The Mineral Newsletter

Next meeting: April 3 Time: 7:30 p.m.

Dunn Loring Fire Station, 2148 Gallows Road, Dunn Loring, VA

Vivianite

Morococala Mine, Santa Fe Mining District, Oruro Department, Bolivia

Source: Alfred Schreilechner collection. Photo: Albert Russ.

Volume 63, No. 3
April 2023
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April Meeting Program:

The Pugh Mine in Ohio

Details on page 12

In this issue …

Mineral of the Month
Vivianite

by Sue Marcus

Tom Burke suggested that we examine vivianite as a Mineral of the Month. I checked and was surprised that we had not looked at this beautiful mineral, which is found in Virginia. It was named by German geologist Abraham Gottlob Werner. He carefully studied minerals, creating and standardizing physical characteristics to assist in differentiating and identifying them. He is reported to have provided the initial descriptions of 8 minerals and to have named 26. Werner is credited with naming vivianite, although his description was published posthumously in 1817 by the government of Saxony. It was based on his notes, as prepared by three of his students.

Werner named the mineral after John Vivian, who provided the type material from Truro, Cornwall, England. Since Vivian was a mine owner and manager, the type material probably came from one of his own properties. Werner states, in German, that the name originally came from B.R. Werner, though who B.R. Werner was remains one of life's mysteries.

Color is a notable attribute of vivianite. Many sources state that specimens are colorless or light green when initially extracted but turn green and then blue before darkening to black upon exposure to light. Vivianite is highly pleochroic, more green when viewed along the Y-axis (long axis) and more blue when viewed along the X-axis (90 degrees from the Y-axis), with some crystals appearing yellow-green to olive in the third direction.

Vivianite occurs as a secondary mineral in low-temperature geological environments. Many rock types containing phosphorus can lose that chemical through weathering, resulting in the redeposition and crystallization of vivianite. Even nonrock materials like bones, shells, or bogs can contain phosphorus and other chemicals that result in vivianite deposition. In German, *Blaueisenerz* (blue iron ore) is a name given to vivianite in boggy, iron-rich, oxygen-poor environments found throughout Europe and in Cameroon.

"Vivianite" is also the name for a group of monoclinic minerals containing arsenic or phosphorus. Metavivianite forms when vivianite loses water though oxidation. The conversion of iron ions during oxidation gives metavivianite a slightly different chemistry and associated molecular structure, so it is not a member of the vivianite group.

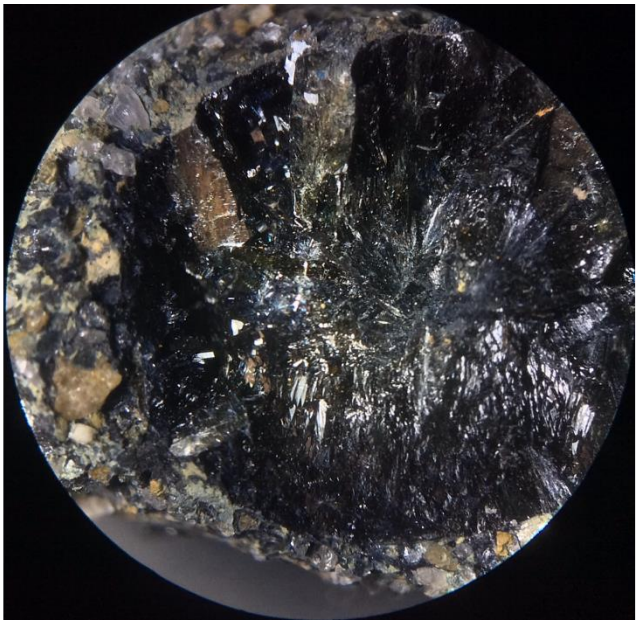
Maine is known for its minerals, mostly from pegmatites. The state is the source of fine vivianite microcrystals. Most of these pictured on Mindat are bluer and more translucent than the macroscopic vivianite crystals from most other localities. Given the large

Happy Easter!

Northern Virginia Mineral Club members,

The next club meeting will be a remote meeting via Zoom on **April 3, 7:30 p.m.** The program will be on the Pugh Mine in Wood County, OH. See details on page 12.

Vivianite, Tomokoni Mine, Potosí, Bolivia.
Source: Wikimedia; photo: Rob Lavinsky.

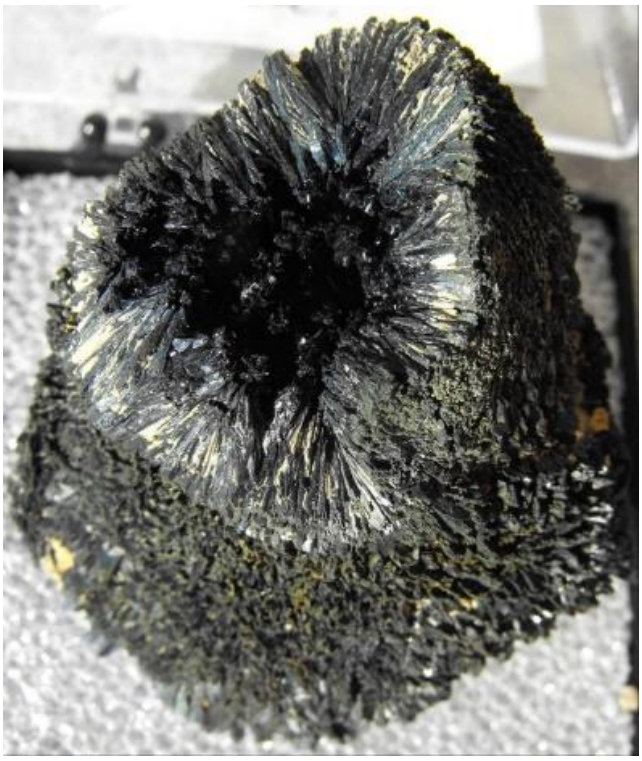


Vivianite micromount, Mullica Hill, Gloucester County, NJ. Source: Mindat; photo: Jamison K. Brizendine.

number of mineral collectors who have scouted Maine, vivianite is now relatively rare there. Based on photos shown on Mindat, Paris (Oxford County) and West Baldwin (Cumberland County) are the most prolific localities.

