The Mineral Newsletter

Meeting: October 26 Time: 7:45 p.m.

The meeting will be remote due to the coronavirus pandemic. Details to come.

Rhodochrosite

Sweet Home Mine, Alma District, CO

Source: Wikipedia; photo: Eric Hunt.

Deadline for Submissions

October 20

Please make your submission by the 20th of the month! Submissions received later might go into a later newsletter.

Volume 61, No. 8
October 2020
Explore our website!

October Meeting Program:

Details to come

In this issue …

Mineral of the Month
Rhodochrosite

by Sue Marcus

I had to be reminded that we had not yet explored rhodochrosite as a Mineral of the Month. How could we have ignored such a beautiful mineral for so long!

Rhodochrosite ($MnCO_3$) forms solid solution series with siderite ($FeCO_3$) and calcite ($CaCO_3$). Remember solid solution series? Chemical substitutions can occur incrementally along a spectrum from one mineral species to another, with one element substituting for another.

Manganese provides the color for rhodochrosite and rhodonite ($CaMn_3Mn(Si_5O_{15})$) as well as the inspiration for their names, coming from the Greek words ῥόδος (rhodos) and χρώς (color). German mineralogist Johann Friedrich Ludwig Hausmann created the name in 1813 based on a specimen from Romania. For about three decades, from 1781 to 1813, there was confusion between rhodochrosite (a manganese carbonate) and rhodonite (a manganese silicate). Quantitative analysis in 1800 led to the final distinction and later naming by Hausmann, though what came to be called rhodochrosite had originally been found perhaps as early as 1781 in Europe—or probably earlier by the Incas in Peru. The European material had been described in 1794.

Chemistry and technology have progressed to allow scientists to identify varieties of rhodochrosite; Mindat recognizes five and Minerals.net adds one more, all of which I have listed in the technical details section. Parakutnohorite, a synonym provided by Webmineral.com, is shown as discredited by Mindat.

Arguably, the world's best rhodochrosite comes from Colorado, where silver was the major prize for prospectors and rhodochrosite was a colorful associated mineral. Then the silver petered out and collecting minerals became popular. The mines around Silverton, Leadville, and Ouray produced pretty, light pink, usually rhombohedral rhodochrosite crystals. The Idarado Mine specimens from the Telluride District occur with quartz and may be faintly pink, almost white.

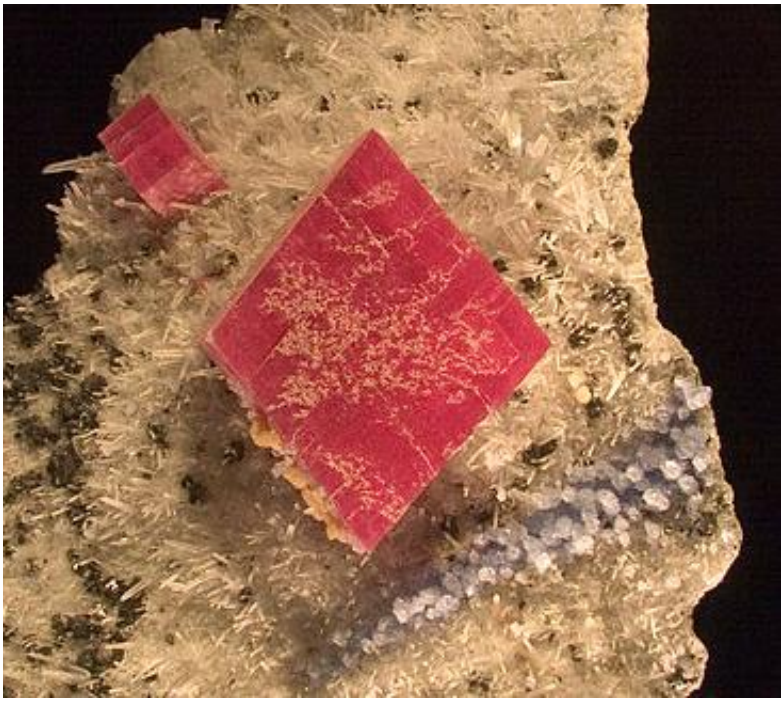
All of these were far surpassed by what has become the world's most productive rhodochrosite specimen producer and the site of the world's best specimens.

Happy Halloween!

Northern Virginia Mineral Club members,

No in-person social events for now!

Rhodochrosite specimens from the Sweet Home Mine (top, Hedgehog Pocket; left, on quartz, Robs Pocket), Alma, Park County, CO. Photos: Bob Cooke.



Alma King Rhodochrosite from the Sweet Home Mine, on display at the Denver Museum of Nature and Science. Source: Wikipedia; photo: Kimon Berlin.

This is the Sweet Home Mine, opened by Bryan and Kathy Lees, owners of the Collector's Edge mineral business (together with their investors), specifically offering rhodochrosite specimens to collectors. The property is only about 90 miles southwest of Denver, though at 11,300–11,600 feet, so mining is seasonal.

Although there was some mining of rhodochrosite in the 1960s—including discovery of the Alma Queen, sporting crystals 10 centimeters across—more consistent mining production under Lees and crew commenced in 1991 and is continuing. The Alma King, coming in at an astounding 15 centimeters across, was found in 1991. It was literally touching both walls of a narrow pocket and is now displayed at the Denver Museum of Nature and Science. That museum also hosts an "artfully reconstructed" depiction of part of the mine called the "Denver Wall of Rhodochrosite" or the "Crystal Wall," showing hundreds of bright red rhodochrosite crystals. This display is not an exact replica of part of the mine; instead, it exhibits real slabs of rhodochrosite-crystal-studded rock, pieced together as if in a single huge pocket.

