THE NORTHERN VIRGINIA MINERAL CLUB INC

The Mineral Newsletter

Meeting: January 24   Time: 7:30 p.m.

The meeting will be online only (Zoom). Details on page 7.

Volume 62, No. 1
January 2022
Explore our website!

January Meeting Program:

Urgent Business/Show & Tell

Details on page 7

In this issue …

Jamesonite

***from* Concepción del Oro, Zacatecas, Mexico**

Source: Wikipedia   *Photo: Rob Lavinsky.*

Mineral of the Month
Jamesonite

by Sue Marcus

We are starting 2022 with a metallic mineral of the month—jamesonite, named for Robert Jameson, a Scottish geologist. In 1821, Jameson wrote *Manual of Mineralogy*, in which he describes minerals by "genus," a word we don't use for minerals now, though we do use "species."

It is interesting to translate his 19th-century English into our 21st-century American English. Baryte was easy, and I assume that "geognostic situations" would be called "geologic environments" today. As the namesake for this mineral, Jameson was also the first author referenced in the list on Mindat references for jamesonite. Ah! He described it, I thought.

Frustratingly for this writer, Jameson mentions several types (species?) of antimony, like white antimony, antimony ochre, and grey antimony. He even states that some of the latter comes from Huel (Wheal) Boys in Endellion, Cornwall. This is one of the earliest localities where indisputably identified jamesonite was found. It is tantalizing to think, though not at all certain, that Professor Jameson saw the (as yet) unnamed mineral that was later called jamesonite, though he did not fully describe it.

So who did describe it? Good question.

The International Mineralogical Association gives that honor to Friedrich Mohs and colleagues for their 1825 *Treatise on Mineralogy*. However, that work briefly describes some of the properties of the mineral and names it but gives no location or description of the type (original) specimen(s). All sources I found state that Cornwall was the original source in 1824.

And then the plot thickens. A new source, previously unknown to me—Memim Encyclopedia—has a trove of information, though no references to confirm their sources. According to Memim, this mineral was first called *Zundererz* ("tinder ore" in German) by Johann G. Lehmann, who described it in 1758. Memim confirms my guess, stating that Jameson used the term "grey (or gray) antimony" for it in 1820, followed by the first description by Mohs in 1824 referring to it as "Axotomer stibnite."

Jamesonite was the name bestowed on the mineral in 1825 by Wilhelm von Haidinger. Von Haidinger met and worked with Jameson during a sabbatical in Edinburgh. He then wrote the English version of Mohs's 1825 mineralogical treatise, using the name jamesonite, probably in honor of his Scottish colleague. Memim gives the type locality as St. Endellion, Cornwall, England. The International Mineralogical Association lists the type locality more broadly as United Kingdom.

Jamesonite forms in low to moderate temperature environments through hydrothermal processes. Think about the chemistry of this mineral: $Pb_4FeSb_6S_{14}$—

Happy New Year!

Northern Virginia Mineral Club members,

No in-person meeting in January!

*** Zoom meeting this month ***

See details on page 7.

Jamesonite, Anita Mine, Huaron, Peru.
Source: Wikipedia; photo: Didier Descouens.

lead, iron, antimony, and sulfur. Iron and sulfur are ubiquitous, so jamesonite is most likely to be found in antimony or lead deposits. It is relatively uncommon as a collectible mineral, more likely as micromounts than macrospecimens, although I've had one of the latter in my collection.

Jamesonite can be massive or form crystals that are usually hair-thin, in felted mats, and randomly oriented—or, more rarely, as radiating crystal sheafs. Many authors describe thin jamesonite crystals as acicular, as needles, or as felted mats of those thin crystals. I will use "felted" in this article for mats of hair-thin crystals. To me, "acicular" implies crystals radiating from a central point, which is not what the authors are usually describing. Needles have sharp points; the jamesonite crystals described as "needles" may have pointed terminations, though I doubt the authors have examined the tips in the specimens. Jamesonite crystals with faces or that are thicker that thin fibers are rare.

Jamesonite with pyrite, Noche Buena Mine, Zacatecas, Mexico. Source: Wikipedia; photo: Rob Lavinsky.

Silver-rich (argentiferous) jamesonite has been reported and analyzed. It might have later been named owyheeite, though whether all the silver-rich jamesonite specimens are the same mineral (owyheeite or something else) is undetermined, probably because the samples were very limited (usually only one) and described long ago from old collections. Burton (1868) and Shannon (1920) described specimens from the Sheba Mine in Star City, NV, and from the Poorman Mine in Idaho, respectively. The Sheba Mine specimen could be in Yale's collection because that is the successor to the "Sheffield Scientific School," reported by Burton (1868) as its owner.

Jamesonite with nadorite, Port Quinn, Cornwall, England. Source: Mindat.

A 1920 report by Shannon described a single silver-rich jamesonite specimen from the Poorman Mine in Idaho's Silver City Mining District using thorough optical techniques available at the time. The specimen, in the National Museum's/Smithsonian's collection, was reported to contain 7.40 percent silver and to be extremely low in iron (0.46 percent). Otherwise, the specimen had the jamesonite habit of fine, thin crystals and the hardness and streak of jamesonite, although it was a bit denser (6.03). I could not determine whether the "silver jamesonite" in this study was eventually renamed as a different mineral. Jamesonite is not included in the Mindat list of minerals reported from the Poorman Mine.

The Cornish mines near St. Endellion were mined for antimony. Specimens from the old mines would be of greatest interest to those who want specimens from type localities. For those of us who seek something more attractive, we'll look elsewhere.

We will start our world tour of jamesonite localities in Canada and then move south. The now inactive Lake George Antimony Mine in New Brunswick produced only a few jamesonite specimens shown on Mindat. However, because it was an active mine and there were vugs in some of the ore that contained jamesonite, other specimens likely exist.

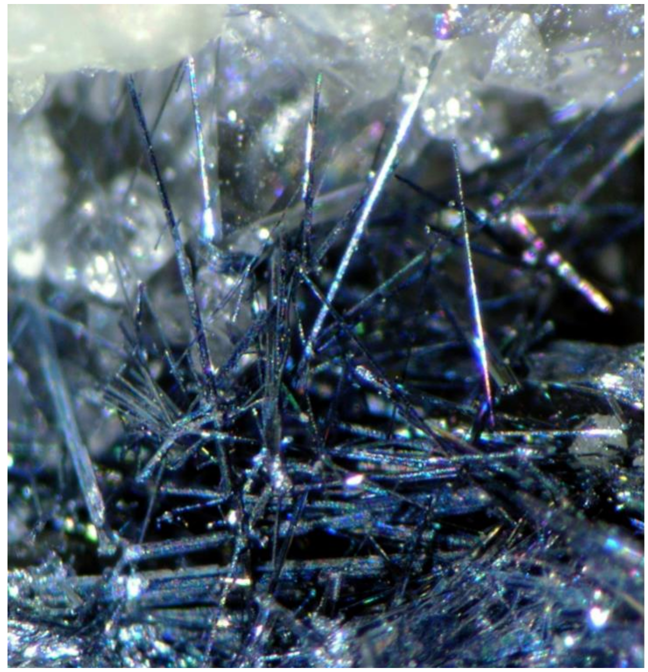
The United States is not a leader in mining the mineral commodities associated with jamesonite, so it isn't noted for this mineral. Jamesonite occurs here, but rarely. At the Daley-Judge Mine in Utah's Park City Mining District, jamesonite was found as scarce hairlike crystals with quartz and arsenopyrite. Micromounters would be most interested in these specimens, although the crystals are visible.