We learn together through these columns. Checking on vivianite localities, I learned that Mullica Hill, NJ, has produced some lovely vivianite specimens. I prefer macroscopic crystals that show most crystal faces. This form of vivianite was found at Mullica Hill, along with vivianite pseudomorphing fossil belemnites and mollusks (bivalves). Also found were vivianite nodules in which the narrow crystal blades radiate from a central point. Jamison Brizendine posted a photo on Mindat (shown above) of a micromounted specimen that had belonged to Clarence Domire, a former NVMC member. At the Mullica Hill site near the Raccoon Valley Swim Club, vivianite formed the fossiliferous clays of the Cretaceous Navasink formation. Vivianite alters to rarer phosphate minerals, including ferrostrunzite (for which Mullica Hill is the type locality), strengite, rockbridgite, phosphosiderite, metavivianite, and more.

In Maryland, vivianite has been reported from Oxen Hill in Prince Georges County and near Henderson in Caroline County. Wheeler Road in Oxen Hill was a roadcut where specimens were found in the 1960s. Neither Oxen Hill nor Caroline County was a prolific

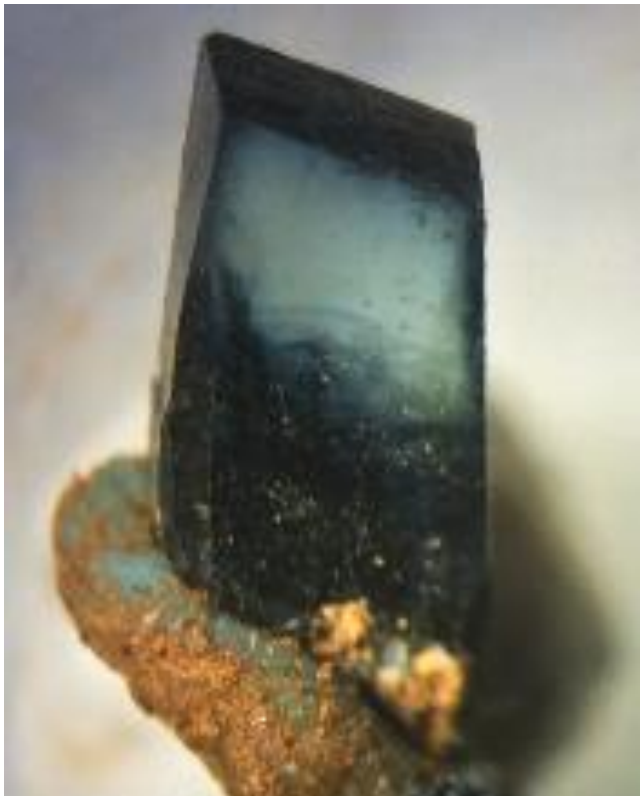


Vivianite, Richmond, VA.
Source: Mindat; photo: Rolf Luetcke.

producer; Maryland specimens (found decades ago) are most likely to interest those who want suites of local minerals.

Vivianite has been found at two locations in Virginia. Most specimens—and there were never many—came from a road construction project in the 1960s in the state capital of Richmond. In downtown Richmond near what is now I-95, vivianite crystals were found in radiating clumps; the tips, initially translucent, darkened over time. Clusters were extracted up to 10 centimeters (3.9 in) in size. More robust crystals up to about 4 centimeters (1.6 in) long formed rarer parallel growths or sprays. At least one "bowtie" spray (two divergent sprays originating from the same center) was extracted. Most of these Virginia specimens are fragile, tending to easily fall apart.

Miocene phosphate beds in Florida are mined in open pits for fertilizer. A teachable moment for me was learning that the Clear Springs Mine in Bartow produced a small number of beautiful vivianite crystals in the 1980s. Looking at the specimens shown on Mindat, I thought I was seeing the much better known stunning crystals from Bolivia, found at about the same time. The Clear Springs crystals are smaller



Vivianite, Clear Springs Mine, Homeland, Central Florida Phosphate Mining District, Polk County, FL. Source: Mindat; photo: Jamison K. Brizendine.

Vivianite, Huanuni Mine, Huanuni, Bolivia. Source: Wikipedia; photo: Carles Millan.

than their Bolivian cousins, usually measuring 2-4 centimeters (0.8-1.6 in) in size. The best of the Florida vivianite crystals are lustrous, translucent green and well terminated. Some perch on fine-grained matrix of white or rust-colored collophane (rock phosphate composed of massive carbonate-rich fluorapatite and carbonate-rich hydroxylapatite).

The Blackbird Mine in Lemhi County, ID, produced uniquely colored vivianite in shades of purple, green, and blue and (rarely) green with purple tips. The color might be due to traces of the cobalt for which the mine was operated. Rock Currier reported that vivianite specimens were colorless when originally extracted, although this could not be confirmed. Single crystals up to 6.9 centimeters (2.7 in) in size were found. Many of the crystals from this locality are translucent and euhedral. Some show distortions in their growth. Most specimens were extracted in the 1940s-60s; the locality is now a reclaimed Superfund site.

