologically fascinating regions in the United States and Canada.(Public domain.)

Now, you too can learn some of that history and see a small part of the mineral potential of the United States without leaving your comfortable chair! The USGS has just

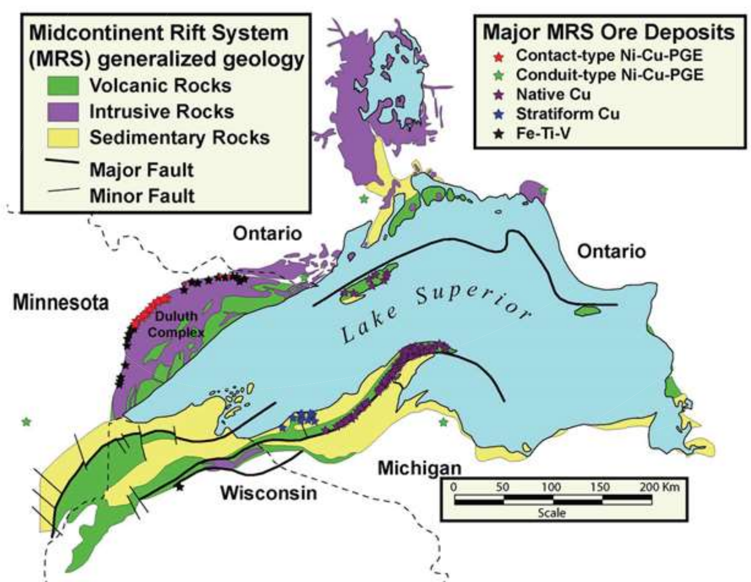




released a new interactive Story Map describing the Mineral Deposits of the Midcontinent Rift System.

The Midcontinent Rift System, which curves for more than 2000 km across the Upper Midwest, is one of the world's great continental rifts. Rifting began about 1.1 billion years ago, when the Earth's crust began to split along the margin of the Superior craton. Rifting ended before the crust completely opened to form a new ocean, and as time passed rift rocks were buried beneath younger rocks. With erosion and glaciation, the ancient rocks of the Midcontinent Rift were exposed in the Lake Superior region, creating much of its spectacular shoreline.

In the Lake Superior region, rocks of the rift contain a wealth of mineral resources that formed by magmatic and hydrothermal processes during the ~30 million year course of rift development. Rift rocks are host to Michigan's storied native copper deposits, and contain significant copper and nickel that were deposited during various stages of rift development.



In this Story Map, mineral deposit locations and descriptions, compiled from the USGS Mineral Resource Data System and the Ontario Geological Survey Mineral Deposit Inventory, are categorized by mineral commodity, mineral deposit type, and the relative time frame of mineralization.

Much of the Great Lakes' mineral wealth can be traced to the Mid-Continent Rift. Here is a generalized geologic map of the Midcontinent Rift System. Modified from Dean Peterson, Duluth Metals.(Public domain.)

The Midcontinent region is the focus of active mineral exploration, including for mineral deposit types previously unrecognized there. Here, USGS scientists Laurel Woodruff and Suzanne Nicholson visit an anorthosite quarry, Duluth Complex, MN. Photo by K. Schulz, USGS.(Credit: Klaus, Schulz. Public domain.)

This Story Map also describes a new comprehensive digital Geographic Information System for the Midcontinent Rift System recently compiled by the USGS from numerous regional studies conducted over the last several decades.

Characterizing the mineral resources of the Midcontinent Rift System is a priority of the USGS Mineral Resources Program, and we hope you enjoy this Story Map that tells just part of the amazing story of this important geologic feature.

Rocks with Soft-Tissue Fossils Share a Mineral Fingerprint

By Kimberly M. S. Cartier 20 March 2018, from ScienceNews.com

Ultra-rare, soft-tissue fossils are more likely to survive in rocks containing bacteria-inhibiting minerals, according to new research that identified common mineralogical signatures for fossil-bearing rocks. Scientists hope to use these results to dig into the complexity of life surrounding the Cambrian explosion, an intense period of evolution and diversification that occurred approximately 540 million years ago, and to increase their efficiency at finding soft-tissue fossils.

With a better understanding of when, where, and why soft-tissue fossilization happens, "we might be able to more easily find fossils.""It's really important for interpreting the [fossilized] organisms that we have a good understanding of the types of preservations and how those preservations happen," said Ross Anderson, a postdoctoral research fellow at All Souls College in the University of Oxford in the United Kingdom and lead scientist on the project. With a better understanding of when, where, and why soft-tissue fossilization happens, "we might be able to more easily find fossils," he added.