In the now-closed Coeur d'Alene Mining District in northern Idaho, jamesonite was rare but present in at least some of the mines. Massive jamesonite was more common than other forms, although hairlike vug fillings and parallel crystals were also found. The Evolution Mine might have been the most productive source of jamesonite, but detailed location information is not known. Specimens shown on the Coeur d'Alene Mining District pages on Mindat mention the Federal Mining and Smelting Company, which owned the Evolution Mine in that district.

Jamesonite was reported with galena, pyrite, sphalerite, chalcopyrite, arsenopyrite, and tetrahedrite at the Iron Daisey Mine in Sanders County, MT. The last two of these minerals, along with jamesonite, were said to usually be included in galena.

Several deposits in the Mexican state of Zacatecas are noted for some of the world's best jamesonite specimens. Some feature fine hairs of silver-gray jamesonite contrasting with brassy gold pyrite crystals, making them bright and showy. More rarely, well-terminated individual macrocrystals have come from this area, also with pyrite crystals. The Noche Buena Mine has produced crystals up to 5.7 centimeters (2.8 in) in size, close to a record. That mine was the most prolific source of the Zacatecas jamesonite localities.

Sombrerete also produced jamesonite crystals up to 5.7 centimeters (2.8 in) in size, again with contrasting



Jamesonite with quartz, Herichová, Revúca District, Slovakia. Source: Mindat.

pyrite in some specimens. Thinner, hairlike jamesonite seems to have been less common at these two mines. The Concepción del Oro Mine also produced both piles of hairlike crystals and more robust individual crystals more than 1 centimeter (0.4 in) in size. Jamesonite micromounts were found at all of these mines. The Tajo Mine in Chihuahua was a source of at least a few nice specimens of jamesonite with quartz and sulfides like pyrite, arsenopyrite, and tetrahedrite.

In Bolivia, jamesonite came from the San José Mine in Oruro, primarily from 2002 to 2004. If the relatively few specimens shown on Mindat are any guide, jamesonite from this location ranks high among worldwide localities. Specimens of just aggregated jamesonite crystals range up to 10 centimeters (3.9 in) in size, with no matrix or other minerals. Individual crystals larger than the more common hairlike form found in other places were the more normal habit at the San José Mine. It becomes easier to understand why jamesonite from here was originally identified as stannite based on visual identification. Jamesonite from San José looks too nice and comes in crystals too large to be jamesonite. Small numbers of specimens have also come from Peru's well-known Quiruvilca Mine.

Jamesonite, Concepción de Oro, Zacatecas, Mexico. Source: Wikipedia; photo: Rob Lavinsky.

Different and interesting jamesonite specimens have come from the Herja Mine in the Maramures region of Romania. Images on the Mindat site for the mine show jamesonite included in calcite, in acicular balls of jamesonite, and in jamesonite pseudomorphs after fizelyite (with a chemical formula of $Ag_5Pb_{14}Sb_{21}S_{48}$, as compared to jamesonite's $Pb_4FeSb_6S_{14}$). Although fine hairs of jamesonite occur here, other forms are better known from the Herja Mine. Other deposits in the same region have produced interesting balls of jamesonite as well as scarce specimens of other crystals habits, along with micromount-size specimens.

In what is now the Czech Republic, jamesonite was found in the Příbram District as acicular (radiating) crystals and as random jackstraws in vein openings and vugs. This is an old, likely long inactive mining district, although the specimens that came from it could interest macro and micro collectors alike; maximum individual crystal length shown on Mindat was 2.5 centimeters (~1 in).

In the 1980s, the Manó deposit in the Košice Region of Slovakia was the source of tabular macrocrystals of jamesonite associated with siderite. Some specimens show radial flat crystals, all with matrix. Determined collectors and mountain climbers have found occasional micromount-sized specimens in the mountains of Germany and Italy.

Asturias in Spain is best known for its stunning, transparent fluorites, although jamesonite is found in the Carlés Mine there too. Specimens don't seem to be abundant, even though the mine might be active both aboveground and underground. Crystals range from stout and prismatic to lovely micromount size.

China is the source of numerous stunning mineral specimens of a wide range of species. The Yaogangxian Mine in the tin-tungsten mining district of the same name has produced jamesonite with attractive associated minerals like chalcopyrite, bournonite in stout crystals, sphalerite, diverse colors of fluorite, and quartz crystals. Fluorite with jamesonite inclusions, and particularly transparent fluorite with scare jamesonite inclusions, are the prettiest to me because each mineral is beautiful on its own, yet the transparent fluorite encasing the jamesonite also tells a geologic story.

The Mindat website for the mine also shows a photo of jamesonite wrapped around a bournonite crystal, looking like fine steel wool. Other specimens show more heavily included jamesonite in fluorite, causing notable color change in the fluorite, as well as jamesonite in its more usual jackstraw forms. Some jamesonite is iridescent, depending on lighting.

Jamesonite on pyrite, Huaron Mine, Peru. Source: Wikipedia; photo: Didier Descouens.

Jamesonite is a relatively uncommon mineral, with prices to match. Specimens are currently available online for about $26 and up—though check sizes. These are delicate specimens, so understand the care they will need before deciding they are right for your collection. Jamesonite is too fragile for any gemological use.

Technical Details

Chemical formula	$Pb_4FeSb_6S_{14}$
Crystal form	Monoclinic
Hardness	2.5
Specific gravity	5.6
Color	Steely gray
Streak	Gray, black
Cleavage	1 distinct, difficult to determine on most specimens
Fracture	Uneven, splintery
Luster	Metallic

Acknowledgment

The author appreciates Herwig Pleckmans's translations and guidance on relatable references.

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Jamesonite, San José Mine, Oruro, Bolivia. Source: Wikipedia; photo: Rob Lavinsky.

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Humor

Hunting Statistics

Three statisticians go hunting for deer. They spot one off in the distance. The first one shoots about a foot too high; the second one, about a foot too low; the third one yells, "We got it!"

Club Holiday Party
December 20

by Sue Marcus

The Northern Virginia Mineral Club holiday party was a joyous affair, held on December 20 and hosted by President Tom Kim and his family. About 20 members and family gathered for food and friendship. There was plenty of food, free parking, and no bad weather to slow us down. With a fine mix of longtime (let's not say "older") members and newer ones—and a great group of young people—we had a festive time.

Tom's house might not have been built for entertaining the club, but we coopted it for the picnic last summer and now for the traditional holiday party. John Weidner was stunning in his Christmas outfit; a right jolly elf! He brought some delicious and different treats from Okinawa. Mike Kaas should get the Humbug Prize for bringing coal to give away—which, since this was a mineral club party, was quickly scarfed up. If you missed the party this year, make a point to come next year—sigh; pandemic dependent!

Club members enjoying the holiday party. Photo: Tom Kim.

January 24 Club Meeting
Zoom Format! Urgent Business/Show and Tell

by Tom Kim, President

For our first meeting in 2022, we're going to hold an online-only club meeting on **January 24, 7:30 p.m.** Please join us on Zoom!

https://us06web.zoom.us/j/86014799283?pwd=NDBSdUZIdy9ZbENINEV1c2sxT0lmdz09

Meeting ID: 860 1479 9283
Passcode: 343849

We will set aside some time to brainstorm some ideas and set some plans for the year. And we'll have some time for some show-and-tell.

You've been reading your newsletter, right? Of course! Grab a specimen of any of the 2021 Minerals of the Month and tell us the story of your specimen: What's special about it? Why do you like it? Where did you find or buy it? Is there a backstory?