Colorado vivianite crystals are rare but collectible. Specimens from the Leadville Mining District are included in the Yale University and British Museum of Natural History collections. A 5.4-centimeter (2.1-in) group of crude, parallel vivianite crystals is not an aesthetically pleasing specimen, even though it shows crystal terminations. Smaller euhedral crystals were also found.

The Bingham Canyon Mine in Utah is a gigantic hole in the ground visible from space. Vivianite was found in 1953 and perhaps later. It was never abundant at this locality, but crystals 5 centimeters (2 in) in size on matrix were recovered. A gemsociety.org article on vivianite states that vivianite crystals up to *5 inches* in size were found at the Bigham Canyon Mine, but this could be based on a misreading of the *5-centimeter* crystals found there. Crossed vivianite crystals without matrix are particularly attractive and unusual. Vivianite microcrystals on matrix were found at the Utahlite claim in Box Elder County.

Vivianite nodules were discovered at the Burney Mine in Shasta County, CA. The nodules were made up of very thin radiating vivianite crystals hosted by

diatomite. The center of the nodules is often organic—for example, a bit of twig or diatom.

Mexico is rich in minerals, with the Santa Eulalia Mining District in Chihuahua producing many collectible mineral species. The East Camp of the San Antonio Mine was a source of beautiful vivianite crystals, though not in abundance. On Mindat, Rob Lavinsky shows a 9.5-centimeter (3.7-in) translucent green crystal (shown at right) mined in 1994. The San Antonio Mine, hosted in Upper Cretaceous limestone, exploits a zinc-lead-tin-vanadium deposit that contains recoverable precious metals.

The Jocão Mine or Claim in Minas Gerais, Brazil, is sometimes erroneously cited as the "Cigana Mine." Sturdy crystals, from lovely light blue micros to 6.0-centimeter (2.4-in) green macros, came from this locality. Some crystals were doubly terminated. This is an unusual locality because the vivianite occurs in a pegmatite rather than the usual sedimentary-related host rocks. A *Mineralogical Record* article apparently reports crystals up to 11 centimeters (4.3 in) in size. The Ênio Pegmatite in the same part of Minas Gerais also produced some collectible vivianite in the 1970s. The Sapucaia Mine, also in Minas Gerais, was another source of vivianite in pegmatite, though a beautiful light blue micromount is the only specimen shown on Mindat. Brazilian vivianite is more commonly blue than green, though both colors have been found.

Vivianite with albite, Joçao Claim, Minas Gerais, Brazil. Source: Mindat; photo: Rob Lavinsky.

Vivianite, San Antonio Mine, Chihuahua, Mexico. Source: Wikipedia; photo: Rob Lavinsky.

For aesthetics, Bolivia's vivianite specimens are some of the most attractive mineral specimens in the world. The Tomokoni Mine in the Potosí Department and the Huanuni and Morococala, and to a lesser extent, the Poopó Mines near Oruro, Bolivia, are the source of the world's finest vivianite crystals. The best of these specimens show off transparent to translucent sharp-edged, deep green crystals, some on sandstone matrix. Vivianite was also reported from Cerro Tazna, Potosí, Bolivia.

The Tomokoni Mine was opened specifically for vivianite. Three adits provided the entire output, with most mining occurring in 2003-06. This is an example of world's previous best, probably from one of the other Bolivian mines, being bested by a later discovery. Sharply pointed, translucent, bottle-green vivianite crystals up to at least 10.6 centimeters (4.2 in) in size were found here, with many 5-centimeter (2-in) specimens. Microcrystals from this locality are lovely, though rarer than larger ones. Some are doubly terminated, looking like deep green rhombs. Other interesting crystals have slight bends or distortions.

Left, top: *Vivianite on quartzite, Tomokoni Mine, Potosí, Bolivia. Source: Mindat; photos: Rob Lavinsky.*

Vivianite from the Tomokoni Mine formed in sandstone metamorphosed to quartzite, the green crystals contrasting aesthetically with the reddish brown sandstone. Looking through 293 Mindat photos of vivianite from this locality, I found one amazingly beautiful specimen after another—eye candy for mineral collectors, if your eyes don't glaze over. Some crystals are reported to have blackened due to Fe^{+2} becoming Fe^{+3}. If you own one of these lovelies, protect it by keeping it away from sunlight and bright light.

The Huanuni Mine is Bolivia's largest tin mine and is reported to host the world's largest cassiterite deposit. Production began in 1880 and continues now. Phosphate minerals, including vivianite, are thought to have been emplaced by rapidly upwelling fluids relatively late in the mineralization sequence of the deposit. Lovely vivianite crystals up to 10 centimeters (4 in) in size were found, with discoveries reported in the 1980s, 1990s, 2000, and 2010. Some crystals are bent or curved, forming unique specimens. Sprays of smaller crystals on matrix are usually dark blue to black, probably due to deprotonation (the loss of a hydrogen ion (H^+)).

Vivianite spray, Huanani Mine, Oruru, Bolivia. Source: Mindat; photo: Manfred Kampf.

Tin mining began at Morococala in Bolivia in the late 1800s, with the latest phase of mining suspended in

Vivianite, Morococala Mine, Oruru, Bolivia. Source: Mindat; photo: Rob Lavinsky.

2022. Silver, copper, zinc, and lead were produced from Morococala Mine ores. Stunning vivianite crystals were found in this mine from 1981 to 1992. Most came from a room-sized pocket that was subsequently destroyed by the mine manager because the miners were too distracted by extracting vivianite to do their actual jobs. Brian Kosnar, a respected collector, states that plates and single crystals of vivianite up to 60 centimeters (24 in) in size were produced. Although many mineral species are reported from the Morococala Mine, Mindat shows only two images of any mineral other than vivianite. Single crystals, sheafs or crystal sprays, and matrix specimens from this bonanza vary in size; spectacular specimens of all sizes were found, with the possible exception of micros.

