THE NORTHERN VIRGINIA MINERAL CLUB INC

The Mineral Newsletter

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

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



Brookite

from Kharan, Balochistan, Pakistan

Source: Wikipedia. *Photo: Rob Lavinsky.*

Deadline for Submissions

April 20

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

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April 2025
Explore our website! Find us on Facebook!

April Meeting Program:

Spring Club Auction

Details on page 11.

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Mineral of the Month
Brookite

by Sue Marcus

Have you ever started a project and then wondered why you chose it? When I started researching April's Mineral of the Month, I wondered why I chose brookite. It is found in so many different localities, even though only a few have produced fine macroscopic specimens (micromounters have more options). I will have to limit this article to the highlights.

Mineral Name

Serve-Dieu Abailard Lévy, also known as Armand, first described the mineral in 1825 and named it for Henry James Brooke. Lévy was a French mineralogist and mathematician. He was particularly interested in crystal structure and described several new minerals.

While living in England, he probably met Brooke, who was also interested in crystallography. Brooke sounds like an interesting person, having had successive careers in Spanish wool, South American mining, and the actuarial business. Though without formal geological training, Brooke was knowledgeable enough to discover and name 12 mineral species.

The type locality for brookite is in Gwynedd, Wales. It has the tongue-twisting Welsh name Twll Maen Grisial, Fron Olau, Prenteg, Dolbenmaen.

Polymorphs

Brookite is one of several minerals (polymorphs) with the same chemical formula (titanium oxide, TiO_2). Brookite forms at temperatures below 750 °C with orthorhombic crystals. By contrast, the polymorphs anatase and rutile form tetragonal crystals. Anatase, like brookite, forms at low temperatures but at lower pressures than brookite; rutile requires higher temperatures and pressures to crystallize. All three polymorphs can occur near each other when, for example, an igneous dike (with high temperature and pressure) containing rutile penetrates cooler rocks containing anatase and brookite.

Titanium dioxide has 12 polymorphs, according to Wikipedia; all but anatase, brookite, and rutile are very rare. They include akaogiite and riesite, both found at the Ries meteorite impact structure in Germany. Mindat lists only five polymorphs of titanium dioxide; in addition to anatase, brookite, and rutile, it designates the polymorphs UM1991-08-O:Ti and UM2000-41-O:Ti (TiO2-II).

Happy Easter!

Northern Virginia Mineral Club members,

Four junior club members volunteered to give hobby-related presentations at our March meeting, but the meeting had to be remote so we couldn't invite them to dinner beforehand. Please join them for dinner instead on April 7 at 5:15 p.m. at:

BJ's Restaurant & Brewhouse
8027 Leesburg Pike, Suite 100, Vienna, VA
Phone: 703-356-7305

Reservations are under Craig Moore, Vice President, NVMC. If you plan to attend, please email Craig at vicepresident@novamineral.club by noon on the day of the meeting.



Brookite, Magnet Cove, Hot Spring County, Arkansas. Source: Mindat; photo: Jerry Cone.

Geologic Settings

Of the many brookite localities, two are (or were) the most productive: Magnet Cove in Arkansas and Balochistan in Pakistan. The geologic settings at these two localities are very different, resulting in distinctively different forms of brookite. The volcanic origin of brookite in Arkansas differs from the tectonic origin of brookite in Pakistan.

At Magnet Cove, fine-grained silica-rich sedimentary rocks were altered by volcanic intrusive rocks, producing black metallic to submetallic pseudoctoahedral brookite crystals. Weathering has eroded the host rocks, so brookite crystals can be found in soft residual clay.

Most brookite found in the rest of the world, including the finest transparent brookite crystals from Pakistan, formed in so-called Alpine clefts (which occur not just in the Alps). As a mass of rock is pulled apart by tectonic forces, the surface area increases. Under the stress of deformation, with increased pressures and temperatures, the rock develops parallel fissures. These clefts can be filled with minerals (quartz and more) as the mountain-building forces drive fluids from the surrounding rocks and often add fluids from distant igneous intrusive bodies.

In the Alps, most Alpine clefts formed during Alpine orogenesis about 25-15 million years ago. At temperatures below 500 °C, rocks like gneiss, schist, and amphibolite tend to become brittle due to tectonic deformation, forming fissures open to circulating fluids; at temperatures of 100-600 °C, crystals start to grow in the fissures.

The same geologic processes formed mineralized clefts in many other parts of the world, giving collectors excellent opportunities to find brookite and many other minerals. The Alpine-cleft brookite forms thin, bladed crystals. However, most localities other than in Balochistan produced only a few microcrystals, sometimes all reported by the same person.

Localities

United States. Magnet Cove, AR, is a famous mineral collecting locality in the eastern United States, as noted on the official Arkansas tourism website. Hundreds of millions of years ago, volcanic activity produced gases (volatile components) that exploded from a volcanic structure, which then subsided and was intruded by igneous dikes, forming a ring-dike complex. The volcanic structure emerged through sedimentary rocks of upper Devonian and Mississippian ages, creating a physiographic basin. The structural geology of the area is defined as a series of synclines and anticlines within a larger syncline. Intrusive rocks composed of Mesozoic nepheline syenite, with lesser amounts of carbonatite, phonolite, and ijolite, penetrated the sedimentary rocks. All of these rock types are unusual because they are low in silica.



Brookite, Magnet Cove, Hot Spring County, Arkansas. Source: Mindat; photo: Rock Currier.