We promise you a speaker in February!

First, let's see who our top members are to serve our club community as officers this year. Then we'll have a bit of food and drink, and we'll talk minerals!

The Northern Virginia Mineral Club has a strong membership. We have funds. We have engaged families with young people—curious proto-Earth scientists.

But we don't have volunteers. Don't sit there like a rock. It is time to ROLL!

Before we get to the show and tell, here's the business we need to conduct.

Club Officer Elections

A top priority is electing club officers for 2022. We are in violation of our club bylaws by not having done so already, a situation that must be rectified!

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 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.

Roger Haskins has agreed to stand again as Treasurer, but Sue Marcus has stepped down as club vice president after serving multiple times in that role—and as club president. So will David MacLean as club secretary after many years of outstanding service, though he is more than willing to support and mentor his successor, as is Sue.

Tom Kim might be willing to remain as club president or vice president—*if* someone else can take on one of those roles.

So we need volunteers!

President.....................**Your Name HERE!**
OR: **Vice President**.....**Your Name HERE!**
Secretary.....................**Your Name HERE!**
Treasurer......................Roger Haskins

Sue Marcus will always be there to support the next president and vice president, as will other previous presidents. If you might be interested in volunteering—or just finding out more—please contact Tom Kim at president@novamineralclub.org or Sue Marcus at vicepresident@novamineralclub.org.

Upcoming Events

Please give some thought as to what you'd like to see the club do this year. Are there presentation topics you'd like to see? Are there field trips you'd like to go on? Do you want more social gatherings? Do you have ideas on the educational outreach of the club? Lend your voice and help set the agenda!

We will go over the 2022 calendar of events to prepare for the coming year and make sure the right events go into the club newsletter. Part of the discussion will focus on venues for club meetings; on the need for reporting meeting minutes in the newsletter; and on possibly holding a November club show.

Budget Status

We will also report on the status of our club budget. The budget is prepared and approved by the club's executive board, then submitted for approval to the club membership. The treasurer is preparing a summary of 2022 expenses and receipts.

Don't forget: membership dues are due! See the last page of this newsletter for details.

Show and Tell

Here's the list of Minerals of the Month from 2021. From the list, choose one in your collection and let us hear about it!

January	halite	June	staurolite
February	chrysoberyl	September	torbernite
March	elbaite	October	axinite
April	prehnite	November	rutile
May	kyanite	December	shattuckite

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Sad News

by Sue Marcus

Grant Hodges, a longtime member of our club, passed away in 2021 at age 93. He was most interested in lapidary arts, cutting and polishing items himself. His sons, John, Jim, and Dean Hodges, noted that he could seem curmudgeonly but was a softie inside. Grant served in the Air Force, then was employed by Washington Gas. Later, he worked in security at Robert E. Lee (now John R. Lewis) High School in Springfield, VA. He served as an announcer for games of the Mount Vernon Majors and as volunteer coach for the various sports played by his sons.

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GeoWord of the Day

(from the American Geoscience Institute)

mesofossil

A plant fossil of intermediate size, such as megaspores and small seeds. Falling between megafossils (such as leaves) and spores or pollen, it still requires microscopic study.

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

An Eighth Continent?

by Matthew Lybanon

Editor's note: *The article, adapted from the* AFMS Newsletter *(January 2022, p. 6), was originally in* MAGS Rockhound News *(November/December 2021).*

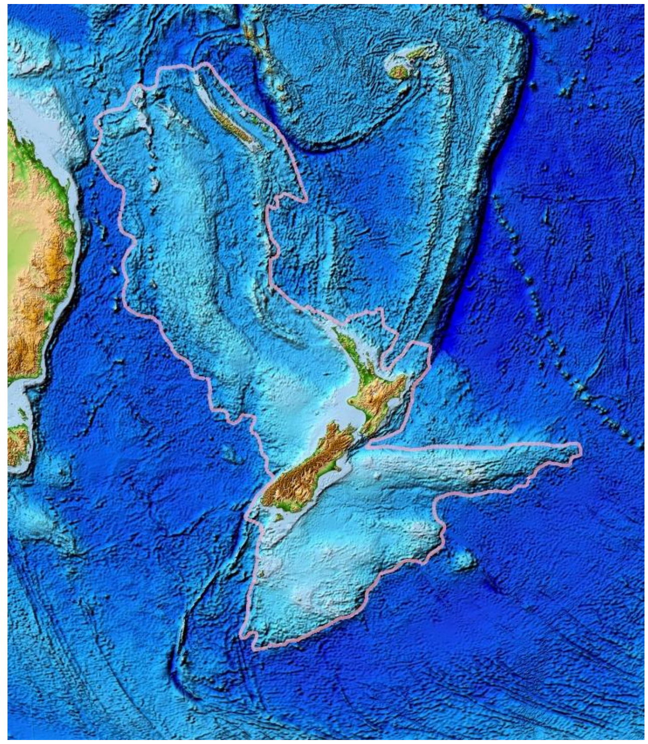
About 3,500 feet under the South Pacific sits a piece of land adjacent to New Zealand that is 2 million square miles in size—about half as big as Australia. But scientists can't agree on whether or not this submerged land mass—a collection of submerged chunks of crust called Zealandia (or the Maori name Te Riu-a-Māui), which broke off from an ancient supercontinent called Gondwana about 85 million years ago—is a continent.

A team of geologists declared it a continent in 2017, but not all researchers are convinced. Nick Mortimer, a geologist from New Zealand's GNS Science who led the 2017 group, explained that a continent should:

- have clearly defined boundaries,
- occupy an area greater than 1 million square kilometers,
- be elevated above the surrounding ocean crust, and
- have a continental crust thicker than that oceanic crust.

Zealandia meets every requirement. The problem, until recently, was that the oldest crust ever sampled from Zealandia was just 500 million years old, whereas all other continents contain crust that is 1 billion years old or more. But a recent study found that part of the submerged continent is twice as old as geologists previously thought, which could boost Mortimer's argument.

Tiny mineral grains taken from granite have led to a potential breakthrough in ancient continental reconstructions. The geologists behind the recent research (published in *Geology*) looked at 169 chunks of Zealandia granite from under New Zealand's South and Stewart Islands. Granite forms when magma crystallizes deep within the Earth's crust. The granites were brought to the surface by continental uplift due to earthquake activity along a plate boundary over millions of years. By extracting microscopic crystals from the granite, the team was able to determine the age of both the crystals and the crust in which they formed. The results showed that the crust was once



Zealandia, outlined in pink, with New Zealand at its core. Source: Wikipedia.

part of another supercontinent known as Rodinia, which formed between 1.3 billion and 900 million years ago—far earlier than 500 million years ago.

Dr. Rose Turnbull (also of GNS Science and one of the authors of the *Geology* article) says that a key finding in this study was the unique isotopic signature measured in microscopic grains of zircon ($ZrSiO_4$), a mineral found in all granites. The isotopic composition of zircon can be used to reveal what the Earth's crust looked like both at and deep below the surface. To use a human analogy, all of today's eight continents have older ancestors, such as Gondwana, Laurasia, and Pangea. The new study enables scientists to place Zealandia in the "family tree" of continents descended from Rodinia. With this new information, Zealandia may yet turn out to be a "missing link" between South China, Australia, and North America.

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Meet Karen I. Lewis!

by Sue Marcus

Many longtime members of our club remember Karen Lewis, who died at 95 in August 2021. Karen was a friendly, lively person who was a skilled lapidary. She joined our club in the 1980s, when her fascination with this part of our hobby was just beginning.