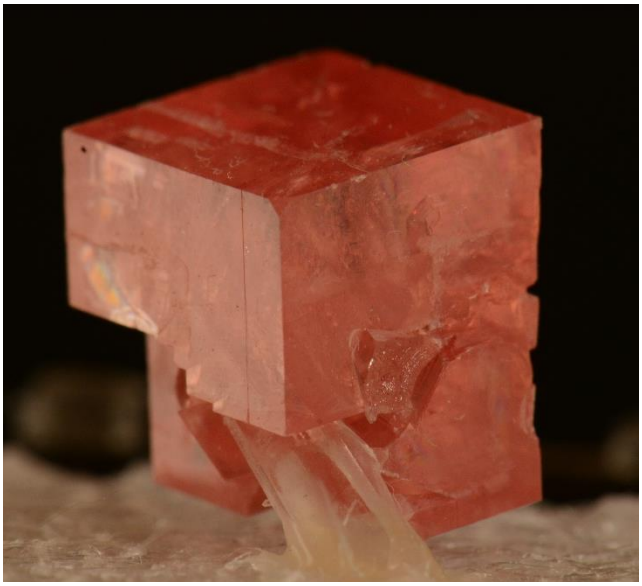
The Sweet Home Mine was closed and sealed in 2004 after the Lees and their associates decided that further exploration was unlikely to find more specimen material of any sort. This mine was truly planned, developed, explored, and managed with the intention of producing mineral specimens. It was highly unusual because it was done very professionally, with modern exploration and safety techniques—usually.

I added that last because, while reading about one of the major discoveries there, I learned that the discovery occurred when a geologist tapped his rock hammer on the ceiling! See the Collector's Edge link in the sources section for more details.

The Alma deposits are hydrothermal, caused by hot fluids probably related to the emplacement of plutonic (granitic) rocks. Mineralization was introduced by these fluids along preexisting faults and other structures.

Sweet Home is such an amazing place that too many reports have been written about it to include them all. *The Mineralogical Record* published a special edition dedicated to the mine in 1998 (listed in the sources below).

The Sweet Home Mine now has a sibling, the Detroit City Mine, an adit (an opening that is roughly horizontal, as opposed to a shaft) about 200 feet above the Sweet Home deposits. The Detroit City Mine began producing specimens in 2018. These are somewhat pinker crystals, with less vibrancy than specimens from the Sweet Home Mine—though still beautiful and expensive.



Rhodochrosite, Sweet Home Mine (Corner Pocket), Alma, Park County, CO. Photo: Bob Cooke.

Rhodochrosite, Hotazel Mine, Kalahari manganese field, South Africa. Photo: Bob Cooke.

Rhodochrosite with quartz, Pasto Bueno, Peru. Photo: Bob Cooke.

Another source of stunning (and expensive) rhodochrosite is the Kalahari manganese field in South Africa. Hotazel and the N'Chwaning Mines have produced transparent, gemmy scalenohedral specimens (pointy rather than the lopsided rhombs typical of Colorado). These are usually small clusters or single crystals, with specimens seldom more than 5 centimeters long and individual crystals rarely more than 4 centimeters long. Other crystal forms have also been found there, though less frequently. Colors vary from cherry to deep wine red, pink, and orange-red.

From (sad) experience, I can confirm that the rhodos are easily cleaved—and two specimens are not worth more than one! Anyone wanting eye candy should look at the Mindat images from the N'Chwaning Mines. The N'Chwaning deposits formed from hydrothermal fluids that metamorphosed the country rock, altering it through concentrations of manganese, calcium, and other minerals.

Peru is another source of rhodochrosite. Pasto Bueno has specimens up to about 14 centimeters in size sporting light to dark pink rhombohedrons with quartz crystals. Another noted Peruvian source is the Uchucchacua mine. If you see pink to red, transparent scalenohedral rhodochrosite crystals on matrix for sale from Peru, they are probably from this locality, although it has also produced other crystal forms of rhodochrosite. Other Peruvian localities were or are specimen producers as well.

A relatively new source of rhodochrosite is the Wutong Mine, Guangxi Zhuang Autonomous Region, China. Pink, sometimes bladed rosettes of rhodochrosite are the most aesthetically pleasing to me, though others might prefer slightly darker rhombs. Most of what I have seen is translucent to opaque, and a lot of what is for sale seems to be cleavages.

The Wolf Mine in Herdorf, Germany, is another noted rhodochrosite locality. Mining started in 1870; after interruptions, it finally ended in 1962. The aggregates of small salmon to raspberry-colored crystals are probably Europe's finest for the species. Since they were never plentiful and the mine is closed, they are sought after. Although other minerals were extracted later, early Celts initially mined the iron in the deposits here. Iron ore, a mix of siderite and limonite, formed from hydrothermal fluids driven from distant basaltic intrusions that coursed through Devonian sedimentary rocks.

Rhodochrosite is composed of common elements, so it is a relatively common mineral, although beautiful crystals are unusual. Along with the localities already described, rhodochrosite is found elsewhere, though not as abundantly or in as exquisite crystals.

Rhodochrosite, Wolf Mine, Herdorf, Germany. Photo: Bob Cooke.

Rhodochrosite, Mont Saint-Hilaire, Quebec, Canada. Photo: Bob Cooke.

In Mexico, specimen localities include Santa Eulalia (which also produces crystals of numerous other minerals); Cananea, Sonora; and the Los Remedios Mine, Guerrero. Triangular and twinned triangular crystals were found in the 1980s at the famous Poudrette quarry in Mont Saint-Hilaire, Quebec. These and other forms of rhodochrosite, including pseudomorphs after serandite, were uncommon; but fine, unusual specimens make this location worth mentioning.

Gabon, though a major source of manganese, has not been a significant source of rhodochrosite specimens. Lovely transparent scalenohedral crystals reminiscent of the South African ones from the Kalahari fields, though usually smaller, came from the Moanda Mine from the 1960s into the 1980s, though never in great numbers.