In some parts of the Magnet Cove complex, brookite crystals were occasionally subjected to increased temperatures and pressures, causing rutile paramorphs after brookite. Brookite, rutile, and molybdenite form veins in both the ring-dike complex and in the contact zone around it.

Mining for magnetite (iron), titanium, vanadium, rutile, barite, and other minerals, usually at separate deposits defined by their specific geologic environments, brought collectors to the area starting in the



Brookite, Magnet Cove, Hot Spring County, Arkansas. Source: Mindat; photo: Stephan Wolfsried.

1850s, with brookite reportedly found prior to 1850. New minerals were discovered and described here, increasing the enthusiasm of collectors.

In 1946, titanium was classified as a strategic mineral. Subsequently, the U.S. Bureau of Mines drilled test holes in some of the Magnet Cove deposits to help determine the feasibility of mining rutile and brookite. They were sufficiently abundant to be extracted for titanium, although mining was never extensive or of long duration.

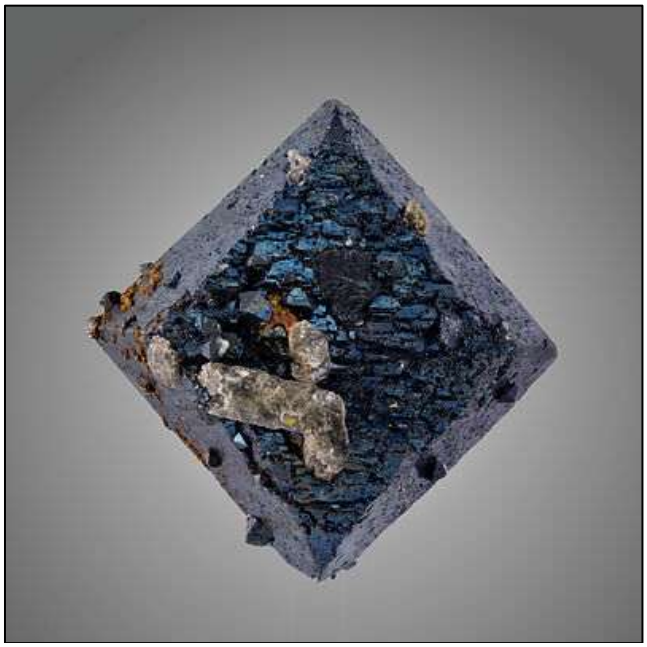
Brookite from Magnet Cove is typically opaque black, forming pseudoctahedral crystals. Some are lustrous and metallic to submetallic, though many show small etched pits on the crystal faces. Many crystals are doubly terminated.

A publication on Magnet Cove by Fryklund and Holbrook (1950) is still the most comprehensive report on the area's titanium deposits. The Rutherford Mine (or deposit), also known as the Moses Hill, Cemetery, or Miller deposit, is the premier source of Magnet Cove brookite specimens. Crystals up to 1.5 centimeters (0.6 in) in size have been recovered. At the time of the 1950 report, most of the brookite-quartz float (surface material) was found around a house on the top of a hill.

The Hayes-Walsh workings, also called the Kilpatrick and Adams Mine, was another source of Magnet Cove brookite. Most was fine-grained (1-millimeter (0.04-in)) grains in residual clay. Weathering of the original titanium sources—intrusives and novaculite—concentrated the titanium minerals. (Novaculite is an extremely fine-grained (cryptocrystalline) siliceous rock formed from marine organisms like foraminifera. Also called Arkansas stone, it is a type of chert or flint that can be used for arrow or spear points or as a whetstone to sharpen other materials.)

Frylund and Holbrook (1950) found that "large" brookite crystals (0.2 centimeters (0.08 in) in size) at the property were associated with clay in veins up to 8 feet (2.4 m) wide containing smoky quartz. The authors suggested that brookite formation preceded quartz formation because brookite crystals were included in some quartz crystals. The quartz was recrystallized, incorporating some of the brookite, with other brookite crystals perched on or partly embedded in the quartz. They also mentioned "coarse brookite," implying that massive brookite also occurs at this site, probably in limited amounts. Rutile and tainiolite are accessory minerals at the Hardy-Walsh property.

Mineralization at the Christy deposit is similar to that at Rutherford. At Christy, loose brookite crystals, usually pseudoctohedral, are found in residual clay. Quartz crystals are sometimes adorned with brookite



Brookite, Rutherford deposit, Magnet Cove, Hot Spring County, Arkansas. Source: Mindat; photo: Eugene and Sharon Cisneros.

crystals. Subeconomic titanium ore consisting mostly of brookite is hosted by novaculite. Some of the novaculite has been altered and recrystallized during metamorphic events and intrusions, becoming more porous. Other parts of this unit recrystallized into hard, fine-grained material.

Frylund and Holbrook (1950) separated the Christy deposit into two ore types. One type is residual, formed by weathering and erosion; it extends from the surface to about 20 feet (6 m) deep. Brookite occurs here as loose crystals in the residual clay.

The other ore type, called primary ore, is also weathered in places but retains the original geologic structural features. The primary ore zone, which underlies the residual zone, has pyrite and pyrite altered to limonite and then to iron-rich clays. Euhedral to subhedral brookite crystals are included in quartz or might be attached to the exterior of quartz crystals. Rutile paramorphs after brookite are reported from the Christy deposit. Molybdenite is associated with brookite at the locality, although not in abundance. Brookite is the main ore mineral in both ore types.