The Poopó area in Bolivia was a source of vivianite crystals in the early 1970s. Translucent green crystals up to about 5 centimeters (2 in) in size graced the collections of well-known U.S. collectors of that era. Poopó is a town with tin-rich polymetallic mineral deposits to the north and south. These deposits were mined for diverse metals, possibly since the Incan Empire. The mines exploit a vein system in a major regional fault zone. It could not be determined from which mine or mines the vivianite specimens were extracted.

The Siglo Veinte Mine (20th Century Mine) near Llallagua was another Bolivian tin mine that produced gorgeous vivianite specimens. Translucent green vivianite crystals perch on contrasting yellow-orange limonite, with some single and matrix-free crystals. Limonite forms pseudomorphs after wavellite, giving additionally aesthetic contrast between the sharp vivianite crystals and the botryoidal limonite. Rare Siglo Veinte vivianite crystals show growth changes that look like waves or ripples, where the crystal lattice was dislocated. The largest vivianite crystal seems to be about 8 centimeters (3 in) in size, but most specimens have 2- to 4-centimeter (0.8- to 1-in) crystals. Most vivianite specimens date to the mid-1985s, which was evidently a boom time for Bolivian vivianite.

The Wheal Kine Mine is the type locality of vivianite (the source of the originally described specimens). It is part of the Polberro Mines in the St. Agnes District of Cornwall, England. The mines have been closed for more than a century. Vivianite from the locality is not attractive but would interest Cornwall or type-locality collectors.

Vivianite on botryoidal limonite, Siglo Veinte Mine, Potosí, Bolivia. Source: Mindat; photo: Rob Lavinsky.

Ukraine has been in the news, and Crimea has been a sad part of that news. Vivianite specimens from Crimea occur in fossil bivalves and other shells. Spiky lathes of vivianite crystals fill shell cavities and occasionally replace the shells, rather like the opalescent transformation of some ammonites. Crystals up to about 3 centimeters (1.2 in) in size were found, though micromounters too might want specimens from this locality. The vivianite is usually dark blue-black, probably altered due to exposure to light. Vivianite was found in iron-phosphate deposits, which were still being mined in 2019, although the vivianite site was apparently eliminated decades ago. Most specimens were extracted in the 1990s.

Lovely vivianite crystals were found at the Trepča complex in Kosovo, particularly at the Stan Terg (mine). Metamorphosed Upper Triassic limestone hosts a lead-zinc-silver deposit. Although mining began on this deposit in the Middle Ages and the mine was flooded during the 1998-99 war, it was reopened in 2005. Curved vivianite crystals were recovered from this locality, along with short and stout crystals, sprays of thinner crystals, and crystals up to 10 centimeters (4 in) long. Crystals on matrix can be attractively offset by arsenopyrite, sphalerite, or siderite. Specimens were extracted prior to 2003, with some coming out decades earlier; some were also found in 2006. The 2006 discoveries came from lower levels of the mine. Perhaps new pockets will be encountered in the future.

Vivianite ball from a lignite deposit, Wetteraukreis, Darmstadt, Germany. Source: Mindat; photo: Manfred Kampf.

Vivianite in fossil shell, Kerch Peninsula, Crimea, Ukraine. Source: Mindat; photo: Rob Lavinsky.

Unusual rosettes and balls of vivianite crystals have been found in German lignite deposits in Hesse. The crystals form thin blades, with some specimens having multiple balls. Unlike vivianite nodules in which the extremely thin crystals radiate from a center, the German specimens show small numbers of parallel crystal blades adjacent to another small group of crystals with a different orientation, like a monkey's fist knot. Green when extracted, the crystals turn blue or black when exposed to light and air. Most specimens shown on Mindat were collected in the late 1970s. Very different from the rosettes, euhedral vivianite crystals suitable as micromounts were infrequently found in the Hagendorf South Pegmatite in Bavaria.

Romanian vivianite crystals from the Rosia Poieni Mine can be lustrous, translucent, and emerald green. A fine, terminated, 10-centimeter (4-in) specimen might be the largest from this find, although beautiful smaller crystals were also found, able to delight macro and micro collectors alike. Copper and other minerals are still being mined. Poorly handled discharge of mine tailings has destroyed nearby towns.

Micromounters might want to be aware of vivianite crystals in a wide range of colors from the Brunita Mine near Cartagena, Spain. Though the mine is now flooded, new deposits might be are forming. Wikipedia, citing a book in Spanish, states that crystals up to 5 centimeters (2 in) in size occurred at the Brunita

Local miners excavating huge vivianite specimens from the Aloua swamps in Cameroon. Photo: Unknown.

Mine. I could not confirm the existence of these relatively large crystals.

Cameroon is seldom mentioned in these columns. Vivianite occurs in argillaceous shales in a swampy area on the shores of Lac Bini, northwest of Ngaoundéré. Single crystals grew to huge lengths—up to 1.35 *meters* (4.4 ft), with crystal aggregates reportedly more than 4.5 *meters* (14.8 ft) in size! Crystal forms vary from perfect and translucent green, to club shaped, to looking like a feather or single-bladed knife. Most of the specimens shown on Mindat are not the most aesthetic vivianite specimens I've seen, though the size of many of them is astounding, especially from a locality that I'd never known existed. Original discoveries were in the 1920s. Extraction seems to have been intermittent, with another burst of activity in the 1960s-70s. Some vivianite crystals from Cameroon seem to be fragile, possibly becoming friable over time and with exposure to light and air, though others have been exhibited in European museums for decades.