A unique type of rhodochrosite formation occurs in the Argentinian Capillitas mining district, where water coursing through manganese-rich host rocks became chemically infused and formed stalactites and stalagmites. The slow building of the layers of rhodochrosite, with slight variability in the water chemistry, resulted in the lovely banding we see today when the formations are cut, slabbed, and used for jewelry and decorative items. These ancient deposits, probably initially worked by the Incas for silver nearby, led Argentina to name rhodochrosite as its national gemstone.

Another unique form of rhodochrosite occurs in Archean stromatolite fossils in Western Australia. Manganese in a reducing (anerobic) environment contrib-

Rhodochrosite on display at the Museum of Natural Sciences, La Plata, Argentina. Source: Wikipedia; photo: Javier Conles.

Rhodochrosite, Santa Eulalia, Chihuahua, Mexico. Photo: Bob Cooke.

uted to the precipitation of rhodochrosite particles as an unusual biomineral. It's probably not what most collectors dream of, but it's important scientifically because its origin helps explain part of Earth's early history.

Collectors beware—well, sort of. Certain species of fungi can dissolve and break down rhodochrosite. I don't think most of us need be too concerned, but I found a paper on *Ascomycete*, a phylum of fungi that I did not trace any further. I also found that other fungi can cause the precipitation of rhodochrosite in leaf litter (forest debris) north of Rome. It isn't stellar rhodochrosite but rather another biomineral novelty.

Banded Argentinian rhodochrosite is the form most often seen in cabochons. It is also carved into animals and other small statutes or as part of the lovely Peruvian bird figurines. Transparent rhodochrosite may be faceted, but considering the hardness (3.5 to 4) and excellent cleavage, it is difficult to cut and not durable to wear. Faceted rhodochrosite is best suited to showing off as a novelty rather than as a wearable gemstone.

Rhodochrosite is available to collectors at less than $10 (without shipping)—or, if you have the funds, at seven-figure prices. At the higher end, you have to ask the price—and I haven't. I did see a South African specimen offered online in September 2020 for $35,000.

Manganese is used in steel production to remove sulfur from iron ore and as an alloy in the final products. The United States does not produce any manganese. Our primary import sources are Gabon and South Africa. Rhodochrosite is a primary manganese ore; unlike the pink manganese silicate (rhodonite), rhodochrosite is much simpler to process since it is a carbonate and breaks down easily—and cheaply.

Characteristics

Chemical formula ..... $MnCO_3$, with Fe, Mg, and Ca able to substitute for Mn in part of the crystal lattice

Crystal form ..... Trigonal

Hardness 3.5–4

Density ..... 3.45–3.70 g/cm^3 (measured)

Color ..... Red, pink, sometimes banded pink and white; color can be more brown or gray if more Fe or less MN are present

Streak ..... White

Cleavage ..... Three perfect cleavages; cleaves easily

Fracture ..... Irregular, conchoidal

Luster ..... Vitreous, sometimes pearly on cleavages

Varieties ..... Capillitite, cobalt-bearing

Rhodochrosite, Mont Saint-Hilaire, Quebec, Canada. Photo: Bob Cooke.

rhodochrosite, ponite, sphaerodialogite, zincorhodochrosite, rosinca

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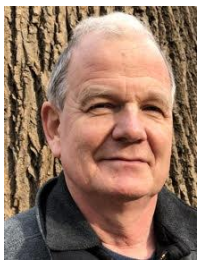
Rhodochrosite, Moanda Mine, Gabon. Photo: Bob Cooke.



President's Collected Thoughts

by Tom Burke, President

Thanks again to all who have been participating in our online meetings!

The next Zoom meeting will be on Monday, October 26, at 7:30 p.m. I will send out the details as that date approaches. We had hoped to have the club's annual auction during that meeting, but alas we haven't yet found a simple enough mechanism for making it work. We haven't completely given up on the idea, but it may be a while before we can pull it off.

Sorry to keep harping on this subject, but we really, *really* need to have a volunteer for the position of club president for 2021. Seriously, folks, the club is just going to die if we can't keep the leadership posts filled. If you benefit from being a member of NVMC, then *please* contribute to its continued success. If you are willing to stand for election, then please send your name ASAP to me at president@novamineral.club.

Tom

Meeting Minutes
September 28, 2020

by David MacLean, Secretary

President Tom Burke called the Zoom meeting to order at 7:30 p.m. There were no minutes of Zoom meetings during summer 2020 and no meetings at all from February to June due to lockdowns in response to COVID-19. The July 2020 Zoom meeting was a "show and tell" of mineral specimens in members' collections.

New Business

Past NVMC meetings in September were always devoted to the fall club auction of minerals and other items sold by members. This year, due to the restrictions associated with a remote meeting, there was no auction. However, the attendees discussed how the NVMC might conduct future remote auctions by videoconference. People could photograph items for sale by cell phone and send the photos to the club president to post for viewing by Zoom. Holding sale items up in front of a computer camera might make it difficult for bidders to see them well. Logistical issues include documenting items sold and to whom, receiving payments (perhaps via Paypal), transmitting payments to sellers, and delivering items sold or arranging pickups from sellers' homes. There was discussion of whether the NVMC might waive the 15-percent commission on sales. It was decided that the club might conduct a trial remote auction at the November meeting.

The Walter Cox estate has three items: a belt sander with lapidary belts; casting equipment; and a Shinline lathe and milling machine lacking some parts, such as cutting heads available for about $75 on the Shinline website.

Several people reported having seen successful slide presentations on Zoom.

At the November club meeting, the 2021 nominees for president, vice president, secretary, and treasurer will be presented. The election will follow at the December meeting. The current club vice president, secretary, and treasurer offered to serve again in 2021, if elected. Anyone willing to stand for any of our club offices should let President Tom Burke know.

Announcements

The Denver mineral show in September 2021 will be in person, according to plans. The New Jersey show on 30 September–4 October, 2021, will be at the Edison, NJ, convention center.