Small, beautiful brookite crystals have been found at the Mo-Ti Corporation prospect. These lustrous, opaque black crystals grew to at least 1.2 centimeters (0.5 in) in size. Many fine crystals were extracted by Clyde Hardin from about 1984 to 1992. Apparently, brookite was replaced by molybdenite, although no pseudomorphs of this type are known. The replacement was likely localized and might have been fine-grained or massive material. Brookite was also reported in a feldspar vein, again without details.



Brookite with quartz and pyrite, Melbybråten, Øystre Slidre, Innlandet, Norway. Source: Mindat; photo: O.T. Ljøstad.



Brookite on pyrite, Mo-Ti Corporation deposit, Magnet Cove, Hot Spring County, Arkansas. Source: Mindat; photo: Kelly Nash.

Brookite occurs at other places near Magnet Cove. The presence of novaculite or syenite—or, even better, a contact zone between those two rock types—would be a good place to look for brookite. Brookite has been found in roadcuts, so they are worth a look if it is legal and safe. Because single brookite crystals can weather out of the host rock and roll downhill, stream beds or the bottoms of slopes would also be good places to search.

Brookite is also found at several other U.S. localities, although specimens are never abundant and are usually microcrystals. At the Buckwheat Dump in Franklin, NJ, brookite micromounts range from deep red to iridescent and submetallic. A few deep-red brookite micros were collected in Somerville, MA. At the Beilke Quarry in Wisconsin, microcrystals of reddish brookite occur in rotten granite, an unusual geologic setting. Lovely transparent, orange-yellowish brookite crystals were found near Hansen Creek in the Snoqualmie Mountains of King County, WA.

Norway. Norway has several small quarries where brookite crystals have been found, including beautiful transparent smoky-quartz-colored single crystals up to 1.3 centimeters (0.5 in) in size. Localities include the Delebekken Quarry, Nibbenut, and Hattfjelldal. My favorite Norwegian brookite crystal is a transpar-

ent rich brown crystal with internal dark shadows (shown on the previous page).

England and Wales. The Shap Pink Quarry is an active granite quarry in Cumbria, a lovely hilly to mountainous region in northwest England. Attractive yellow-brown microcrystals of brookite up to 0.5 centimeters (0.2 in) in size were found there, sometimes with anatase and rutile—a titanium dioxide trifecta. Most specimens seem to have been collected in the early 2000s.

At the type locality, Twll Maen Grisial, in Gwynedd, Wales, brookite crystals associated with quartz grew up to about 0.8 centimeters (0.3 in) in size. Buyer beware! A collector who posted brookite images from this locality on Mindat found that many brookite crystals from this place have been artificially attached to the matrix. Even 19th-century specimens were found to have brookite crystals, often single crystals, cleverly affixed to the matrix with the adhesion point disguised by crumbled and glued matrix material.

France. Thin olive-brown to submetallic brookite microcrystals from Jarrier, a commune (municipality) near Savoie, are almost square in two dimensions. Many of the brookite crystals from this locality that are posted on Mindat exhibit striations. Some crystals are doubly terminated, and some show internal phantoms. Brookite from this locality, which is called Les Crevasses, was found in quartz veinlets in granite. The variations in crystal morphology and internal structures would make a fascinating study of these lovely brookites.

Microscopic yellow-brown brookite crystals were found at the La Lande crushed rock quarry in Brittany. The quarry closed in 2022 and a power plant might have been erected on the site, probably preventing further collecting. Similar microcrystals of red-brown to honey-yellow brookite were found near Le Fraysse, Occitaine, in 2010 and 2011.

Spain. I don't think of Spain when I think of the Alps, but brookite occurs in the Alpine cleft environment in Spain. Prospecting roadcuts during construction of the Adra-Motril highway led to the excavation of some unique and exquisite brookite micromounts. The most interesting crystals form yellow-brown to orange penetration twins or small rosettes, unlike brookite crystals found elsewhere. Terminated single crystals were also found, although all specimens shown on Mindat are micros.



Brookite, Jarrier, Saint-Jean-de-Maurienne, Savoie, France. Source: Mindat; photo: Matteo Chinellato.

Austria. Microcrystals of brookite have been found near Salzburg. They are usually tabular but less frequently elongated. Colors vary widely from bright orange through brown, and striations are often evident. Brookite has been reported from more than half a dozen quarries, mines, and other places near Salzburg, including an arsenic mine, the Kaiserer Quarry, a diabase quarry, the Lohninger Quarry, the Leffler Source, the Hopffeldboden, the Wildenkarwald, and the Plattenkogel north slope. However, no locality was notably prolific, and all brookite found consisted of microcrystals. Moreover, there is likely a "reporting bias," meaning that the number of localities is due to the number of collectors posting images of their discoveries on Mindat rather than an unusual abundance of brookite.

Switzerland. Swiss brookites were, not surprisingly, formed in Alpine clefts. Near Elm, in the Glarus canton, reddish-brown crystals occur with colorless quartz. Saphira Minerals had gorgeous specimens of quartz and brookite from this locality, with brookite crystals reaching 0.5 centimeter (0.2 in) in size. They featured internal dark shadows. Lucky collectors at the Tête Noire locality near Martigny found tiny transparent brookite crystals with colors ranging from pale yellow-brown through brown to reddish-brown treated. Like at other Swiss collecting sites, the brookite formed together with quartz in Alpine clefts.

Italy. Italy has several brookite localities. Mt. Bregaceto in Borzonasca, Genoa, Liguria, is probably the most prolific producer of brookite crystals. Brookite crystals here have more orange hues than at many other localities, almost the bright orange of wulfenite.



Brookite, Mt. Bregaceto, Borzonasca, Genoa, Italy. Source: Mindat; photo: Matteo Chinellato.