The team compared the mineralogies of hundreds of rocks that hosted soft-tissue fossils with those that supported mineralized skeletons. They discovered that soft-tissue, or Burgess Shale–type (BST), fossils were more likely to exist in materials that slow down the rate of tissue decay and also promote the fossilization of organic matter. These results offer the first statistical evidence of a connection between fossil occurrence and clay mineralogy, according to the researchers.

Seeing the Guts

Nowadays, much of the life that walks, swims, crawls, or slithers has a hard skeleton, and most fossils from the past 400 million years trace those skeletons. But when alive, those creatures are made primarily of soft tissues—brains, muscles, organs, etc.—that often do not get preserved because they decay too quickly. Before the Cambrian explosion, most life-forms did not have a skeleton at all—they were all soft tissue.

Fossils of soft tissues are incredibly rare but can provide a wealth of information about the ecology and biology of the creature when it was alive, Anderson explained. For a bone to fossilize, its rigid organic molecular structure gets slowly replaced by more time-resistant minerals, a process called mineralization. The type of fossilization seen in the Burgess Shale, however, preserves those delicate soft tissues without chemical alteration by compressing and sealing them within sediments, keeping them carbon-rich and nonmineralized.

At the Burgess Shale, "you do get the soft parts preserved. You see the guts. You see wholly organic organisms like worms.""The Burgess Shale and other similar deposits… preserve some of the original organic matter in shales," Anderson said. "You do get the soft parts preserved. You see the guts. You see wholly organic organisms like worms."

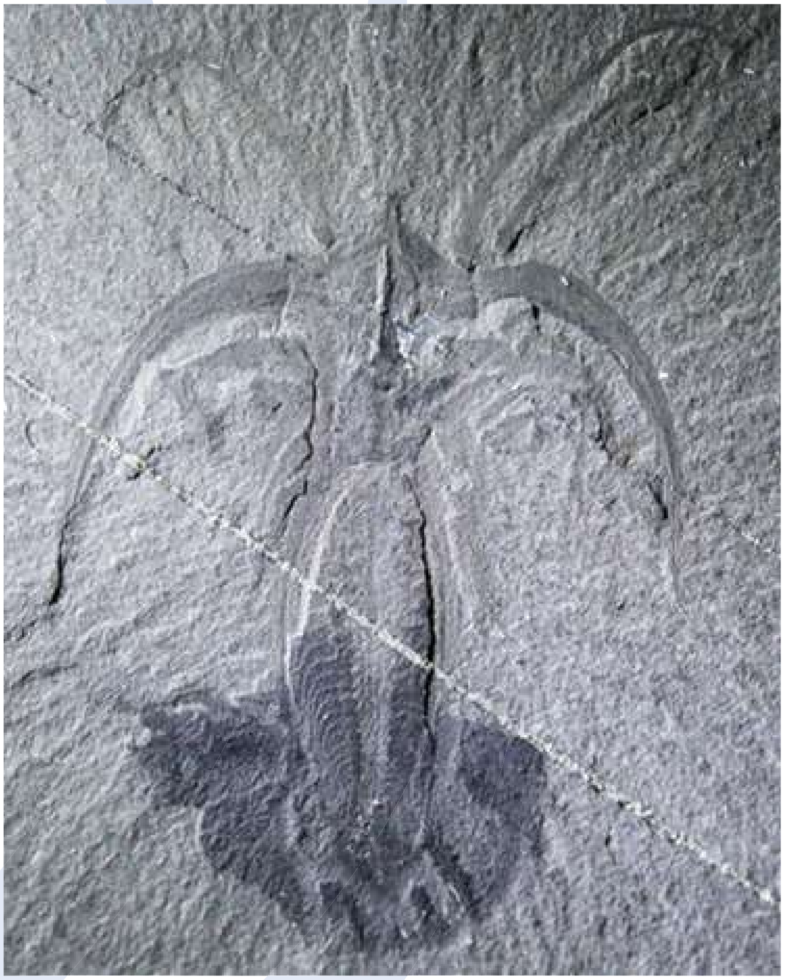
But, until now, it has been difficult to understand why soft tissues fossilized in some locations but not others. Lab experiments that Anderson's colleagues conducted in the mid-1990s suggested that the mineralogy of the surrounding material might play a key role in the preservation of soft tissues, and he sought to test that with actual fossils.