Karen traveled the world, accompanying her husband, Walter, who became an Air Force Colonel. They raised two daughters before settling in northern Virginia.

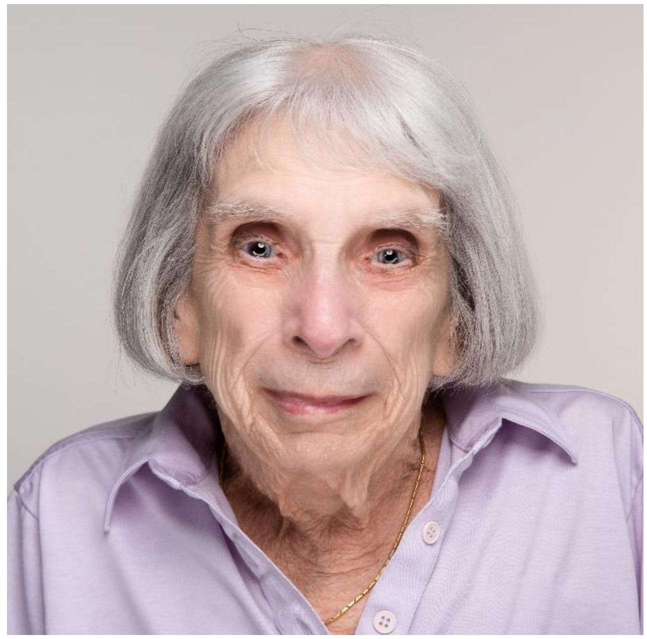
She met Lois Dowell, another devoted club member, when they took Arlington County adult education classes in lapidary arts. Lois and Karen became best buddies, teaching lapidary techniques for the county during twice-weekly classes. They enjoyed their times at Wildacres, too. Karen wrote, "Nothing makes a better vacation for me than a weeklong getaway focusing solely on lapidary classes! Even after going there more than 25 times, the toughest part is deciding which class to sign up for!"

It might have been at Wildacres that Karen learned faceting and silver work. She happily set up shop in the garage, with Walter's gracious acquiescence. She expanded her knowledge to lost wax casting and was proud of crafting sterling silver badges with her family's Scottish coats of arms, making badges unique to each branch of the clan.

During our club shows, Karen was ever present, helping at the entry table, with kids' activities, or wherever she was needed. She was a delightful, active member for as long as she could physically manage it.

I remember Karen most for her baking. For many years, she was the hospitality provider for our club. She baked goodies for each meeting. Even when she felt no longer able to come to meetings, she would have me swing buy her home to pick up the sweet stuff—she knew the way to my heart.

Karen was unable to attend our club meetings for the past few years, so more recent members were unable to know the joy and enthusiasm Karen brought us. She loved living and evidenced that in her passions for lapidary crafts and teaching others and for her generosity. As her daughter noted, "We had to take away her blowtorch when she was 88!" ⛏



Longstanding NVMC member Karen Lewis.

"Don't Choose Extinction," Dinosaur Warns World Leaders

Editor's note: *The article is from "UN News" on 27 October 2021. Thanks to Sue Marcus for the reference!*

In a United Nations first, a ferocious and talkative dinosaur bursts into the iconic General Assembly Hall at UN Headquarters in New York, with a special warning for any diplomats who still think climate action is for the birds.

"At least *we* had an asteroid," the carnivorous critter warns, referring to the popular theory explaining dinosaurs' extinction 66 million years ago. "What's your excuse?"

This isn't a slice of real life of course, rather the key computer-generated scene from a new short film launched this Tuesday by the UN Development Programme, as the centerpiece of the agency's "Don't Choose Extinction" campaign. ... [Read more](#).

Cleaning Staurolites: What Works Best?

by Daniel Simon

Editor's note: *The article is based on a school science project by the author, a member of our club.*

I got interested in cleaning staurolites after collecting them together with my father in Stuart, a town in southwestern Virginia. Stuart is the county seat for Patrick County, a staurolite locality noted by Mindat, known for Fairy Stone State Park. The county straddles the boundary line between the Piedmont and Blue Ridge. The bedrock types include schist, gneiss, and Catoctin greenstone, all metamorphic.

Staurolite, a silicate mineral that can form crosses, originates when shale is altered by regional metamorphism into schist. Regional metamorphism occurs when deeply buried rock is subjected to enormous pressure during mountain-building events. Staurolite often occurs together with muscovite and garnet in schist. According to Mindat, staurolite is also found in Fannin County, GA, and localities in Idaho.

A silicate is a salt in which the anion contains both silicon and oxygen. The staurolites I collected were encased in a silicate material. The main chemical difference between staurolites and their encasings is the higher iron content in the encasing material. I was having trouble separating the silicate casings from the staurolites due to the hardness of the casings. I wanted an easier way to clean them.

Staurolite specimens from Stuart, VA, used for testing, separated by group (control, baking powder, and soap).

Staurolites from Fairy Stone State Park, Patrick County, VA. Source: Virginia State Parks.

Science Project

In trying to clean up my staurolite specimens, it occurred to me that I might boil the stones to soften them. I surmised that just boiling the stones alone would do nothing but heat them up, so I came up with the idea of boiling the stones with something more chemically basic than just water. The idea was that the silicate shells would then soften enough for me to free the staurolites more easily.

For this project, the problem was the hardness of the silicate shells and staurolites. The practical objective was to find out which of my two independent variables—soap and baking soda solutions—would soften the dependent variable—the hardness of the silicates. I decided to test the hardness on the Mohs hardness scale using a knife, a penny, and a fingernail.

Methods and Materials

I followed the standard requirements for science projects, using:

- 3 groups of 10 staurolites each from Stuart, VA;
- a metal pot;
- 32 grams of baking soda;
- 42 milliliters of Dawn dish soap;
- 700 milliliters of water;
- a gas stove;
- a knife;
- a penny;
- a fingernail; and
- a well-ventilated room.

In addition to conducting the experiment in a well-ventilated room, I employed such safety procedures as tying back long hair, wearing long sleeves, and letting the stones cool before touching them.

I tested the staurolites using the Mohs scale of hardness (fig. 1, top) by scratching each specimen with a knife, a penny, and a fingernail. On the Mohs scale of 1 to 10, a knife can scratch minerals with a hardness of up to about 6; a penny can scratch minerals with a Mohs hardness of up to 3; and a fingernail can scratch minerals with a Mohs hardness of up to about 2.

Next, I filled the pot with the water and brought it to a boil on the stove, then placed 10 stones into the boiling water (fig. 1, bottom). After boiling the stones for 10 minutes, I let them cool for an additional 10 minutes, then tested them again on the Mohs scale of hardness with the knife, penny, and fingernail.

Then I repeated the entire procedure twice more with the next groups of 10 stones, first using the baking soda in the boiling water, then the dish soap. After 5 days, I tested all of the stones again on the Mohs hardness scale using the knife, penny, and fingernail.

Results

Table 1 shows the results.

Test subjects in the control group showed an average hardness for the silicate after being boiled of 4 on the Mohs scale. After 5 days, they still had a hardness of 4 on the Mohs scale, demonstrating that just boiling the stones had little to no effect on the silicate shells.

Test subjects in the group boiled with soap showed an average hardness of 2 on the Mohs scale. When tested again after 5 days, they gained in hardness, going to a 3 on the Mohs scale. However, they did not return to their original hardness of 4.