Members gave updates on various collecting sites and mines, including the Sweet Home Mine and other sources of rhodochrosite in Colorado. The mine near Amelia, VA, recently still open for collecting amazonite and other minerals, is closed and up for sale. The White Pine copper mine near White Pine, MI, closed in 1996, is rumored to have reopening intentions.

Nominations for the 2021 Club Officer Elections

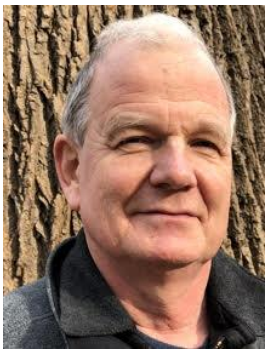
by Tom Burke, President

At the December club meeting, we will elect club officers for 2020. I will be stepping down as club president.

We have many club officers (see the list on the last page of this newsletter), but only four positions are elected each year:

- The ***president*** presides over club meetings and helps to coordinate club activities ranging from auctions and the annual club show to field trips and the club newsletter.
- The ***vice president*** assists the president and coordinates programs and speakers for the monthly club meetings.
- The ***secretary*** takes minutes at club meetings for the club newsletter and summarizes presentations at club meetings, again for the newsletter.
- The ***treasurer*** collects club dues, keeps records of club members, and handles all club financial transactions.

We need volunteers for each of these four positions, and if you nominate yourself, that counts. Fresh ideas from newer members and the experience of valued longer term members are all welcome in officer positions for the leadership we will need in the future. Former club officers are willing to mentor new officers as needed. Please send your nomination(s) to me, Tom Burke.



Member Profile

How I Became Interested in Rocks

by Tom Burke

Editor's note: *All of us have a backstory, so why not share a few paragraphs (up to 500 words or so)? A photo of you would be nice too! Just send your contribution to editor@novamineral.club.*

My wife Julia and I joined the NVMC at the January 2019 meeting after being inspired by buying way too much random stuff at the GLMSMC auction that month.

Before that, I hadn't taken collecting more seriously than picking up random shiny things since my high school days, when I used to follow Sue Marcus around on her collecting expeditions and marvel at the fact that her parents' house didn't collapse under the weight of all the rocks that the three of them had crammed into it.

Speaking of which, can anyone identify the people in the photo below? Year?

New Study Finds Cannibalism in Predatory Dinosaurs

by the University of Tennessee at Knoxville

Editor's note: *The article is from* EurekAlert! *(May 28, 2020). Thanks to Sue Marcus for the reference!*

Big theropod dinosaurs ate pretty much everything, including each other, according to a new study published last month in the journal *PLOS ONE*.

"Scavenging, and even cannibalism, is pretty common among modern predators," said lead author Stephanie Drumheller, a paleontologist in the University of Tennessee's Department of Earth and Planetary Sciences. "Big theropods, like Allosaurus, probably weren't particularly picky eaters if it meant they got a free meal." … *Read more*.

Bench Tip
Dividers

Brad Smith

I find a set of dividers useful in laying out the geometry of a piece I'm making. The set has two needle-like tips, with an adjustment to set the spacing between them.

The dividers can be used to transfer a measurement. Let's say you need a 7-millimeter-wide strip of sheet metal. Set the spacing between the divider tips to 7 millimeters on the ruler. Then lay the sheet on the bench, put one tip against the edge, and run the dividers down the edge, scribing a line parallel to the edge.

Dividers can be used to mark equal segments of a line or arc. For instance, assume a line between A and B that might be straight or curved, and you want to divide it into 5 equal lengths. Set the dividers to an estimate of the distance. Starting at point A, use the dividers to mark off five lengths along the line. If you end up short of point B, lengthen the distance between the dividers. If you end up overshooting point B, shorten the length of your dividers. After a few tries, the length on the dividers will be the exact distance you need.

Dividers can let you quickly find the center of a circular disk. With one tip of the dividers at the edge of the disk, set the other tip to an estimate of where the center might be. Fix one tip of the dividers at the 3 o'clock position, and scribe an arc with the other tip near the center. Do this again from the 6 o'clock, 9 o'clock, and 12 o'clock positions. The arcs at the center will form a small four-sided box, and the center of the box is at the center of the disk.

See Brad's jewelry books at
amazon.com/author/bradfordsmith

Meteorite Impact Craters (Astroblemes) in the United States

by Bill Beiriger (Gem and Mineral Society of Livermore, CA) (original contribution)

An astrobleme (from Greek *astron* and *blema*, meaning "star wound") is the remains of an ancient meteorite impact on the Earth's surface. It is generally in the form of a circular depression lined with crushed and deformed bedrock, fused silica glass, and meteorite fragments. The designation is made mainly based on the presence of subsurface shock structures known as shatter cones and fallback breccia.

The United States has about 30 confirmed impact craters and another 13 unconfirmed craters. Most people interested in geology or astronomy know about the **Meteor Crater** near Winslow, AZ, also known as the Barringer Crater. With a diameter of 0.74 miles, the crater was formed about 50,000 years ago. It is easily accessible and has been well studied.

The largest impact crater in the United States is the **Chesapeake Bay Crater**, with a diameter of 56 miles. The crater was formed about 35.5 million years ago. It is hard to study because it is totally submerged in Chesapeake Bay. The object that formed it is buried many miles beneath the water.

The **Beaverhead Crater** is located between Dell, MT, and Leadore, ID, with the impact site in Montana. A little over 37 miles in diameter, the impact crater formed about 600 million years ago.

Then there is the **Manson Crater** in Manson, IA. It is about 74 million years old and has a diameter of 22 miles. It is located in the middle of agricultural land and is not recognizable because the land underwent several advances and retreats of glaciers during the Ice Ages and has since been farmed. What is interesting about this impact crater is the "resurgent cone" and a "crater moat," making it look a like a volcano (fig. 1).