Finding the Right Minerals

To do this, the researchers examined the mineralogy of more than 200 Cambrian fossils, some newly collected and some from museums and archives, originating from 19 sedimentary layers spanning four different continents. Using X-ray diffraction, they measured the chemical compositions of the sediments surrounding soft-tissue fossils and mineralized skeletons.

The team found that if a rock's mineralogy was more than 40% illite, BST fossilization was nearly impossible. Conversely, samples made of more than 20% berthierine had a greater than 90% chance of supporting a soft-tissue fossil. Berthierine, a mineral with antibacterial properties that forms in tropical, iron-rich sediments, likely inhibits enzymes that break down soft tissues and promotes fossilization, Anderson explained. These results agree with past lab experiments that explored possible fossilization pathways.

"You need to slow that process of decay down such that they can become stable on geological timescales," he said. "And that, as it turns out, is quite rare and quite difficult to do. You need to have some unique environmental conditions."



A 508-million-year-old Marrella fossil, approximately 2 centimeters long, from the Cambrian Burgess Shale in British Columbia in Canada. This arthropod-like organism, the most common animal fossil in the Burgess Shale, was mostly soft bodied. The mineralogy of the surrounding rock likely helped to preserve the organic soft tissues within the imprint. Credit: Susan Butts

With the two mineralogical signatures, Anderson's team could predict which clays contained BST fossils with approximately 80% accuracy. They noted, however, that the presence of berthierine does not guarantee that soft-tissue fossils will exist at a site. Climate, water chemistry, runoff, and, of course, available fauna also are important factors. High berthierine concentrations likely help tissue preservation along, Anderson said. The team published these results in Geology on 15 February.

The analysis is "fascinating," said Emma Hammarlund, a geobiology researcher at Lund University in Sweden, because it describes a "symptom of Burgess Shale–type preservation rather than the mechanism that led to the preservation of nonmineralized tissue." Hammarlund, who was not involved with the research, called the study "the first 'mineralogical guide' of its kind, predicting a mineralogy of where else to dig deeper for nonmineralized tissue in the Cambrian and earlier."

Expanding the Search

These Cambrian fossils have mainly been found in the Burgess Shale in British Columbia in Canada, and finding new sites that have similar soft-tissue fossils has been a hit-or-miss process, according to Anderson.

The researchers plan to use the results of this study to more efficiently identify locations for additional deposits of Burgess Shale–type fossils around the world and to discover fossil deposits from before the Cambrian explosion, when most life did not have hard skeletons.

More BST fossils could "greatly deepen our understanding of the diversification of animal life on Earth in the Cambrian," said Hammarlund, "and, possibly, even of the preceding dawn of animal life."

—Kimberly M. S. Cartier (@AstroKimCartier), News Writing and Production Intern

Citation: Cartier, K. M. S. (2018), Rocks with soft-tissue fossils share a mineral fingerprint, Eos, 99, https://doi.org/10.1029/2018EO095237. Published on 20 March 2018.

Small Inclusions of Unique Ice in Diamonds Indicate Water Deep in Earth's Mantle

From ScienceNews.com

The team, led by University of Nevada, Las Vegas geoscientist Oliver Tschauner, found inclusions of the high-pressure form of water called Ice-VII in natural diamonds sourced from between 255 and 410 miles (410-660 km) depth.

"In the jewelry business, diamonds with impurities hold less value," the researchers said. "But for us, those impurities — known as inclusions — have infinite value, as they may hold the key to understanding the inner workings of our planet."

For the study, Professor Tschauner and co-authors used diamonds found in the South Africa (Namaqualand), Botswana (Orapa), China (Shandong), Zaire, and Sierra Leone. "This shows that this is a global phenomenon," they said. "These diamonds were born in the mantle under temperatures reaching more than 1,000 degrees Fahrenheit (538 degrees Celsius)."

"The mantle, which makes up more than 80% of the Earth's volume, is made of silicate minerals containing iron, aluminum, and calcium among others. And now we can add water to the list." Ice-VII, a high-pressure form of water ice that is stable above 2.4 gigapascals (24,000 atmospheres), had been found in prior lab testing of materials under intense pressure.