Table 1—*Mohs hardness test results, by variable and timing.*

Variable[a]	After boiling	After 5 days
Control	4	4
Soap	2	3
Baking soda	1	1

a. Control = plain water (neutral); soap/baking soda = solutions of bases in water.

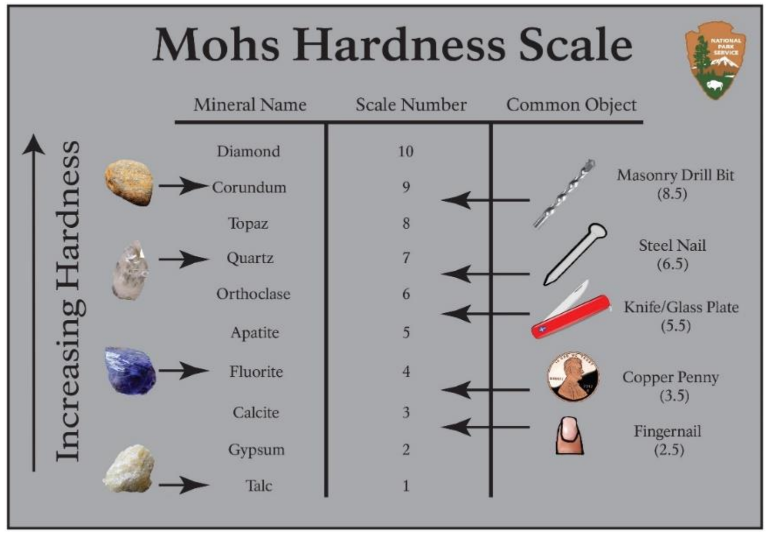


Figure 1—***Top:*** *Mohs hardness scale.* ***Bottom:*** *Staurolite specimens boiling on stove.*

Test subjects in the group boiled with baking soda showed an average hardness of 1 on the Mohs scale. After 5 days, the average hardness was still 1, so they remained relatively soft.

To sum up, the average hardness of the untreated silicate is 4 on the Mohs scale. When the stones are boiled with soap, the silicate hardness descends to 2 on the Mohs scale but gains in hardness over time and goes to 3 on the Mohs scale after 5 days. When the stones are boiled with baking soda, the silicate hardness drops to 1 on the Mohs scale and remains at 1.

Staurolite has a hardness of 8 on the Mohs scale. Its hardness did not change due to being boiled in solutions, which affected only the encasing silicates.

Conclusion

My results confirmed both my first hypothesis—that boiling the stones in a base solution would decrease the hardness of the silicate shells—and my second hypothesis—that one method of softening the silicate encasing would be superior to the other. Whereas soap did soften the silicate, baking soda had superior softening effects because the hardness of the silicate was reduced even more and because the silicate retained the lower level of hardness. I also found that the knife was superior to the penny and fingernail in removing the silicate casings.

To improve this experiment in the future, I would like to boil the silicate with an acidic substance because I believe that the experiment was limited in its effectiveness by the lack of a powerful acid. ⛏

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Mindat. N.d. Staurolite.

Humor

Soluble Scientists

A geologist, a biologist, and a chemist were going to the ocean for the first time.

The geologist saw the ocean and was fascinated by the waves. He said he wanted to do some research on the fluid dynamics of the waves in relation to the sands and cliffs, and he walked into the ocean. Obviously, he drowned and never returned.

The biologist said he wanted to do research on the flora and fauna inside the ocean and walked into the waves. He too never returned.

The chemist waited for a long time and afterwards wrote the observation, "The geologist and the biologist are soluble in ocean water." ⛏

Bench Tip

Sheet and Wire Storage

Brad Smith

The more you work with jewelry, the more problems you have finding the piece of metal you need. My pieces of sheet were generally stored in various plastic bags, and the wire was in separate coils. Few were marked, so it often took me a while to locate that piece of 26 ga fine sheet I bought last year, especially since I usually take my supplies back and forth to classes.

A tip from a friend helped me organize everything. I bought an expanding file folder from the office supplies store (the kind that has 13 slots and a folding cover) and marked the tabs for each gauge of metal I use. Then I marked all my pieces of sheet with their gauge, put them into plastic bags, marked the gauge on the bag, and popped them into the folder. I usually store coils of wire loose in the folder, but they can also be bagged if you prefer. I use one tab for bezel wire and one for the odd, miscellaneous items.

The resulting folder is really convenient when I want to take my metal out to a class or workshop, and it's colorful enough for me to easily find in the clutter of the shop!

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

Physical Properties of Gems and Minerals

Cleavage and Fracture

by Barbara Smigel

Editor's note: *Ever wonder that the "technical details" for a mineral mean? As part of her online course on gemology, the author describes some of them. This article, adapted from the original, examines cleavage and fracture.*

Although a dozen or more physical properties of gems can be measured, we will concentrate on just a few—the ones most important for identification.

Cleavage

In the three-dimensional structure of certain crystals, atoms are bound more tightly to each other in some directions than in others. As a result, when strong forces are applied, relatively clean breaks can occur in the "weakest-link" directions. The breaks, sometimes so smooth that they appear polished, are called cleavages.

The number of directions in which a material cleaves, the ease of cleavage, and the "perfection" of the breaks help with identification. Not every material cleaves; minerals like quartz that are equally strong in every direction have no cleavage. Cleavage—or the lack of it—is a typical characteristic of gems and minerals, so it serves as a good identifier.

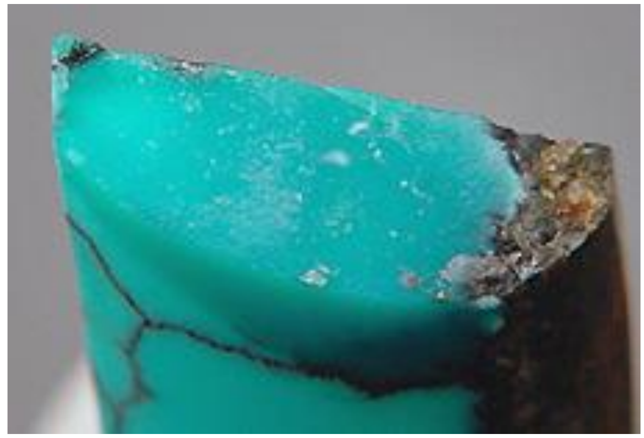
Cleavage is also critically important in lapidary work. Materials with easy or perfect cleavage—especially in multiple directions—are poor risks for most jewelry applications. However, not all gems show cleavage; tourmalines, sapphires, and garnets, for example, do not; nor do citrine, amethyst, and other varieties of quartz.

The use of cleavage is perhaps best known in diamond cutting. Diamond has four perfect cleavages, and maybe you've seen photos or videos of that tense moment when the diamond cutter inserts the wedge at a particular spot on the diamond and strikes it with a mallet. If all goes well, the stone splits precisely where the cutter wanted.

It's said that the expert who first cleaved the Cullinan Diamond—the largest rough diamond ever found—had studied it for months to determine its cleavage planes. In 1908, upon striking the first blow, he fainted dead away from anxiety. (Fortunately, all was well.)

Examples of cleavage. Apatite (top) has two cleavages that are imperfect (with rounded and irregular edges); spodumene has two cleavages, but they are perfect (with flat and smooth breaks); and fluorite has four perfect cleavages.

Fracture



Whereas cleavages occur only in some gems and minerals—and, within those, only in certain directions—fractures can and do occur in all lapidary materials and in any direction. A fracture is a break that is not along a cleavage plane. With sufficient force, any gem or mineral will fracture, although some do so more readily than others.