In Japan, vivianite nodules were found on the island of Hima. Rare euhedral crystals, from micros to 3.25 centimeters (1.30 in) in size, came from the former Ashio Mine. In 1999, scientists from the Geological Survey of Japan reported thin tabular vivianite crystals reaching 10 centimeters (4 in) in size "intimately associated with pyrite" from Nagasawa. The authors suggest that the decomposition of graphite and pyrrhotite provided the iron for the vivianite formation. From the English abstract of their paper (which was

Huge vivianite specimen from Aloua, Cameroon, on display at MINES ParisTech, Paris, France.
Source: Mineral&Exploration.

in Japanese), and I could not readily find any additional information on this intriguing occurrence.

Vivianite has been found in Australia and New Zealand but not in spectacular crystals. Vivianite nodules at Demon's Bluff, near Anglesea, Victoria, Australia, come from offshore marine deposits. Crusts, sprays, translucent tiny crystals, and massive forms of vivianite are found, including some specimens filling fossils or as casts of fossil sea life burrows. In New Zealand, vivianite is reported as nodules in clays. The nodules are described as "coprolite-like," with radiating thin blades of vivianite. Distinct crystals were seen in some specimens under magnification. A technical article reported vivianite in several New Zealand localities, though the nodules and concretions there are unlikely to interest mineral collectors.

Vivianite is found in many places of no interest to collectors of crystalized specimens. This article does not account for all of Earth's vivianite occurrences. I have tried to provide some information on the localities of most importance to mineral collectors.

Vivianite forms readily in bogs and other damp environments with little oxygen or sulfur, where phosphate is chemically available, including from the phosphorus in human bones. Some archeological sites have objects with vivianite forming on artifacts. Your macabre trivia for today is that vivianite has formed in human corpses, including Ötzi, the ancient, mummified body originally encased in ice in the Alps; an 18th-century Swiss drowning victim; and even U.S. airmen downed and lost for years in Vietnam.

An interesting article was written about vivianite's use as a color pigment. Although collectors prize its stunning translucent crystals, the vivianite in bogs is useful as a source of pigment. The Māori people in what is now New Zealand used vivianite as a pigment before European contact. Vivianite was extracted by Yup'ik (Alaska Natives) who used it to paint masks. The source was high on cliffs on Nelson Island. The mining method was sometimes using shotguns to bring the vivianite down without the risk of falling from the cliffs. Vivianite is a relatively soft mineral, easy to crush into a powder, and vivianite pigment is currently available to artists and others.

Vivianite is soft and cleaves easily, as well as darkening in light, so it is not suitable as a gemstone. A few pieces have been cut, probably just to show that it could be done.

Virginia vivianite specimens were selling for about $35 or more on Etsy and eBay, with a thin 9.5-centimeter (3.7-in) "bowtie" of relatively lustrous crystals offered for $600 by a major dealer. Crimean vivianite specimens were offered for $45 up to about $300, with the same location shown as Russia or Ukraine, depending on seller. An 11-centimeter (4.3-in) specimen (with a 10-centimeter (3.9-in) crystal) from Romania was priced at about $880. A beautiful blue 2.9-centimeter (1.1-in) single crystal from Idaho's Blackbird Mine was selling on eBay for $120. A 7.9-centimeter (3.1-in) specimen from Cameroon that looked like a piece of coal was available on eBay for $28. A 14.9-centimeter (5.9-in) specimen was posted on a French dealer's site for 1,200 euros. Prices were found online in mid-March 2023.

Technical Details

Chemical formula ..... $Fe_3(PO_4)_2.8H_2O$ or $Fe^{2+}{}_3(PO_4)_2 \cdot 8H_2O$
Crystal form ..... Monoclinic
Hardness 1.5-2

Vivianite, Clear Springs Mine, Polk County, FL. Source: Mindat; photo: Rob Lavinsky.

Specific gravity 2.67-2.69
Color ..... Strongly pleochroic—blue in 1 direction; green at 90 degrees; often colorless and transparent when freshly unearthed; black when oxidized
Streak ..... Colorless to blue white, quickly altering to brown or dark blue
Cleavage ..... 1 perfect
Fracture ..... Splinters, fibrous
Luster ..... Vitreous, pearly

Acknowledgments

Many people contributed the information and photo permissions that made this article possible. Vivianite is a beautiful mineral, and I kept finding more photos of spectacular crystals and more localities to explore. More than most columns, this one has led to interesting correspondence, including reconnecting with a

geologist whom I knew decades ago. He doesn't collect minerals, although he wrote an excellent article—thanks, Vic Ridgley! Thanks also to editor Hutch Brown for helping to make this more readable!

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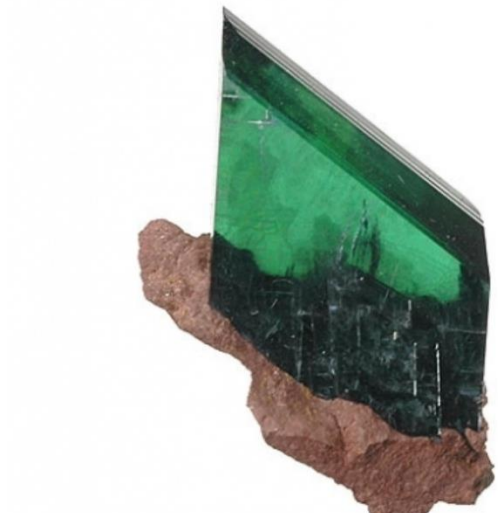


Vivianite, Tomokoni Mine, Potosí, Bolivia. Source: Mindat; photos: Rob Lavinsky.