The scientists found that while under the confines of hardened diamonds found on the surface of the planet, Ice-VII is solid. But in the mantle, it is liquid. "These discoveries are important in understanding that water-rich regions in the Earth's interior can play a role in the global water budget and the movement of heat-generating radioactive elements," Professor Tschauner said.

"They can help us create new, more accurate models of what's going on inside the Earth, specifically how and where heat is generated under the Earth's crust." "In other words: it's another piece of the puzzle in understanding how our planet works."

The findings are published in the journal Science.

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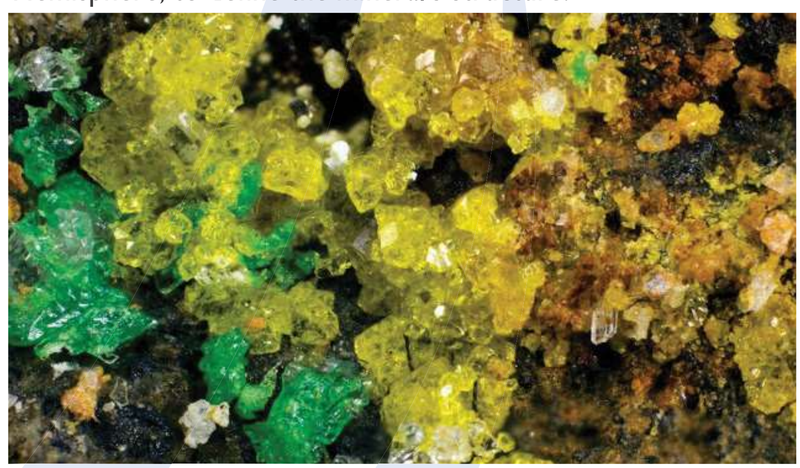
O. Tschauner et al. 2018. Ice-VII inclusions in diamonds: Evidence for aqueous fluid in Earth's deep mantle. Science 359 (6380): 1136-1139; doi: 10.1126/science.aao3030

Scientists Discovered The Most Complex Mineral on Earth

From GeologyIn.com

The Complexity of the Uranium-based Mineral, Dubbed Ewingite, Is Nearly Twice as High as the Previous Most Complex Mineral

Researchers at the University of Notre Dame found that the complexity of a uranium-based mineral, dubbed ewingite, is nearly twice as high as the previous most complex mineral. The study, published in Geology, required the use of the Advanced Photon Source at the U.S. Department of Energy's Argonne National Laboratory, the brightest X-ray source in the Western Hemisphere, to define the mineral's structure.



Ewingite. Chemical Formula: $Mg_8Ca_8(UO_2)_{24}(CO_3)_{30}O_4(OH)_{12}(H_2O)_{138}$
Photo credit: Pavel Skacha

According to Peter C. Burns, Henry J. Massman Professor of Civil and Environmental Engineering and Earth Sciences, director of the Center for Sustainable Energy at Notre Dame and co-author of the study, structural complexity of minerals can be measured by bits per unit cell. The average is about 228 bits.

"Minerals at 1,000 bits are considered very complex, but only about 2.5 percent of known minerals receive that designation," said Burns. "In comparison, ewingite measures at 12,684.86 bits per unit cell, essentially doubling the measuring stick that mineralogists currently use."

Ewingite was found on a damp mine wall in the Czech Republic and was in the same region where uranium ore was mined for Marie Curie's groundbreaking studies of radioactivity a century ago.

Curie's studies resulted in the discoveries of the elements polonium and radium, which had been in the rocks for a long period of time. Ewingite had likely only grown over decades, after humans began interacting with the mine.

"Humans have done a pretty good job at interfering with the planet's natural processes by digging into Earth's surface and releasing chemicals into the atmosphere," Burns said.

"Our next step with this research is to confirm whether or not this extremely complex mineral could have even existed if humans had not opened and exposed the mine to air and water. This is important for understanding what effect human involvement is having on Earth's other geological processes."

Burns and his team are working with the Carnegie Institute to gather all existing data on uranium-based minerals to see if they can find variations between minerals that may or may not have been impacted by human existence. Additionally, the Burns lab is attempting to recreate the mineral to better understand the conditions that led to its formation.

Ewingite was named in honor of Rodney C. Ewing, Frank Stanton Professor in Nuclear Security at Stanford University, for his contributions to the fields of mineralogy and nuclear science. The study was funded by the U.S. Department of Energy Basic Energy Sciences program and led by Travis A. Olds as a doctoral student at the University of Notre Dame. Olds is now a postdoctoral scholar at Washington State University.