The edges and faces of fractures are not smooth like those of cleavages, but they do tend to have one of several basic appearances. Terms for fracture types play on their resemblance to well-known surfaces and objects—conchoidal (shell-like), for example, or splintery, uneven, steplike, and granular. Like cleavage, the type of fracture is typical for a particular mineral and has value in the identification of gems.

Conchoidal fracture (lower right, in citrine) is the most common in lapidary materials, found in corundum, beryls, all quartzes, opals, and both natural and manmade glasses. The granular and uneven fractures characteristic of turquoise and coral are commonly simulated in glass. ⚒

Examples of fracture in lapidary materials. Turquoise (top right) has granular fracture, whereas coral (center right) is uneven. Citrine (bottom right), like all quartz, is conchoidal, and charoite (right) is splintery.

First Known Swimming Dinosaur Just Discovered

Editor's note: *From LiveScience (April 29, 2020).*

Despite out-of-date drawings of long-necked dinosaurs wading in swamps, scientists have long believed that dinosaurs were a land-loving bunch: none were thought to swim. A new tail fossil found in Morocco revealed that the fearsome *Spinosaurus aegyptiacus* was the Michael Phelps of the Cretaceous. … *[You can look it up online by the title.]*

The Rocks Beneath Our Feet

Great Falls: How Did It Get There?

Part 1—The Rocks

by Hutch Brown

Great Falls on the Potomac River is one of the most spectacular geologic features in our area, a favorite destination for visitors on both the Maryland and Virginia sides of the river. In 1980, the U.S. Geological Survey published a fabulous geologic guide for visitors titled *The River and the Rocks*. Unfortunately, it is out of print, so this article summarizes parts of it.

Deepsea Origins

Let's start with the rocks at Great Falls and Mather Gorge below the falls. A common rock is metagraywacke: "meta" stands for metamorphic, and "graywacke" comes from the German term *Grauwacke*, meaning sandstone containing a high proportion of silt ("dirty sandstone," if you will). You can still see the grains of sand in the metamorphic rock.

The other common metamorphic rock near Great Falls is mica schist. Schist typically forms from fine-grained sedimentary source rocks such as siltstone and mudstone. The tremendous pressure from tectonic forces compresses the grains in the rock and "foliates" them, realigning them into parallel platy crystals of mica, quartz, feldspar, kyanite, and other minerals. Under even higher pressures and temperatures, schist can then metamorphose into gneiss.

Great Falls on the Potomac River.
Source: Wikipedia.

So the source materials for the rocks in the general vicinity of Great Falls range from fine silts to sands. Another kind of metamorphic rock downstream from Mather Gorge is similar to metagraywacke but with embedded rocks. It's called Sykesville melange (*mélange* means mixture in French). The Sykesville rock contains many chunks of much older rock, as does the Indian Run sedimentary melange that forms the bedrock for the Long Branch Nature Center where our club used to meet in Arlington.

Where did all these sediments come from?

Picture the deepest part of the ocean today—the Marianas Trench in the North Pacific Ocean. The

Main rock types near Great Falls. **Left:** *Metagraywacke shows the bedding of sands laid down following an ancient undersea debris flow. Later tectonic forces buckled the parallel layers and filled cracks with silica-rich hydrothermal liquids that left veins and nodes of milky quartz.* **Right:** *Schist shows the parallel platy mineral layers formed from fine-grained sedimentary rock under tremendous tectonic heat and pressure.*
Sources: Bentley (2013); Ball (2014).

Marianas, a chain of volcanic islands, get more than a hundred earthquakes each year, and every tremor can send debris sliding into the trench—silts, sands, rocks, boulders, even entire cliffs. The earthquakes are associated with rising magma that can intrude into fissures in the rock, cooling underground to form vertical and horizontal sheets of basalt (dikes and sills).

We live on the eastern edge of the Piedmont geologic province, with the bedrock well exposed along our rivers and streams, especially at Great Falls. Six hundred million years ago, the materials for our local bedrock were in a trench like the Marianas. As the materials piled up, they hardened into layers of sedimentary rock—mudstone, siltstone, shale, and graywacke, some containing pieces of older rock. Magma intruded the rock layers, forming sills of basalt.

A geologic map of Mather Gorge shows the main rock types near Great Falls, all metamorphic (fig. 1): bands of schist/gneiss (gray on the map) alternate with bands of metagraywacke (brown on the map). Along the southern part of Mather Gorge (not shown on the map) are narrow bands of amphibolite—metamorphosed sills of basalt. Other metamorphic members of the Mather Gorge Formation not shown on the map include phyllite, formed from siltstone at relatively low heat and pressure; and migmatite, formed when the heat and pressure were so high that the rock partially melted before recrystallizing upon cooling.

Amphibolite from Mather Gorge. Metamorphosed from basalt, amphibolite is rich in hornblende and plagioclase feldspar. Source: Gigapan (Robin Rohrback).

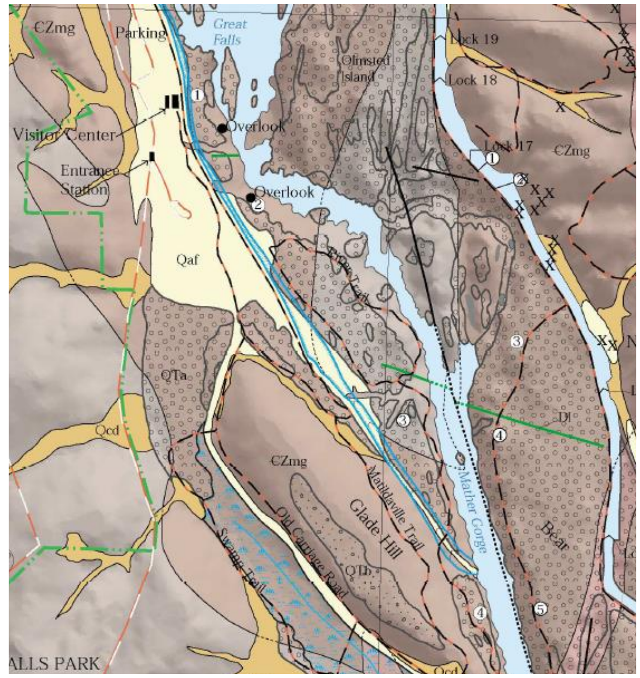


Figure 1—*Detail of a geologic map of Mather Gorge on the Potomac River, showing Great Falls (top), Mather Gorge, and the C&O Canal (right). Gray (CZs) = schist/gneiss; brown (CZmg) = metagraywacke; patterns/yellow/gold = alluvial deposits; C = Cambrian; Z = Proterozoic. Source: Southworth and Fingeret (2000).*

All of these metamorphic rocks originated as sedimentary or igneous rocks in the same deepsea environment more than half a billion years ago.

So how did the deepsea rocks get onto dry land?

Plate Tectonics

That's where the tectonic forces come in. The Earth is mainly made up of molten matter with a solid core (fig. 2). Floating on the Earth's molten mantle (a term related to German *Mantel*, meaning coat or cloak) are solid pieces of rocky crust, the Earth's "lithosphere" (sphere of rock). The pieces are called plates, and convection currents in the superheated mantle drive the plates as upwelling magma forms new rock and as ancient rock sinks into the mantle to break up.