Brookite, Mt. Bregaceto, Borzonasca, Genoa, Italy. Source: Mindat; photo: Eugene and Sharon Cisneros.

Other brookite crystals from Mt Bregaceto appear light brown or reddish. Based on Mindat images, most specimens are micromounts, although larger matrix specimens were also collected. One is thumbnail-size (2.54 square centimeters (1 in^2)) and studded with beautiful transparent light-orange brookite blades up to 0.6 centimeters (0.2 in) in size on what might be white quartz. Another matrix specimen, large for this locality, is 13 centimeters (5.1 in) long, with a single brookite crystal 3.2 centimeters (1.3 in) long—a whopping sample.

Excavation for the Luigi Einaudi hydroelectric power station near Entracque in the Italian Alps required removing part of Monte Ray. Luckily for mineral collectors, construction uncovered veinlets and clefts with interesting minerals. Some collecting seems to have been done in place from the excavated rock dumped onto the surface. Most of the crystals, including brookite, were suitable for micromounts.

Mostly microcrystals of brookite have been found near the Italian alpine glaciers of Estellette and Triolet, both on Mont Blanc in Italy's Piedmont Province. Bussoleno, a commune (municipality) near Turin, has yielded yellow-brown brookite crystals on matrix specimens that reach at least 3 centimeters (1.2 in) in size, possibly larger. These brookites are arrow-shaped with pointed terminations, unlike the terminations on brookite from other localities. The collecting site is an outcrop near San Gregorio Chapel. Also in the Piedmont, red and honey-yellow brookite microcrystals were extracted near Formazza.

Microcrystals of brookite have been collected at various sites around Bologna, Italy. These lovely but tiny crystals are usually 1 millimeter (0.04 in) in size. Larger crystals, up to 0.2 centimeters (0.08 in) in size, were occasionally found.

Pakistan. Balochistan, Pakistan's largest province, has produced brookite crystals that are probably the finest in the world. Elongated blades of brookite crystals can be transparent reddish-brown in transmitted light (backlit). Crystals can extend up to 7 centimeters (2.6 in) in length, and some of the best are nicely contrasted with white quartz or albite.

Some brookite crystals from Balochistan have an interesting feature shared with a few crystals from other sites. Dark "shadows" within the crystals are not precisely symmetrical but show some mirroring, most frequently along the c-axis (vertical axis). These areas are linked to niobium replacing titanium in the brookite crystal lattice—not enough to change the overall chemistry or the mineral species, but enough to be seen. Specifically, niobium ions (Nb5+) replace titanium ions (Ti4+) in the brookite crystal lattice, which changes the ionic state of the titanium. The changed



Brookite, Kharan District, Balochistan, Pakistan. Source: Mindat; photo: Dan Weinrich.



Brookite on quartz, Zard Mountain, Kharan District, Balochistan, Pakistan. Source: Mindat; photo: Martin Gruell.

brookite crystal growth pattern shows up as dark shadows. The quasi-symmetry is caused by niobium's preference for growing along the c-axis of the brookite as it crystallizes (F. Mersch, pers. comm., March 12, 2025).

The Kharan District is the generalized locality for many Balochistan specimens; within it, Zard Mountain seems to be a significant source of brookite specimens. One Zard Mountain specimen of quartz and brookite shown on Mindat measured 8 centimeters (3.1 in) long. Single brookite crystals grew up to 5 centimeters (2 in) long.

A 7.2-centimeter-long (2.8-in-long) single crystal, with the generalized Kharan District cited as the locality, was shown on a dealer's website. Rob Lavinsky notes that there are two separate mines named Nausherwani in Kharan District, run by two brothers with that last name. One mine is near Zard and the other near Char Kohan.

At the Zard deposit, a 20-centimeter (7.9-in) plate studded with transparent euhedral brookite crystals was found in 2010. At the Char Kohan deposit (a quartz mine), beautiful red-brown brookite blades grew up to 3.6 centimeters (1.4 in) in size, and clusters of brookite and quartz crystals up to at least 11.1 centimeters (4.4 in) in size were extracted.

Near Taftan in Baluchistan's Chagai District, fine specimens of transparent brookite and colorless quartz crystals formed specimens up to at least 10.7 centimeters (4.2 in) across. Separately, individual brookite crystals from this locality grew to at least 4.2 centimeters (1.9 in) in size. That's huge for brookite crystals from this geologic environment.

Lustrous brookite with clear quartz crystals from Dalbandin, also in the Chagai District, are similar to those from Taftan. Some Dalbandin specimens shown on Mindat also exhibit the dark shadows described above.

To me, brookite crystals from Zard Mountain are the most exquisite of all due to their transparency and their internal dark shadows.

Russia. Perhaps the largest Russian brookite crystal is a 3.3-centimeter (1.3-in) brown single crystal from the Ural Mountains. The locality seems to comprise a vein or veins running through metamorphosed rock. This assessment is based on the other minerals found here—beryl, including emerald, large quartz crystals, tourmalinated quartz, and anatase, along with the quartz-albite-braunite schist, cassiterite, rhodonite, and jadeite. It is also possible that the brookite locality is different from the areas where the other minerals



Brookite, Dodo Mine, Saranpaul, Berezovo District, Russia. Source: Mindat; photo: Rob Lavinsky.

were found because Polar Ural Mountains is the generalized Mindat location for all these minerals.