April 3 Program

Pugh Quarry, Ohio

Jamison K. Brizendine

Our April program will be presented by Jamison Kilby Brizendine of the Micromineral Club of Cleveland (Ohio). He'll be speaking about the Pugh Quarry in Wood County, OH, a well-known mineral locality. Jamison has an impressive collection of minerals from a former member of our club, Clarence Domire. Clarence was active in the NVMC, the Micromineralogists of the National Capital Area, and the American Federation of Mineralogical Societies. We look forward to welcoming a fellow collector from another club—this is an example of technology bringing us new opportunities. Please join us on April 3.

Atlantic Micromounter's Conference

June 3, 10:30 a.m.-3:30 p.m.
(see website for more info)

Location: James Madison University in Harrisonburg, VA

Presentation: Dr. Elizabeth Johnson, professor and curator, will talk about the Phil Cosminsky and Fred Keidel micromount collections

Activities: Visiting the James Madison Mineral Museum; micromount trading and giveaways

Attendance: Limited to 50 people; no conference fee

Signing up: Notify Michael Pabst at michaeljpabst@yahoo.co

President's Collected Thoughts

by Jason Zeibel

Happy springtime NVMC! We had a great in-person meeting in March, where we all came back together to enjoy bidding on quite a selection of rocks, fossils, and minerals. Almost everything up for auction sold, including many club donations with all proceeds going to benefit the club. If you are a big fan of the rock auctions (as my daughters are), you can look forward to the fall 2023 auction coming up at the September meeting.

The March auction was also our first experience with the new Dunn Loring Fire Station location. We all agreed that it was a nice space with lots of room and convenient facilities. Several new members and visitors came to the auction, and it was great to be able to welcome them. If you know someone interested in rocks and minerals, please invite them to one of our meetings. Similarly, if you have been away for a while due to COVID or something else, please consider coming back to the meetings. The club has a good core of regulars, but we are always looking for new faces and the excitement that comes with them.

The April meeting will be on Monday, April 3, at 7:30 p.m. It will feature a return to Zoom for a presentation because the Dunn Loring site is already booked that week. Then we will plan to return to in-person meetings again on the first Monday in May and June, again at the Dunn Loring Fire Station. If you are reading this in our newsletter and have not already paid your 2023 NVMC dues, please reach out to our treasurer, Roger Haskins, or bring a check to our May meeting (you can find all the information on the last page of this newsletter).

As spring weather starts to bring us outside a bit more, let's start thinking about some good field trip locations. Finding new specimens at rock shows and auctions is nice, but pulling them right out of the ground yourself can be even more gratifying. We will have a short discussion at the April meeting (via Zoom) about field collection sites. The goal is to get a couple collecting trips on the calendar before it gets cold again in the fall.

Happy collecting and remember, you rock!

Jason

We Regret the Fossil Error …

by Joshua Sokol

Editor's note: The article is adapted from the Seattle Times (26 February 2023). Thanks to Sue Marcus for the reference!

At its best, paleontology opens windows into trillions of other lifetimes spent swimming, scuttling, stomping, and soaring across this planet. Scientists, the press, and the public alike tend to tell and retell these success stories, lionizing intrepid researchers. The most impressive specimens are enshrined in museums. But possibly just as important is when scientists get something wrong, badly, and somebody sets the record straight.

Never Mind …

In the last pre-COVID-lockdown days of 2020, for example, Gregory Retallack, a paleontologist from the University of Oregon, and a few colleagues toured a famous set of Indian cave paintings. Afterwards, they announced the discovery of something that previous visitors had overlooked: a 550-million-year-old fossil called *Dickinsonia* from the dawn of animal life.

The dramatic find drew outside scrutiny. Last December, a team led by Joseph Meert, a paleontologist at the University of Florida, studied the same site. "When we found the fossil, some alarm bells went off in my head," Meert said.

First, the specimen looked different than it had in pictures from 2020: Part of it had rubbed off. Second, the team kept noticing giant honeybee nests on the surrounding rocks.

Then it clicked: This wasn't a *Dickinsonia* at all. Neither was it a fossil. The pattern on the cave wall was just a bit of waxy material left behind by a bee nest, the team reported in December, in the same peer-reviewed journal that had vetted the original finding. Another study, recently accepted to the *Journal of the Geological Society of India*, arrived at the same result.

Retallack is now working on a formal correction. "It is rare but essential for scientists to confess mistakes when new evidence is discovered," he wrote to the Florida team, once its researchers contacted him with their new analysis.

Artist's conception of a Megalosaurus.

This discovery-that-wasn't joins a long, ignominious history of paleontological misfires. These range from outright misclassifications to pseudofossils (where a nonbiological process made a pattern that only looks biological) and dubiofossils (weird, ambiguous rocks that are probably not as important as they're cracked up to be).

Each of the examples below is ambiguous in another way, too: as both a scientific failure and a demonstration of how science advances by publicly correcting mistakes.

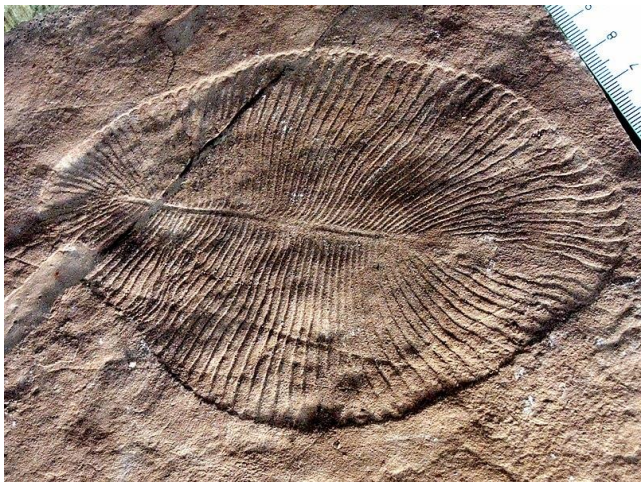
"Scrotum humanum"

In the 1670s, the English chemist Robert Plot made perhaps the first ever scientific illustration of a dinosaur fossil. He suspected that the specimen was part of a femur bone. But it was big—perhaps, Plot reasoned, belonging to a Roman war elephant or a giant human described in the Bible.