Figure 2 shows plates divided by a midoceanic ridge, where upwelling lava pushes them apart. As the edges of the heavier oceanic plates dive under the lighter continental plates, they pull the plates behind them into the mantle. Under the continental crust, the convection currents that move the viscous and sticky

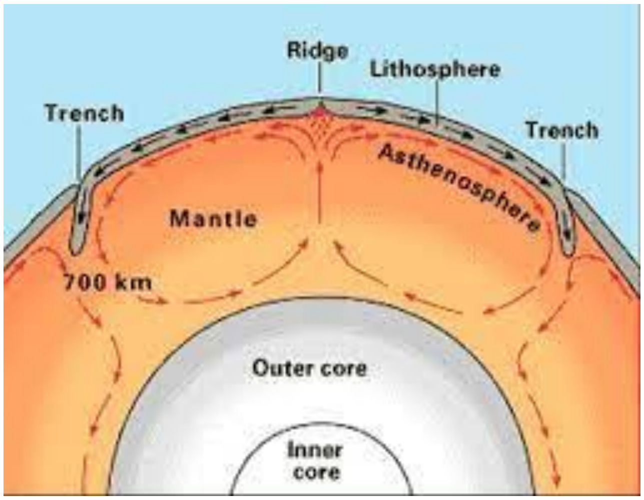


Figure 2—*Cross-section of the Earth showing convection currents in the mantle under the lithosphere. The currents push oceanic plates and pull continental plates into collisions, with the heavier oceanic plates diving under the continental plates and sinking into the mantle to melt. Source: [No author] [No date].*

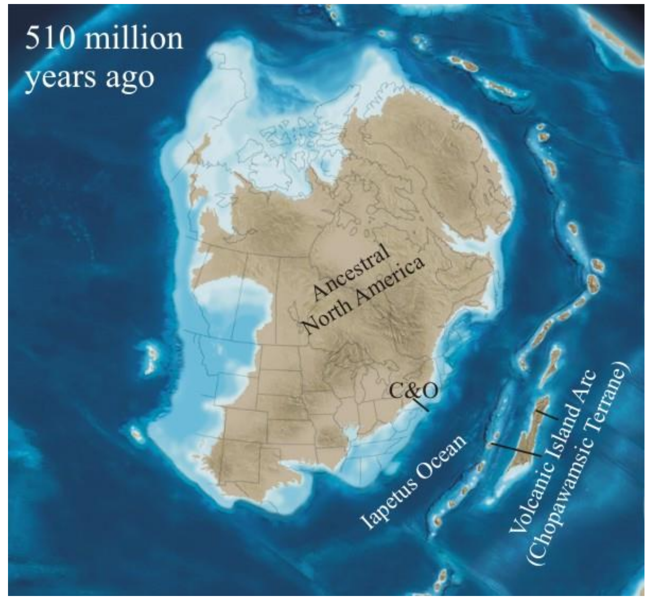


Figure 3—*Depiction of Cambrian proto-North America, with the Taconic Terrane (a "microcontinent" with a volcanic island arc) approaching what is now the eastern seaboard. Source: Blakey (n.d.).*

magma drag the overlying plates along. Convection transports the plates into mutual collisions that shape new land masses while forming volcanoes and building mountains—hence the term "tectonic plates" (from Greek *tektonikos*, "pertaining to building").

Taconic Orogeny

Half a billion years ago, the deepsea trench containing the Mather Gorge sediments was at the leading edge of a line of islands, much like the Marianas, the Antilles in the Caribbean Sea, and other archipelagos around the world today. Known by geologists as the Taconic (or Chopawamsic) Terrane, the main island was a relatively large "microcontinent" approaching proto-North America across the Iapetus Ocean (fig. 3), predecessor of the Atlantic.

At the time, the area of Great Falls was undersea and the continental bedrock was granite. The continental plate was heavier than the Taconic Terrane, so it formed a ramp descending into the mantle (fig. 4, top). As the terrane approached, the melting crust sent magma rising to the surface, where it formed an arc of volcanic islands with the deepsea trench ahead of it—the perfect environment for the Mather Gorge sediments.

About 450 million years ago, the approaching Taconic Terrane collided with proto-North America (fig. 4,

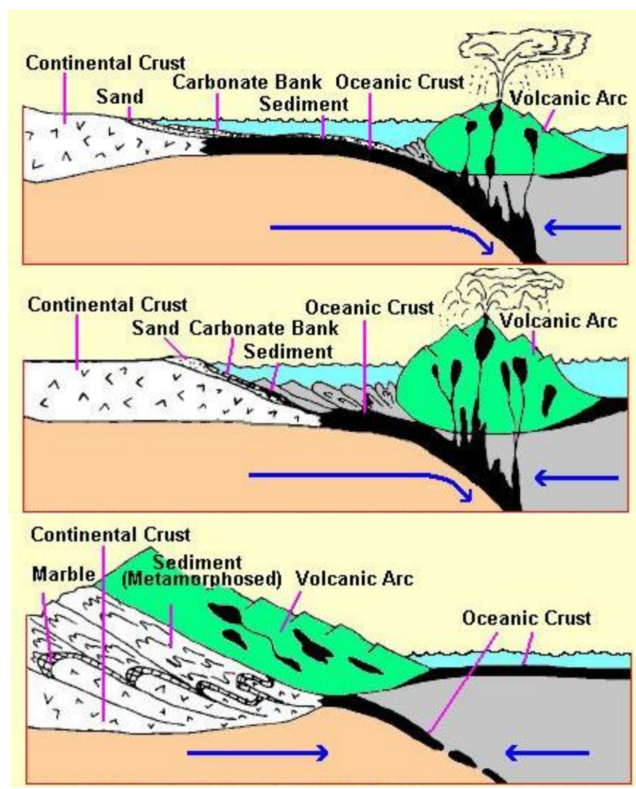


Figure 4—*The Taconic Orogeny (mountain-building event), about 500-430 million years ago. The approaching island arc pushed trench sediments onto the continental bedrock and formed mountains over them. Source: Wikipedia.*

middle). The collision pushed the deepsea rocks up onto the continental bedrock. The tremendous heat and pressure folded and faulted the rock layers as the island masses rode up over them, initiating metamorphism (fig. 4, bottom). Ahead of the rising mountains, the collision warped the basement rock downward, forming a great foreland basin (initially flooded).

Mountain ranges never last long in geologic time. Within 10 to 20 million years, the Taconic Mountains were gone, eroded away by rivers that filled the foreland basin with silts and sands visible today in the sedimentary rocks of Massanutten Mountain, North Mountain, Seneca Rocks, and other ridges west of the Blue Ridge Mountains.

Alleghanian Orogeny

For the sake of simplicity, let's skip over the next collision of a terrane (the Avalon or Acadian) with proto-North America and go straight to the collision of continents about 320 million years ago that formed the supercontinent Pangaea (fig. 5). The continental collision closed the Iapetus Ocean, with the heavier proto-North American crust again forming a ramp (fig. 6), this time for the oncoming proto-African land mass. As the crust sank into the mantle and melted, rising magma again formed a line of volcanoes, this time at the edge of proto-Africa. Metarhyolites in the Blue Ridge today originated as volcanic ash from the Alleghanian and earlier orogenies.

As the African continental plate rode up over the continental edge of proto-North America, the tremendous heat and pressure displaced the underlying rocks (fig. 6), moving them great distances and forming the Blue Ridge and Piedmont geologic provinces. Old sutures associated with the Taconic Terrane and old faults along the ancient continental edge caused large sheets of rock to detach and slide westward along great, nearly horizontal thrust faults. Parts of the Taconic Terrane moved inland, forming belts of metasedimentary rock in what is now the Piedmont Province. The thinned and stretched granite basement rocks at the old continental margin also broke free. Together with overlying rocks, they moved inland ahead of the Taconic Terrane rocks to form the Blue Ridge Province.