The Dodo Mine in Russia's Subpolar Mountains near the village of Neroika produced fine brookite crystals up to 3.6 centimeters (1.4 in) in size, with specimens up to at least 10.2 centimeters (4.0 in). At this locality, brookite occurs with quartz, with the quartz crystals doubly terminated in some specimens. Some brookite crystals are also doubly terminated. These attractive specimens would be a nice addition to any collection. They were found in the 1980s through 2000, so finding specimens for sale might be difficult.

Small macroscopic brookite crystals have been found in the Khambo Mountains of Western Siberia's Khanty-Mansi Autonomous Okrug. Like some Pakistani specimens, they typically have dark shadows caused by irregularities in the internal crystal structure. Khambo Mountains brookite crystals grew to at least 1 centimeter (0.4 in) in size.

Other Countries. Brookite specimens, mostly as microminerals, have been found in additional countries ranging from Australia to Canada, Japan, and Madagascar.



Brookite on lorenzenite, Poudrette Quarry, Mont-Saint-Hilaire, Quebec, Canada. Source: Mindat; photo: Stephan Wolfsried.

Economic Uses

Brookite contains titanium, primarily used in paints and papers as a whitening agent. Although brookite can be mined as a titanium ore, other titanium-bearing minerals are currently the main titanium ores because they are much more abundant and concentrated than brookite.

Gems

Brookite can be faceted, but it is a relatively unattractive gemstone. Cut brookite is more of a novelty than a stunning gem because the cut stones lack brilliance. Most faceted brookite is brown to orange-brown with dark inclusions or shadows, indicating a likely Pakistani origin. Faceted brookite is affordable, starting at $7 or best offer (plus $10 shipping) for a 0.56-carat stone I saw online on March 21, 2025.

Prices

Brookite prices varied greatly when I looked them up online on March 21, 2025. At the lower end, $11 bought 0.5-1 centimeter (0.2-0.4 in) opaque black single crystals from Magnet Cove; or, for $13, you could buy pretty single crystals, probably from Pakistan. Remember, buyer beware of faked specimens with brookite crystals glued onto matrix! At the high

end of the price range, Fine Art Minerals offered a $3,600-priced specimen about 7 centimeters (2.8 in) long, a single orange crystal from Pakistan.

Technical Details

Chemical formula .....TiO_2
Crystal form.....Orthorhombic
Hardness.....5.5-6
Specific gravity.....4.08-4.18 (measured)
Color .....Black, reddish-brown, brown, orange to yellow
Streak .....White to offwhite (grayish or yellowish-white)
Cleavage.....Poor
Fracture .....Irregular to sub-conchoidal
Luster .....Metallic, submetallic

Sources

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*Brookite. **Top:** Zard Mountain, Kharan District, Balochistan, Pakistan. **Bottom:** Buckwheat Dump, Franklin Mine, Franklin, NJ. Source: Mindat; photos: Jeff Scovill (top); Modris Baum (bottom).*

Club Member Rocks and Minerals Auction Coming Up!

April 7 Program



Our April club meeting will feature our spring club auction! Proceeds from the auction go into the Fred Schaefermeyer Scholarship Fund, which supports students in the field of geology.

Sellers should come early to set up. The meeting will start promptly at 7:30 p.m. We will quickly move through the business part of the meeting so we can get to the fun!

Sellers, come early to help set up the room and your items. Each auction item should be described on an individual bid slip (see page 25 for the forms—just print out as many pages as you need). Information on the bid slip should include:

- item number (your initials or other unique code followed by a sequence number);
- description;
- from (locality); and
- starting bid amount (lowest bid you will accept for sale—if not stated, the minimum bid is $2).

Also, use the summary sheet on page 26 to list all of your items for sale so that the club treasurer can record the final sales price and give you your money after the auction.

Bring guests or invite nonmembers who might be interested in rocks and minerals! Although only current club members are allowed to sell, the meeting and auction are open to all.

Please consider volunteering. The auctioneers, accountants, and runners are all volunteers—so help us out here, folks!

Bring small bills, bid early and often, and help us move on to the next item. We end promptly at 9 p.m. with unsold items returned to the owner.

**** Note Current Club Auction Rules ****

- Any member may offer up to 20 specimens or up to 4 flats for auction.
- Each flat is one auctionable item.



Specimen acquired by a lucky buyer at the fall 2024 NVMC club member auction.

- The club gets 15 percent of the purchase price; the remainder goes to the seller
- Anyone may donate items to the auction to fully benefit the club (no money goes back to the donor).
- The minimum bid is $2 on any item. The minimum increase is also $2. Bids higher than $20 increase by $5.
- We start with a silent auction to assess interest in each item for sale. So look carefully and start bidding. Items with multiple bids during the silent auction will be brought sooner to the actual (vocal) auction.

Winning bidders must pay for the item promptly at the close of the meeting with cash or check.





Meeting Summary
March 3 Club Meeting

by Almas Eftekhari, Secretary

President Jason Zeibel turned the March NVMC meeting from in-person into online-only because the Zeibel household had the flu.

Members discussed the possibility of starting meetings half an hour earlier to give people time to socialize beforehand. We will try it for the April meeting, with light refreshments and chitchat starting at 7 p.m., with the auction beginning at 7:30.

Jason asked whether anyone had problems with the emails or links he'd recently sent out; hopefully, our ongoing tech issues will be resolved soon. He urged members to bring any outstanding dues or membership applications to the April meeting. You can also mail a check to our treasurer, Roger Haskins (see the directions on the last page of this newsletter).

Our meeting on April 7 will feature our Spring Club Auction, which will be in-person only (no Zoom available). Bring your unwanted specimens to put up for bid. We will also be taking our four youth speakers to dinner beforehand (details on page 2).