Almost a century later, the illustration was reprinted in a natural history volume compiled by a physician, alongside a new, fairly self-explanatory caption that compared it to the dangly bits of an ancient human. But these were no reproductive organs: whereas the specimen itself has been lost, it was in fact part of a femur of a carnivorous dinosaur, maybe Megalosaurus.

A Bad Year for Old Species

In 1981, two different ancient species named by the early 20th-century German paleontologist Baron Friedrich von Huene—mercifully, already deceased at the time—were both shown to be cases of mistaken



Trace fossil of a Dickensonia costata*, a sea animal that lived about 550 million years ago. Source: Wikipedia.*

identity. One supposed mammal tooth was actually a bit of the mineral chalcedony. The other, a dinosaur jaw, turned out to be a chunk of petrified wood that mollusks had burrowed into.

Filler in the Fossil Record

In 1864, Canadian geologists announced the discovery of *Eozoon canadense*, the "dawn animal of Canada," a wavy, striated set of rock patterns they claimed came from the fossilized shells of giant cellular organisms. The find filled a gap in the theory of evolution: until *Eozoon canadense*, there had been no prior fossil evidence for life on Earth before 540 million years ago.

In the following decades, evidence mounted that the patterns were just layered bent rock forged by high temperatures and pressures. Eozoon's proponents never quit arguing that it was a real fossil, but they eventually died. In the meantime, other very old fossils (like real examples of *Dickinsonia*) emerged to fill the gap in the fossil record.

Decapitated Discovery

In 2019, a team announced the discovery of a new Triassic species similar to a horseshoe crab. But the researchers were corrected the following year: what had looked like a separate animal was actually the severed head from a known fossil cicada.

GeoWord of the Day

(from the American Geoscience Institute)

eye agate

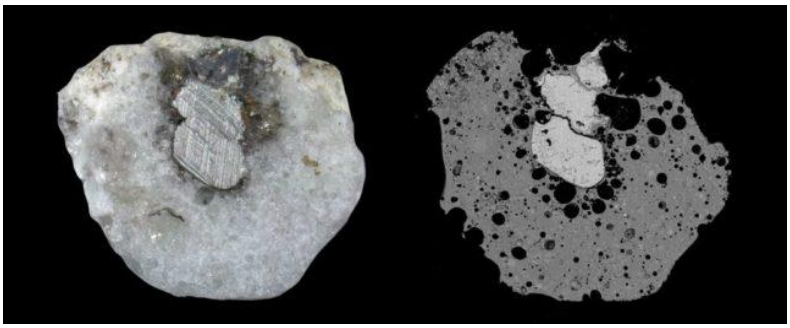
Agate displaying concentric bands, usually of various colors, around a dark center, suggesting an eye. Also called: aleppo stone; eyed agate.

(from the *Glossary of Geology*, 5th edition, revised)

Life on Mars

Differentiating impostor fossils from the real deal can come with much higher stakes. In 1996, scientists proposed that they had found a microfossil in a Martian meteorite. President Bill Clinton even held a news conference discussing the implications of the discovery, footage of which was edited into the 1997 movie *Contact*.

Since then, scientists have documented many chemical and geological processes that can "grow" intricate, tiny structures without any life involved. Some of the oldest claimed fossils on Earth might fall into this category—and similar patterns could show up in the first rocks returned from Mars.



Lightning Strikes Create a Strange Form of Crystal

by Michelle Starr

Editor's note: *The article is adapted from* Nature *(30 January 2023). Thanks to Tom Burke for the reference!*

The violent fingers of electricity that struck a sand dune in Nebraska have left behind a configuration of crystal rarely found in nature.

Inside a piece of fulgurite—"fossilized lightning"—created by a powerful bolt of electricity traveling into and fusing sand, scientists have found a quasicrystal, an arrangement of matter once thought to be impossible.

This discovery suggests that there are previously unknown formation pathways for quasicrystals, opening up new avenues for their synthesis in the laboratory.

"The current investigation was designed to explore a different possible nature-inspired mechanism for generating quasicrystals: electrical discharge," write a team of researchers led by geologist Luca Bindi of the University of Florence in Italy in their paper.

"The discovery of a quasicrystal in a fulgurite with rarely observed 12-fold symmetry and a not-been-reported-previously composition indicates that this approach may also be promising in the laboratory."

Most crystalline solids in nature, from the humble table salt to the toughest diamonds, follow the same pattern: their atoms are arranged in a lattice structure that repeats in three-dimensional space.

Solids that don't have these repeating atomic structures—amorphous solids like glass—are generally an atomic mess, a jumble of atoms mooshed in together with no rhyme or reason.

Quasicrystals break the rule—their atoms are arranged in a pattern, but that pattern does not repeat.

Bench Tip
Spot Sanding Tool

Brad Smith

Sometimes, you have a little discoloration or debris to clean from the bottom of a pocket, from an area of coarse textured surface, or from a small space between two soldered objects. Finding something to get into those close areas is always an effort in creativity.

One tool I have for these special occasions is a glass fiber spot sanding brush. It's great for cleaning a small area and doesn't leave deep scratches, only a faint satin finish.

There are probably several manufacturers of these pens, but one is the PrepPen Adjustable Sanding Pen selling for US$ 10.95 from Amazon.