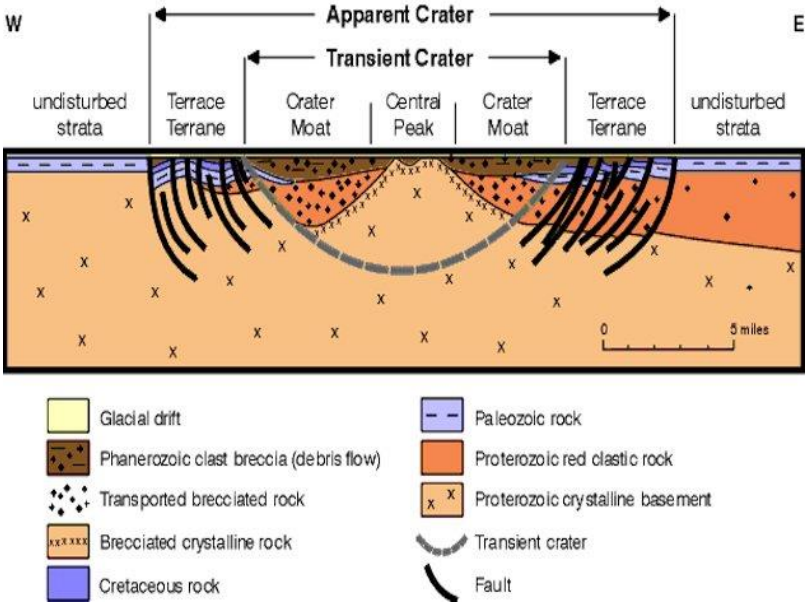


Figure 1—*Structure of the Manson Crater, an impact crater near Manson, IA. Source: Charles O'Dale, Ottawa, Canada.*

Ames, OK, is the location of the **Ames Crater**, one of a series of craters associated with the production of oil and gas; the other three are located in the north-central United States. The Ames Crater is 10 miles in diameter and about 470 million years old. The impact shattered the deep rocks, making oil and gas available to drills deep in the Earth around the impact site. Since 1991, more then 17 million barrels of oil and more then 79 billion cubic feet of natural gas have been produced. The impact site was discovered as an anomaly in seismic patterns during a search for oil.

The **Sierra Madera Astrobleme** is one of five impact sites that are about 6 to 8 miles across and 58 million to 200 million years old. The site is Sierra Madera Mountain in Texas, 25 miles south of Fort Stockton. The impact site is very easy to see because it looks like a small mountain, almost 800 feet above the surrounding land. The rocks in this impact site are Permian limestone. The other four impact sites in the group are in Kentland, IN; Avak, AK; Wells Creek, TN; and Marquez, TX. The Avak and Marquez impact sites were recognized during subsurface geologic studies in search of gas and oil. The Wells Creek site

The Meteor Crater in Arizona.

View from the west of the Sierra Madera impact crater site.

has a well-defined uplifted area. The Kentland site is in a limestone quarry; much of the limestone has been removed for commercial use, exposing the impact zone.

The last site I will discuss is from Haviland, KS—the Haviland Crater, alsoo called the **Brenham Crater**. The crater is only 50 feet in diameter and only about 1,000 years old, although some date it at about 20,000 years ago. The meteorite responsible for this crater is classified as a pallasite; about 15,000 pounds of the meteorite have been recovered. Pallasite meteorites are composed of nickel, with olivine crystal inclusions (fig. 2).

I have only given basic information on 11 of the 30 impact sites confirmed in the United States. You can find more information for North America by clicking here or by googling List of Impact Craters in North America.

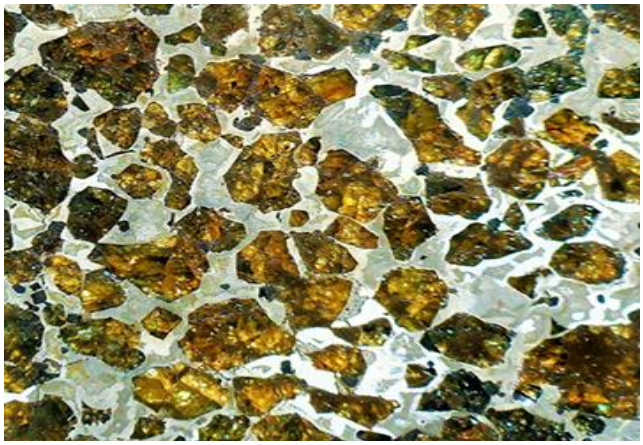


Figure 2—*Cross-section of a pallasite meteorite, made up of nickel with olivine crystal inclusions.*

Safety Matters
Top of the List

by Ellery Borow, AFMS Safety Chair

Editor's note: *The article is adapted from* EFMLS Newsletter *(February 2020), pp. 5–6.*

Lists. Lists often have tops and bottoms. Generally speaking, the top-of-the-list items are more likely to be accomplished, whereas the bottom-of-the-list items—well, they may be lucky to be done at all.

Our hobby is rife with lists, lists with tops and bottoms. The question is, where do items regarding safety appear on our lists? Does safety appear on our lists at all?

There are those who put safety first and foremost in all things. They don't put safety on their lists because, well, safety is automatic and so ingrained, so natural, that it is not listed. The case to be made here is about the wisdom of keeping safety, your safety, show safety, public safety, equipment safety, and so on at or near the top of your list.

The model for keeping safety first is instruction manuals. Glance at any instruction manual and you will note that safety guidelines and procedures usually appear on top, right in the front of the manual.

However, people don't come with manuals, so we make our own. Same is true for our hobby. There are no universal safety lists in our hobby, so we generally make our own for each activity. We therefore have a choice of where to include safety.

The guidelines in instruction manuals mention safety first. Manuals have been thoughtfully constructed, which seems a good reason for putting safety first on most of our hobby-related lists.