Jason invited visitors to introduce themselves; a 14-year-old mineral collector named Christian Callahan did so.

Jason invited members to order name tags from him if they wanted, then bring $15 in cash or a check made out to the Northern Virginia Mineral Club to the April 7 meeting. He also called on members to volunteer for the various club positions outlined in his article below on page 15, and he discussed the possibility of having a club directory with member contact information. He invited members to submit articles for publication in our newsletter by emailing them to editor@novamineral.club.

Katy Johnson, our field trip co-chair, announced a field trip on March 22 to Odessa, DE, for collecting petrified wood. She also announced a field trip to Accotink Gorge on April 19, 10 a.m. to noon, with details to come. She's planning another trip to the National Limestone Quarry in Pennsylvania on May 17.

Vice President Craig Moore discussed the possibility of Casper Voogt delivering a program on West Virginia trilobites in May or June, depending on his availability, and possibly even leading a corresponding field trip.



Figure 1—*NVMC junior member Maria Nopo with her award-winning pyrite display at the GLMSMC show in March. Maria gave a presentation on pyrites at the March NVMC meeting.*

Craig then introduced our three youth speakers (ages 21 and under). Our first speaker was Mickey Johnson (our field trip co-chair and a freshman at Fairfax High School), whose presentation was titled "Minerals of Fiction," specifically in the Marvel and Star Wars universes. The best known fictitious mineral in Star Wars is the kyber crystal. Extremely rare it is, used to power lightsabers and is found in death stars and desert planets. Minerals of Marvel include vibranium, which originated in meteors. Reflecting energy, it is used in starships, weapons, clothing, electronics, and shields.

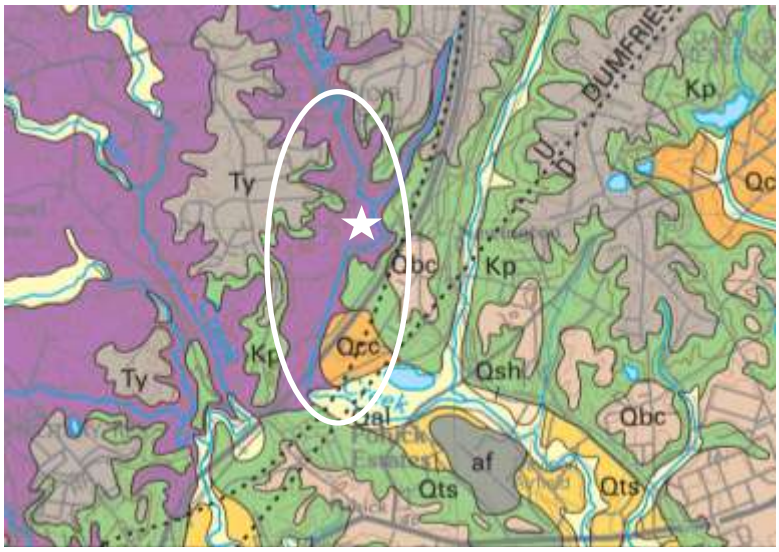
After Mickey, Maria Nopo gave a more traditional presentation on pyrite. Maria, a sophomore in high school in Maryland, started collecting minerals in kindergarten and wants to be a geologist when she grows up. She discussed "fool's gold," the varying crystallographic forms of pyrite, and pyrite localities popular with collectors. She also shared some details on her pyrite exhibit case at the Montgomery County show in March (fig. 1), closing out with pictures of her exhibit.

Our third speaker, Jason Krusling, is a junior at George Mason University, where he volunteered for our club show last November. Jason took us on a virtual field trip that he went on last summer with one of his friends. He traveled through 8 states and visited

13 mineral localities in 13 days before the start of fall semester, collecting primarily near Lake Superior and Herkimer, NY, and also joining us for the NVMC field trip to the National Limestone Quarry in Mt. Pleasant Mills, PA.

Our fourth speaker was supposed to be Celia Zeibel, who prepared a presentation on the geologic time periods of Mars. Unfortunately, she came down with the flu and was unable to join us. She plans to give her talk at a future club meeting.

All three presenters had much more to share; we recorded their presentations, which you can watch here. Hopefully, more junior members will be inspired to present at next year's youth night!



Detail from a USGS geologic map showing the approximate location of Accotink Gorge (star) in the Fall Line zone (circled) for Accotink Creek (blue line). Purple = Occoquan granite; green = Potomac Formation; other colors = later sediments (Tertiary/Quaternary).

Nature Walk in Accotink Gorge
April 19, 10 a.m. to noon

by Hutch Brown

A hidden gem in our area is little-known Accotink Gorge, where Accotink Creek crosses from the Piedmont onto the Coastal Plain, forming a counterpart to Great Falls on the Potomac River. Bordered by steep slopes, the creek has cut down to the bedrock in its Fall Line zone, forming a gorge in the hilly Piedmont before flowing onto the relatively flat Coastal Plain. The gorge is known for its exceptional biodiversity, including plants that are relatively rare in our area.

At 10 a.m. on Saturday, April 19, joined by members of the Fairfax Regional Master Naturalists, the NVMC will meet behind the Springfield Costco (at 7373 Boston Blvd.), where there is a gate in the fence just west of the loading dock. We will hike down to the creek and look for bedrock exposures, listen for birds, and watch for plants coming up in spring.