Contributors to the study include Yu-Sheng Chen of the Center for Advanced Radiation Sources at the University of Chicago; Anthony R. Kampf of the Natural History Museum of Los Angeles County; Jakub Plásil of the Academy of Sciences of the Czech Republic; Luke R.

The above story is based on materials provided by University of Notre Dame.

http://www.geologyin.com/2018/03/scientists-discovered-most-complex.html#0JtPzuxK0JCSXZEc.99 Follow us: @GeologyTime on Twitter

Mineralogical Society of America Editors' Picks

With the permission of Keith Putirka, the following are the Editor's picks of Highlights and Breakthroughs & Invited Centennial Articles from the February 2018 issues of the American Mineralogist: Journal of Earth and Planetary Materials.

http://www.minsocam.org

Biominerals – A Review

On page 665 of this issue, Wysokowski et al. provide a comprehensive review of biomineralization processes, describing a range of mineral types and biological processes and structural diversity, with an emphasis on biosilica in viruses, bacteria, plants, diatoms, and sponges. Their work also illustrates how the structures and functions of biosilicifiers can inspire new forms of artificial biomineralization with far-ranging technological applications, including biomimicry.

No Si in the Core?

On page 742 of this issue, Tateno et al. present new, high-pressure experimental results in the system Fe-Si-S. They find that crystalline metallic Fe is enriched in Si relative to S, compared to co-existing liquids. And so, with partial crystallization, especially at inner-core pressures (330 GPa), the solid, inner core is enriched in Si relative to the outer, liquid core. This finding may preclude Si as an important light alloying element if the 4.5% jump in density across the inner/outer core boundary requires an inner core that contains less Si than a presumably equilibrated liquid outer core. The authors find similar reasons to reject core compositions in the systems Fe-Si-C and Fe-Si-O, although they cannot exclude liquids in the system Fe-Si-H. It is not yet clear phase topologies within a more complex system (e.g., Fe-Si-O-S) might yet still allow a core that is Si-enriched, but if the core is a ternary system, then a Fe-Si-H ternary would be the only Si-bearing ternary that could explain the inner/outer core density change.

An Unexpected Basalt Source for the Huckleberry Ridge Tuff

On page 757 of this issue Swallow et al. examine mafic materials from the 2.08 Ma Huckleberry Ridge Tuff (HRT), the first and largest of the Yellowstone Plateau caldera-forming eruptions, and find a surprising result. The mafic materials that were involved in the HRT magmatic system are quite similar to much more recently erupted materials (ca. 5-10 ka) at the Craters of the Moon lava field in ID, and which also occur just west of the HRT caldera. These results yield a new perspective on the diversity and roles of various mafic magma inputs that likely provide the necessary thermal input to drive eruptions in the Yellowstone region.

A New EOS for Stishovite and CaCl2-structured SiO2

On page 792 of this issue Fischer et al. conduct new high-pressure experiments to determine the equations of state for stishovite, and CaCl2-structured SiO2, a higher-P polymorph that, as shown by this new study, is stable at >68 or >78 GPa, along with expected subduction and ambient geotherms, respectively. The new EOSs also show that stishovite will indeed be denser than ambient mantle but the CaCl2 polymorph is likely to be buoyant relative to a pyrolite lower mantle, and that if Si is exsolved from the core into the mantle, the lowermost mantle might become locally saturated in SiO2, and in such a case, this SiO2 would add a degree of compositional buoyancy to its enclosing material.

Errors When Using V to Estimate Mantle fO2.

On page 819 of this issue Li presents new experiments to show that clinopyroxene/melt partition coefficients for V and Sc are sensitive to temperature, and possibly magmatic water contents, but that V and Sc are about equally affected and so are not fractionated from one another during melting. The result is that mantle fO2 estimates based on V only might be in error by nearly 2 orders of magnitude if T-effects are not accounted for, but that fO2 values based on V/Sc ratios are more likely to be valid, except perhaps for those cases where V is oxidized to V5+.

Letters: Monazite, heal thyself

On page 824, Seydoux-Guillaume et al. report a study using ion bombardment of LaPO4 monazite aims to understand why this mineral is never found amorphized. Simultaneous and sequential irradiations using Au and He ions at energies designed to simulate the recoil from nuclei undergoing alpha decay and the electronic energy loss of the alpha particle moving through the structure. This study shows that it is the latter that prevents amorphization in this mineral. This understanding is for predicting nuclear waste form performance and has implications for the application of geochronology and thermochronology in monazite.