Other reasons for putting safety near the top of your list:

- putting safety first is often easier than trying to fit it in later;
- putting safety first can often be far less expensive in the long run;
- putting safety first can build confidence that later things will go well;

- putting safety first can reassure our insurers;
- putting safety first can make what we do better;
- putting safety first shows that you care about yourself, your family, your neighbors, and others;
- putting safety first makes safety more automatic; and
- putting safety first with make you and the whole hobby safer.

Please, when making your lists, consider putting safety first. Your safety matters.

Field Trip Opportunity

Northern Virginia Community College Geology Field Trips

NOVA's Annandale campus offers 1-day weekend courses—essentially, field trips—related to our hobby. You can get more information on each of the field trips listed below at the Field Studies in Geology—GOL 135 website.

Geology of Holmes Run Gorge

November 9, 9 a.m.–5 p.m. Holmes Run Gorge is a canyonlike area less than 2 miles from NOVA in Alexandria. Our instructional day will consist of a 4-hour class at the college, followed by a 4-hour geologic tour of the gorge. Then you will have 10 days to complete a set of related online assignments.

GeoWord of the Day

(from the American Geoscience Institute)

whistling sand

A sounding sand, often found on a beach, that gives off a high-pitched note when stepped on or struck with the hand. The sound apparently results from the translation of grain over grain. *Syn:* squeaking sand; musical sand.

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

Discover the Fun of Backyard Geology

by Hermann Samano

Editor's note: *The author asked us to run the piece, dated 2 September 2020, in our newsletter.*

When you're teaching your kids about the big wide world, why not start in your own backyard? Give them a shovel and turn them loose on the path to learning firsthand about our planet's rocks and minerals through your own backyard geology.

Rocks and stones are solids naturally made from minerals. Becoming a rockfinder—or a rockhound, as some call it—is a cool way to spend time and learn about how rocks are formed.

When you introduce your kids to geological exploration, it's quite possible that this up-close, hands-in-the-dirt, real-life learning can spark a lifelong interest in science and geology. Your kids can hunt for and examine rocks and discover how and when those rocks or minerals formed on Earth. Kids—and adults—can uncover facts about their own local geology and then branch out to other cities, states, countries, and continents. Pretty much wherever you go, you can find rocks.

We'll show you easy-to-use tools and methods for finding and identifying different types of rocks and minerals. You don't have to be an expert, and this may become a great hobby and bonding experience for your whole family. *Read more*.

AFMS Code of Ethics

A large measure of the enjoyment of our hobby consists of collecting in the field. For that reason, the members are proud to endorse the following:

1. I will respect both private and public property and will do no collecting on privately owned land without permission from the owner.
2. I will keep informed of all laws, regulations, or rules governing collecting on public lands and will observe them.
3. I will, to the best of my ability, ascertain the boundary lines of property on which I plan to collect.
4. I will use no firearms or blasting material in collecting areas.
5. I will cause no willful damage to property of any kind, such as fences, signs, buildings, etc.
6. I will leave all gates as found.
7. I will build fires only in designated or safe places and will be certain they are completely extinguished before leaving the area.
8. I will discard no burning material—matches, cigarettes, etc.
9. I will fill all excavation holes that might be dangerous to livestock.
10. I will not contaminate wells, creeks, or other water supplies.
11. I will cause no willful damage to collecting material and will take home only what I can reasonably use.
12. 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.
13. 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.
14. I will cooperate with field trip leaders and those in designated authority in all collecting areas.
15. I will report to my club or federation officers, the Bureau of Land Management, or other authorities any deposit of petrified wood or other materials on public lands that should be protected for the enjoyment of future generations or for public educational and scientific purposes.
16. I will appreciate and protect our heritage of natural resources.
17. I will observe the Golden Rule, will use good outdoor manners, and will at all times conduct myself in a manner that will add to the stature and public image of rockhounds everywhere.

The Rocks Beneath Our Feet

The Quartz in Our Creeks

by Hutch Brown

Editor's note: *The article is a slightly revised reprint from* The Mineral Newsletter*, May 2015, pp. 9–12.*

When I moved to northern Virginia in 1992, I started an aquarium of tropical fish. People decorate their aquariums with more than just fish, often with a showy centerpiece of rock or wood.

I found my showpiece in the creek near the nature center where our club meets. It was a large angular piece of quartz, orange in color, and it wasn't hard to find. None of the bedrock nearby was quartz; the bedrock is a gray or brown metamorphic rock with origins half a billion years ago in a deepsea trench. Yet there was (and is) plenty of quartz in the stream bed.

Why is there so much quartz in our creeks when most of the bedrock in our area is clearly something else?

Abundance

Quartz (SiO_2) is made up of silicon and oxygen, the two most common elements in the Earth's crust. Together, silicon and oxygen account for almost three-quarters of the weight of the Earth's crust.

The three feldspar groups (alkali, plagioclase, and barium) contain most of the silicon and oxygen in the Earth's crust. These silicate minerals alone account for about 60 percent of the Earth's crust.