In particular, we will examine exposures of Occoquan granite, the bedrock type in the gorge, along with quartz fragments from veins and lenses in the granite. The medium- to coarse-grained Occoquan granite is rich in quartz and feldspars, with lesser amounts of epidote and micas (biotite and muscovite). Quartz and feldspar color most of the granite light gray, but high amounts of orthoclase feldspar can tinge it pink and biotite can turn it dark gray.

According to the USGS geologic map, the granite can have "a strong quartz-rod lineation and, in places, two foliations." We will see lineation in some granite exposures caused by tectonic pressure after it formed.

The granite was emplaced about 484 million years ago on the eve of the Taconian Orogeny, when a small tectonic plate collided with proto-North America. As the plate slid up over the continental plate, melting rock sent magma plumes to the surface, forming volcanic islands. Some plumes cooled deep underground, leaving huge bodies of granite that are now exposed. The Occoquan batholith intrudes the Piedmont's metamorphic rock (schists, phyllites, and so on), which formed during the Taconian mountain-building event. In southern Fairfax, Occoquan granite borders on the Coastal Plain, where it is overlain by Potomac Formation sediments left by ancient rivers up to about 140 million years ago.

The trails down into the gorge are short but rough and steep, so bring hiking sticks if you have them. Wear boots or sturdy shoes and long sleeves and pants to protect yourself from the undergrowth. Bring rock hammers, loupes, binoculars, and plenty of water.

Sources

Geocaching. No date. Occoquan granite earthcache.

Lyttle, P.T.; Aleinikoff, J.N.; Burton, W.C. [and others]. 2017. Geologic map of the Washington West 30' by 60' Quadrangle. Open file rep. 2017-1142. Reston, VA: USGS.



President's Message

by Jason Zeibel

Spring has clearly sprung in the Zeibel household. We have all manner of flowers in bloom, and the weather is warm, humid, and stormy! It makes me want to spend time outdoors gardening, hiking, and (of course) looking for interesting rocks.

Unfortunately for us and apparently for many of our friends in the area, this year has also seen the resurgence of respiratory diseases. Beginning in February, our house played host to both versions of influenza (flu A *and* flu B). One victim was the NVMC's in-person March meeting: several key NVMC participants were suffering from flu, so the board made the last-minute decision to pivot the March meeting to all-Zoom.

One of the few benefits from COVID was learning how to still have meetings despite the risk from illness. We discovered how to conduct our lives, engage with friends, and—yes—enjoy our hobbies from the comfort and safety of our own homes. Despite the deficiencies in this way of sharing community, it is—as they say—better than nothing.

Therefore, we all got to enjoy the club's first annual youth night in March, in spite of all the flu going around. We got to hear about the minerals of Star Wars, about hunting for pyrites, and about a 10-day road trip to collect minerals across several states (fig. 1). Many thanks to Mickey, Maria, and Jason for taking us in three different mineralogical directions all on the same night! If you missed the meeting, you can check out their presentations here.

Celia came down with the flu, however, so we missed out on her presentation on Martian plate tectonics. Look for that as a bonus addition to a future club meeting.

I tried my best just before the meeting to let everyone know it was going to be entirely virtual by sending out an email blast to everyone on our list. I also noted the change on our club's Facebook page. But I clearly missed some of you because several folks showed up in person at our usual meeting place. I sincerely apologize to members and any visitors who missed the update. We'll try to keep that from happening again (and to avoid welcoming influenza into our home).



Figure 1—*Slides from three presentations by club members 21 and under at the NVMC March meeting. All images: Jason Zeibel.*

So if you did not receive my email message, please send me your updated email address at president@novamineral.club. Also, it's probably a good idea to check our Facebook page on the day of the meeting to make sure there aren't any last-minute changes.

The March meeting highlighted a few other needs for our club. I think we need to diversify our leadership responsibilities. In the immediate aftermath of the COVID-induced transition to virtual-only meetings, our club membership declined markedly; we were certainly not the only ones affected in this way. This led to a few key folks doing most of what it took to keep the club alive.

However, in the last 2 years, we have more than doubled our membership! This is an amazing success that all of you share in. Let's leverage this new energy and let everyone contribute a little rather than asking a few to do a lot.

With that said, we are asking folks to consider volunteering for some bite-sized tasks. This could include volunteering as meeting greeter (welcoming visitors and taking down their names and contact information, plus administering door prizes); AV-equipment coordinator (getting us up on Zoom at meetings); youth chairperson; auction coordinator (helping to organize our twice-yearly club auctions); and (my own new favorite) show exhibit chair.

If you are at all interested (or could be convinced) to volunteer for any of these roles, please reach out to me or to any other club officer. I think all these tasks could be done much better with a dedicated person in charge rather than as something that elected club officers try to do in addition to handling all their other responsibilities. Thank you from me and from all future club presidents!

In mid-March, I made the trek around the Beltway to the gem, mineral, and fossil show put on by the Gem, Lapidary, and Mineral Society of Montgomery County (GLMSMC). The GLMSMC always puts on a good event, with many smiling faces, wide-eyed kids, and happy dealers. I got to see Tom Taaffe, Dave Hennessey, and Ken Reynolds selling some gorgeous minerals and fossils.

While at the show, I enjoyed strolling around the 27 exhibit cases covering everything from mining to fluorescent minerals (fig. 2). I also got to see our own Germaine Broussard making dino footprints. Maria Nopo was also doing a lapidary demo. Congratulations to Maria for winning second place in the youth exhibits for her case on pyrite, which perfectly complemented her talk on pyrite at our March meeting.