Useful Mineral Links:

	American Federation of Mineralogical Societies (AFMS)	www.amfed.org
	Eastern Federation of Mineralogical and Lapidary Societies (EFMLS)	www.amfed.org/efmls
mindat.org	MINDAT	www.mindat.org
	Mineralogical Society of America (MSA)	www.minoscam.org
	Friends of Mineralogy	www.friendsofmineralogy.org/
	WebMineral	webmineral.com
THE GEOLOGICAL SOCIETY OF AMERICA	The Geological Society of America (GSA)	www.geosociety.org/
Scovil PHOTOGRAPHY	Jeff Scovil Mineral Photography (not advertising - just great photos)	scovilphotography.com/
USGS science for a changing world	United States Geological Survey (USGS)	www.usgs.gov
The Geological Society of Washington founded 1893	The Geological Society of Washington (GSW)	http://www.gswweb.org/

AFMS Code of Ethics

- I will respect both private and public property and will do no collecting on privately owned land without the owner's permission.
- I will keep informed on all laws, regulations of rules governing collecting on public lands and will observe them.
- I will to the best of my ability, ascertain the boundary lines of property on which I plan to collect.
- I will use no firearms or blasting material in collecting areas.
- I will cause no willful damage to property of any kind - fences, signs, and buildings.
- I will leave all gates as found.
- I will build fires in designated or safe places only and will be certain they are completely extinguished before leaving the area.
- I will discard no burning material - matches, cigarettes, etc.
- I will fill all excavation holes which may be dangerous to livestock. [Editor's Note/ Observation: I would also include wildlife as well as livestock.]
- I will not contaminate wells, creeks or other water supply.
- I will cause no willful damage to collecting material and will take home only what I can reasonably use.
- I will practice conservation and undertake to utilize fully and well the materials I have collected and will recycle my surplus for the pleasure and benefit of others.
- I will support the rockhound project H.E.L.P. (Help Eliminate Litter Please) and will leave all collecting areas devoid of litter, regardless of how found.
- I will cooperate with field trip leaders and the se in designated authority in all collecting areas.
- I will report to my club or Federation officers, Bureau of Land management or other authorities, any deposit of petrified wood or other materials on public lands which should be protected for the enjoyment of future generations for public educational and scientific purposes.
- I will appreciate and protect our heritage of natural resources.
- I will observe the "Golden Rule", will use "Good Outdoor Manners" and will at all times conduct myself in a manner which will add to the stature and Public "image" of rockhounds everywhere.

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THE MINERALOGICAL SOCIETY OF THE DISTRICT OF COLUMBIA (MSDC)

(____) Family ~ $25.00 per year. One address.

(____) Individual ~ $20.00 per year.

(____) New * (____) Renewal Dues are for Year __________*

For new members who join in the last months of the year, membership will extend through the following year with no additional dues.

ANNUAL DUES – PLEASE PAY YOUR DUES PROMPTLY.

Pay at next meeting or mail to:

Mineralogical Society of DC
c/o John Weidner
7099 Game Lord Drive
Springfield, VA 22153-1312

Name(s) (First and Last) ____

Address____

City ______________________________ State _____________ Zip: ________________

Phone(s): Home/Work/Mobile____

Email(s): ____

OK TO INCLUDE YOU ON CLUB MEMBERSHIP LIST?

( ) Yes – Include name, address, phone, email.

If you want any information omitted from the membership list, please note:

Omit my: ( ) Email; ( ) Home phone; ( ) Work phone; ( ) Mobile phone; ( ) Address; ( ) Name

SPECIAL CLUB-RELATED INTERESTS? ____

Meeting Dates, Time, and Location: The first Wednesday of each month. (No meeting in July and August.) The National Museum of Natural History, Smithsonian Institution, 10th Street and Constitution Ave, Washington D.C. We will gather at the Constitution Avenue entrance at 7:45 PM to meet our guard who will escort us to the Cathy Kirby Room. Street parking: Parking is available in the Smithsonian Staff Parking – Just tell the guard at the gate that you are attending the Mineral Club Meeting.

THE MINERAL MINUTES

NEWSLETTER OF THE MINERALOGICAL SOCIETY OF THE DISTRICT OF COLUMBIA

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