Smart Solutions for Your Jewelry Making Problems
amazon.com/author/bradfordsmith

When the idea of quasicrystals first emerged in the 1980s, the concept was thought impossible. Solids could be either crystalline or amorphous, not this weird in-between. But then scientists actually found them, in both the laboratory setting and in nature, deep inside meteorites. … *Read more*.

Friends of Minerals Book Project

Editor's note: *Friends of Minerals, Inc., has an active Virginia chapter led by Thomas Hale, who has spoken before our club multiple times. This announcement is from February 1. Thanks to Sue Marcus for the reference!*

Dear friends, members, and affiliates of FM-Virginia,

Our team is excited to announce that we have secured funding for our second book publication, *Mineral Deposits of the Virginia Piedmont* (the working title). If you have collected at, have specimens from, or know any information/stories about the localities in the Piedmont, please let us know! We are in the research and data collection phase and are open to working with collaborators on this book project. A locality list is attached below for your reference. To participate with us on this next project, please email *fmvapublications@gmail.com*.

Famous Piedmont sites:

- Allah Cooper Mine
- Armenius Mine
- Bakers Mountain
- Champion Mine
- Charlotte Court House Amethyst
- Contrary Creek
- Dale Quarry
- Dobbins Prospect
- Dunlap Mine
- George Smith Farm Amethyst
- Goochland Smoky Quartz Crystals
- Harris Mica Mine
- Herbb No. 2 Pegmatite
- High Hill Mine
- Jones Creek Muscovite
- Kidd's Store Rhodonite
- Ligon Mines
- Mitchell Mine
- Morefield Mine
- Morrow Mine
- Nuchols Farm
- Old Sulfur Mine
- Pittsylvania Wayside
- Pontiac Mine
- Powhatan Fair Grounds
- Red House Amethyst
- Ridgeway Mine
- Rutherford Mines 1, 2, 3
- Schaar Farm Amethyst
- Scufflin' Acres Farm
- Simpson Prospect Roanoke
- Simms Center Ridge
- Trueheart Mine
- U.S. Silica Quarry
- Westlake Subdivision
- Willis Mountain
- Wingo Mine

How Zircon Helps Identify Untapped Copper Deposits

Editor's note: *Adapted from Mining.com (28 February 2023). Thanks to Sue Marcus for the reference!*

New research shows that it is possible to mine zircon textures to identify valuable mineral deposits.

In a paper published in the *Journal of Geophysical Research: Solid Earth*, Chetan Nathwani and his colleagues at Imperial College London explain that zircons are common, hardy minerals that can be found in rocks up to 4 billion years old. Their structure and texture can reflect the conditions in which they formed, earning them a reputation as nature's time capsules.

Knowing this, Nathwani and his team developed a method to distinguish minute differences between zircon grains formed in copper-associated rocks and granitic rocks. Their method could help scientists search for mineral deposits and probe the origins of different sediments. … *Read more*.

April 2023—Upcoming Events in Our Area/Region (see details below)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1 April Fool's Day Show, Raleigh, NC
2 Show, Raleigh, NC	3 NVMC mtg	4	5 MSDC mtg	6	7	8 Easter
9	10 GLMSMC mtg	11	12	13	14	15
16	17	18	19	20	21	22 Show, W Friendship, MD
23	24	25	26 MNCA mtg	27	28	29
30						

Event Details

1-2: Raleigh, NC—Annual show; Tar Heel Gem & Mineral Club; Kerr Scott Bldg, NC Fairgrounds, 1025 Blue Ridge Rd; Sat 10-6, Sun 10-5; admission free; info: Cyndy Hummel, 919 779-6220, mchummel@mindspring.com, tarheelclub.org.

3: Arlington, VA—Northern Virginia Mineral Club; info: https://www.novamineralclub.org/.

5: Washington, DC—Mineralogical Society of the District of Columbia; info: http://www.mineralogicalsocietyofdc.org/.

10: Rockville, MD—Gem, Lapidary, and Mineral Society of Montgomery County; info: https://www.glmsmc.com/.

22: West Friendship, MD—Annual show; Chesapeake Gem and Mineral Society; 2210 Fairgrounds Rd; 10-4; admission free; info: Lynne Emery, Chesapeakegemandmineral@gmail.com; www.chesapeakegemandmineral.org.

26: Arlington, VA—Micromineralogists of the National Capital Area; info: http://www.d centimeter-sicrominerals.org/.

THE NORTHERN VIRGINIA MINERAL CLUB INC

Crystals are the flowers of the Mineral Kingdom

2023 Club Officers

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The Northern Virginia Mineral Club

Visitors are always welcome at our club meetings!

PLEASE VISIT OUR WEBSITE AT:
http://www.novamineralclub

Please send your newsletter articles to:
Hutch Brown, editor
4814 3rd Street North
Arlington, VA 22203
hutchbrown41@gmail.com

RENEW YOUR MEMBERSHIP!

SEND YOUR DUES TO:

Roger Haskins, Treasurer, NVMC
4411 Marsala Glen Way, Fairfax, VA 22033-3136

OR

Bring your dues to the next meeting.

Dues: Due by January 1 of each year; $20 individual, $25 family, $6 junior (under 16, sponsored by an adult member).

Club purpose: To encourage interest in and learning about geology, mineralogy, lapidary arts, and related sciences. The club is a member of the Eastern Federation of Mineralogical and Lapidary Societies (EFMLS—at http://www.amfed.org/efmls) and the American Federation of Mineralogical Societies (AFMS—at http://www.amfed.org).

Meetings: At 7:30 p.m. on the fourth Monday of each month (except May and December).* (No meeting in July or August.)

**Changes are announced in the newsletter; we follow the snow schedule of Arlington County schools.*