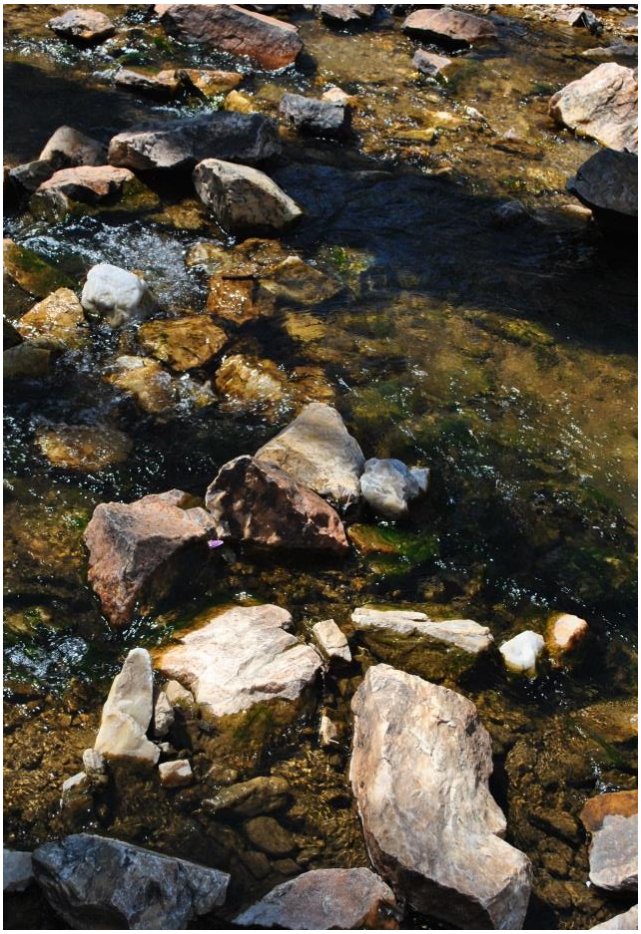
But quartz is second to the feldspars in abundance, comprising about 12 percent of the Earth's crust. So you would expect to find a lot of it around.

And you do, though not always in easily recognizable form. Granite contains most of the Earth's quartz; metamorphic and sedimentary rocks contain smaller amounts. Sandstone and quartzite, both mainly granular quartz, contain the highest quartz concentrations.

Yet the quartz in our creeks is mostly solid rather than granular. So where do all the massive quartz rocks in our creeks come from?

Quartz Lenses

The most obvious sources of quartz in our creek beds are the quartz lenses and veins embedded in the metamorphic bedrock in our area. Some of the quartz lenses are gigantic—tens of feet thick.



Quartz in Long Branch, a tributary of Accotink Creek in Fairfax County, VA. Photo: Hutch Brown.

One such lens overlooks a tributary of Accotink Creek in Fairfax County called Long Branch. The quartz outcrop is huge—as kids, we played on it, calling it Rock Fort—and it forms almost all of the alluvium in the nearby stream bed, as shown above.

In fact, a geologic map for the Fairfax quadrangle suggests that the quartz outcrop underlies Long Branch creek (fig. 1). As far as I can tell whenever I revisit the site (a shamefully neglected geologic treasure), quartz forms a visible part of the bedrock for the creek.

But huge quartz lenses make up only a tiny proportion of the bedrock compared to the surrounding metamorphic rock, such as Lake Barcroft metasandstone (fig. 1). Moreover, quartz outcrops the size of Rock Fort are not all that common. Arlington County has only one; known as Brandymore Castle, it overlooks Four Mile Run near Falls Church, VA. Yet you can

Figure 1—*The circled quartz lens (top) near Long Branch in Fairfax County underlies the alluvium, forming the creek's bedrock (bottom, arrows). Yellow = alluvium; brown = Lake Barcroft metasandstone; burgundy = Indian Run sedimentary melange (also the bedrock in much of Arlington); lilac = Falls Church tonalite (an intrusive igneous rock similar to granite). Map: Drake (1986); photo: Hutch Brown.*

find plenty of quartz in Four Mile Run all along its course, both upstream and downstream from Brandymore Castle.

So there must be other sources of quartz.

Segregation Quartz

Another source of quartz in our creeks is quartz veins and nodules. You can easily find both in the metamorphic bedrock near the Long Branch Nature Center, where our club meets in Arlington.

The veins are smaller, more common versions of the massive quartz lenses in our area. Like the lenses, the

Quartz vein (arrow) in the Indian Run sedimentary melange at Huffman's Falls on Four Mile Run in Arlington. Photo: Hutch Brown.

veins formed from quartz that ancient parent rocks like sandstone and siltstone already contained. In Arlington, for example, most of the bedrock is Indian Run sedimentary melange, a metamorphic rock made up of quartz-rich sands and silts laid down in a Cambrian ocean trench about half a billion years ago.

During mountain-building events, the immense pressure of the tectonic forces heated, buckled, and folded the sedimentary parent rock. Aided by hydrothermal processes, tectonic forces squeezed out quartz from the rock, depositing it in cracks and fissures. As the rock cooled, veins and lenses of pure white quartz formed, sometimes tinged with orange, pink, and red.

The process is called lateral secretion, and the result is known as segregation quartz. Lateral secretion is part of the broader process of metamorphism that yields such rocks as schist, gneiss, quartzite, and the Indian Run sedimentary melange near the Long Branch Nature Center. All of these rocks contain veins, bands, or inclusions of pure quartz.

In addition to veins, the Indian Run sedimentary melange contains quartz nodules (fig. 2)—rounded pieces of quartz of various sizes. How did they get there?

Geologists believe that the Indian Run sediments came from debris slides into an ancient ocean trench, probably resulting from earthquakes. Following the turbidity caused by a submarine slide, the heavier materials settled out of the water before the lighter

Figure 2—*Quartz nodules in Indian Run sedimentary melange along a tributary of Four Mile Run. Segregation quartz? Drop rocks? Photo: Hutch Brown.*

ones did. Graded layers of sediment formed, from heaviest at the bottom to lightest at the top.

Yet the quartz nodules embedded in the Indian Run bedrock seem to be random and unsorted (fig. 2). They do not seem to have been part of the ancient submarine debris slides. Instead, the quartz nodules might have formed through lateral secretion—in exactly the same way as the quartz veins formed.

Another possibility is that the quartz nodules are what geologists call drop rocks: extraneous pieces of rock that fell into the soft Indian Run sediments after they had already been laid down. The rocks might have been shaken loose by postquake tremors, for example, and carried by powerful submarine currents, drifting down onto the sediments.

Unconsolidated Sediments

Beginning at the Fall Line, the Cambrian bedrock in Arlington is mostly overlain by much younger sediments. An ancient river system, forerunner of the Potomac, began depositing the sediments about 140 million years ago. A layer of Cretaceous sediments known as the Potomac Formation directly overlies the Cambrian bedrock. On top of the Potomac Formation are sediments from the Tertiary Period.