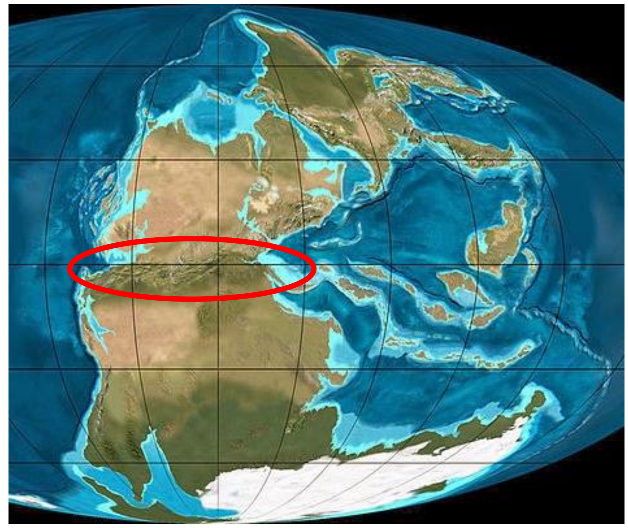


Figure 5—*Depiction of the supercontinent Pangaea about 300 million years ago. Our area was buried under the great Alleghanian mountain chain (circled) between proto-North America (above) and proto-Africa (below). Source: Blakey (n.d).*

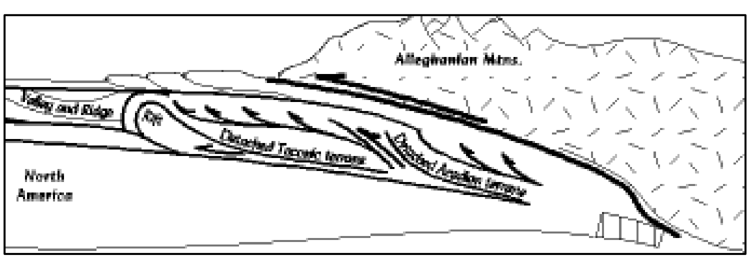


Figure 6—*The Alleghanian Orogeny, about 300 million years ago (during the late Paleozoic era). As proto-Africa rode up over proto-North America, massive thrust faulting pushed Taconic rocks and granite basement rocks westward while folding the flat sedimentary rocks beyond. Source: Fichter and Baedke (1999).*

Proto-Africa buried the Blue Ridge and Piedmont rocks under a mountain range as high as the Himalayas today (fig. 5). Over millions of years, the Alleghanian Orogeny subjected the underlying rocks to tremendous heat and pressure, completing their metamorphism. Silica-rich hydrothermal liquids filled crevices in the folding and fracturing rock, precipitating out veins, nodes, and masses of quartz.

During the Alleghanian and earlier mountain-building events, rising magma formed dikes in faults between rock layers. The magma hardened into lamprophyre, a relatively uncommon intrusive igneous rock high in biotite and orthoclase feldspar. The lamprophyre weathers more easily than the surrounding metamorphic rock, so erosion has formed deeply incised, nearly vertical gaps in the cliffs of Mather Gorge (fig. 7).

Depending on the makeup of the sedimentary layers in the ancient deepsea trench, the same boulder in Mather Gorge can contain both metagraywacke and schist (fig. 8). Both can mirror the effects of subse-

Figure 7—*Lamprophyre dikes, steeply dipping (left), in metagraywacke on the Maryland side of Mather Gorge. The dikes are recessed in the surrounding metamorphic rock because lamprophyre (right, the brown rock) is more erodible. Source: Gigapan.*

quent tectonic pressure in folds and fractures in their bedding or layers, including their veins of quartz.

The Alleghanian Mountains weathered away within a few tens of million years, leaving a flat and featureless plain. Pangaea began to break up about 230 million years ago, reshaping the western Piedmont in the process but leaving the Mather Gorge rocks intact.

So the story of Great Falls begins in a deepsea trench about 600 million years ago and ends with the dramatic exposure of the rocks by the river within the last 2 to 3 million years.

Next: How did the Potomac River cut through the rocks at Great Falls and Mather Gorge?

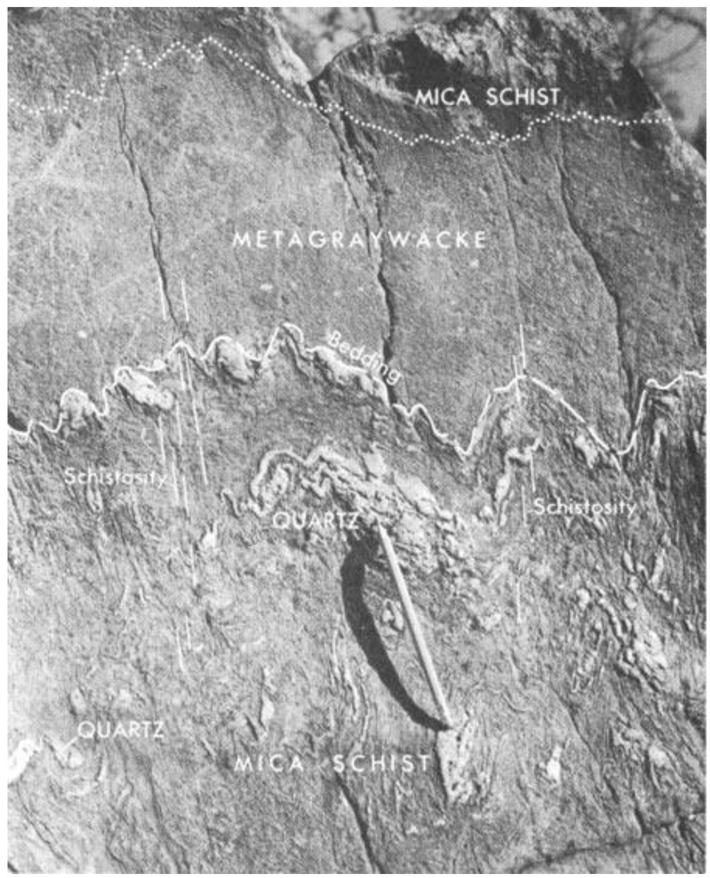


Figure 8—*Metagraywacke (middle) and schist (top and bottom) near Great Falls. The grains in the metagraywacke are larger towards the bottom, having settled out first following an ancient debris slide. Heat and pressure created parallel lines of "schistosity" in finer grained sedimentary rock (bottom), along with lines of white quartz that filled cracks in the rock. Source: Reed and others (1980).*

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January 2022—Upcoming Events in Our Area/Region (see details below)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1 New Year's Day
2	3	4	5 MSDC mtg	6	7	8
9	10 GLMSMC mtg	11	12	13	14	15
16	17 Martin Luther King Day	18	19	20	21	22
23	24 NVMC mtg	25	26 MNCA mtg	27	28	29
30	31					

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.

Event Details

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/.

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

26: Arlington, VA—Micromineralogists of the National Capital Area; info: http://www.dcmicrominerals.org/.

THE NORTHERN VIRGINIA MINERAL CLUB INC

Crystals are the flowers of the Mineral Kingdom

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The Northern Virginia Mineral Club

Visitors are always welcome at our club meetings!

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RENEW YOUR MEMBERSHIP!

SEND YOUR DUES TO:

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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.*