Potomac Formation exposure in an embankment overlooking Lubber Run in Arlington. The unsorted sediments range from clay to cobble, including rounded pieces of white quartz (circled). Photo: Hutch Brown.

Though densely packed, the Potomac sediments do not form rock. They are often unsorted, ranging from clay, to silt, to sand, to cobble in random order. The rocks are rounded, betraying their riverine origins.

The creeks in Arlington have worn through the Potomac Formation down to the metamorphic bedrock, exposing deeply incised stream banks with sediments of various sizes. Erosion has washed the finer sediments in the stream beds away, leaving an abundance of rounded cobble. The cobbles include many pieces of rounded quartz.

The size and shape of the quartz in our stream beds reflect its origin. Large chunks and angular pieces of quartz most likely came from veins and lenses in the bedrock. The rounded pieces of quartz, with origins from across the interior of Virginia, probably came from the Potomac Formation of unconsolidated riverine sediments.

However, some might have come from the bedrock itself. In figure 2, the quartz nodules are visibly standing out from the metamorphic matrix, which is eroding away around them. The nodules embedded in the Indian Run sedimentary melange will eventually fall into the creeks.

Why aren't the quartz nodules eroding away at the same rate as the Indian Run matrix?

Durability of Quartz

Quartz is a stable mineral. It does not readily react with air or water to form other minerals. By contrast,

the metamorphic bedrock in our area is highly prone to weathering. You can easily find crumbling pieces of the dark Indian Run sedimentary melange along creeks in our area; they are well on their way to becoming dark sands and oxidized (rusty) red clay soil.

You will see no such weathering in the surrounding quartz. In our creek beds, quartz gradually breaks apart and wears away, but the process is slow because quartz is so hard, with a hardness of 7 on the Mohs Scale. Other kinds of rock and minerals in our area break apart and wear away much faster, in good part because they are so prone to weathering. Accordingly, quartz makes up a highly disproportionate amount of the rocks and cobble in our creeks.

The Quartz Cycle

None of this is particularly surprising. Most people, if they know anything at all about rocks, can recognize quartz. Many know that quartz forms veins and outcrops and that there is a lot of it in our creeks.

To me, however, it's astounding that a mineral so scantily represented in our area's bedrock in its purest form—as solid quartz—is so well represented in our area's creeks.

The quartz in our creeks is actually at an intermediate stage in the quartz cycle. As it is carried downstream, it is gradually ground down into sands. Deposited by rivers and carried by ocean currents, it makes up most of the sand on our ocean beaches. In a similar process, the dark-colored mountains in the arid West are gradually wearing away, leaving light-colored plains of mainly quartz and feldspar sands.

And then the cycle begins anew, with the formation of sandstone, siltstone, and other sedimentary rocks. Transformed by mountain-building events, they become metamorphic rocks full of bands, veins, lenses, and nodules of pure light-colored quartz—fresh material for creeks and gravel bars far into the future.

Acknowledgments

I would like to thank Roger Haskins and Sue Marcus, NVMC club members, professional geologists, and longstanding mineral collectors, for reviewing and improving the original article. They made invaluable suggestions and corrections.

Rocks on a gravel bar along Lubber Run in Arlington. The light-colored rocks are mostly solid quartz; the dark ones are metamorphic matrix rock that is rapidly weathering away into dark sands. Photo: Hutch Brown.

Sources

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October 2020—Upcoming Events in Our Area/Region (see details below)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7 MSDC mtg, Washington, DC	8	9	10
11	12 **Columbus Day**	13	14	15	16	17 Show, Cherry Hill, NJ
18	19 GLMSMC, Rockvle, MD	20	21	22	23 Show, Hick-ory, NC	24 Show, Hicko-ry, NC
25 Show, Hick-ory, NC	26 **NVMC mtg, Arlington, VA**	27	28 MNCA mtg, Arlington, VA	29	30	31 **Halloween**

Event Details

7: Washington, DC—Mineralogical Society of the District of Columbia; meetings via Zoom until further notice; info: http://www.mineralogicalsocietyofdc.org/.

17: Cherry Hill, NJ—3rd Annual Gem, Mineral, Fossil & Jewelry Show; Sat 10a–5p; 1721 Springdale Road; masks required; info: www.sjmineralshow.com.

19: Rockville, MD—Gem, Lapidary, and Mineral Society of Montgomery County; meetings via Zoom until further notice; info: https://www.glmsmc.com/.

23–25: Hickory, NC—49th Annual Gem, Mineral, Fossil, and Jewelry Show; Catawba Valley Gem and Mineral Club; Fri 9a–6p, Sat 9a–6p, Sun 10a–5p; Hickory Metro Convention Ctr, 1060 13th Ave Drive SE; $5 adults, kids 12 and under free; ***hosted with*** 70th EFMLS Convention; vendor-only show, 29 vendors; info: www.cvgmc.com.

26: Arlington, VA—Northern Virginia Mineral Club; meetings via Zoom until further notice; info: https://www.novamineralclub.org/.

28: Arlington, VA—Micromineralogists of the National Capital Area; meetings via Zoom until further notice; info: http://www.dcmicrominerals.org/.

Disclaimer

All meetings/shows are tentative during the coronavirus pandemic, and club meetings might well be remote. Check the website for each organization for more information.

Hutch Brown, Editor
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THE NORTHERN VIRGINIA MINERAL CLUB INC
Crystals are the flowers of the Mineral Kingdom

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Mineral of the Month: Rhodochrosite

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

The Northern Virginia Mineral Club

Visitors are always welcome at our club meetings!

Please send your newsletter articles to:
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).

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 7:45 p.m. on the fourth Monday of each month (except May and December)* at **Long Branch Nature Center**, 625 Carlin Springs Road, Arlington, VA. (No meeting in July or August.)

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