Figure 2—***Top:*** *NVMC President Jason Zeibel in front of the exhibits area at the March 2025 GLMSMC show.* ***Center:*** *Fluorescent mineral exhibit.* ***Bottom:*** *Germaine Broussard helping a young fossil hunter make his very own dino footprint.*

One of the new responsibilities that I am looking for someone to take on is show exhibit chairperson. I think our own club show in November needs a lot more exhibits; I very much enjoyed the three exhibits we had last year, but I want to see 20 or more!!! We are going to have a much larger capacity for exhibits at our show this year. I was able to secure at least 10 additional exhibit cases, with a lead on 5-6 more.

Therefore, I want to see club members step up and volunteer to put together an exhibit case! It isn't hard. I did it when I was 10 years old (fig. 3), so I'm sure you can all give it a try!

I would ask someone to volunteer to coordinate our displays for the show to make sure we have the right number of cases and that they get set up on show weekend. So please consider volunteering—and also consider putting one or two exhibits together!

A few business items of note. The NVMC name tag order has arrived! Please bring a check for $15 (or cash) to the Spring Club Auction on April 7 and pick up your new name tag!

That brings me to the auction (see page 11 for details). Please come with items to sell and money for buying. Each club member can submit items, with the club getting a small percentage of the proceeds. It is usually a very exciting evening with lots of new treasures to be had.

We are planning on joining our March speakers for dinner at BJs before the auction begins because we couldn't do so before the last meeting. Please reach out to Craig Moore (our club vice president)—see page 2 for details. We will arrive for dinner a little earlier than usual (about 15 minutes) in order to make sure that we are all there with plenty of time to set up for the auction.



Ken Reynolds, Jason Zeibel, Dan Teich, and Roger Haskins at the March 2025 GLMSMC Gem, Mineral, and Fossil Show.



Figure 3—*Jason Zeibel at 10 years old exhibiting at the 1986 Charlotte Gem and Mineral Club show—proof that any of you can put together an award-winning exhibit!*

We don't usually set up a Zoom hybrid meeting for club auctions because it's so hard to examine auction items via Zoom; arranging for payment is also difficult. But if you volunteer as AV-equipment coordinator and want to try live-streaming the fall club auction, then by all means give it a go! Then we will have truly embraced the technological revolution we are living in.

Until then, stay healthy, get out and enjoy the warm weather (in between thunderstorms), and save up for the Spring Club Auction!

Jason

Smithsonian Diamond Exhibit

Editor's note: *The article is adapted from the National Museum of Natural History's* Geology, Gems, and Minerals Hall Monthly Volunteer Newsletter *(February 2025). Thanks to Sue Marcus for the reference!*

The Smithsonian welcomed the arrival of a new exhibit case with "Fancy colored diamonds" in the Winston Gallery. The display features selections from the Winston Fancy Color Diamond Collection that span the rainbow of diamond colors. The Winston Red Diamond is displayed alongside 40 other gems from the collection, with the diamonds arranged in a radiant rainbow of color featuring every shade imaginable, from deep teal to soft peach. The Winston Red Diamond and Fancy Color Diamond Collection resulted from 60 years of acquisitions by Ronald Winston. (The photo is by Robert Weldon, arranged by Gabriela Farfan, courtesy of Ronald Winston.)



Mineral Collection Sale in Baltimore
April 5



The mineral collection of Jim Hooper, former president of the Baltimore Mineral Society, will be offered for sale on Saturday, April 5, at his home near Baltimore. His collection consists of almost 600 mineral specimens acquired over 30 years. Most of the specimens are miniature and small-cabinet size, with a number of larger specimens as well. The collection is especially strong in fluorite and sulfides (pyrite, galena, and sphalerite), with many pieces coming from the personal collection of the late Larry Krause (of Octahedron Minerals). Most specimens will be priced at the price stated on the original dealer's label.

Included in the sale will also be about 50 fossil specimens (including petrified wood); a large number of mineral-related books and periodicals; two large glass-front mineral display cabinets; and other smaller display shelf units, assorted tools and accessories, a microscope, and a large number of small acrylic or metal display stands. The sale will be from 10 a.m. to 5 p.m. on April 5 at 107 Bishops Lane in Catonsville, Baltimore County, MD. Sales will be only by cash, check, or Zelle, and all sales will be final.

More Field Trips Coming Up!

In addition to the April nature walk (see page 13), NVMC Field Trip Co-Chair Katy Johnson has confirmed plans for two field trips coming up in May and June.

- **May 17:** We are confirmed for collecting again at the National Limestone Quarry in Middleburg, PA, which has received our insurance certificate for the site. Last year's participants collected wavellite, fluorite, calcite, strontianite, and Devonian fossils.
- **June 7:** Casper Voogt has agreed to lead a West Virginia collecting trip to look for trilobites at one site and quartz crystals at another.

More to come—watch for details in the May and June newsletters!

The Rocks Beneath Our Feet
Virginia's Natural Bridge—Part 2

by Hutch Brown

Editor's note: *This is the final part of an article on the geology of Natural Bridge. Part 1 appeared in* The Mineral Newsletter *in March 2025.*

Virginia's Natural Bridge (fig. 1) has amazed visitors since colonists first saw it in 1742. A small stream called Cedar Creek appears to have tunneled through a ridge of solid rock more than 90 feet thick and 200 feet high. How could that have happened?

Geologic Backstory

The answer lies in the geologic history of the Valley and Ridge Province, which is made up entirely of sedimentary rock. Sediments started building up more than half a billion years ago, a time when the proto-North-American continent ended at the edge of an ocean called the Iapetus, predecessor of the Atlantic. The first sediments were bits of ancient sea life cemented by calcite. The sediments thickened and hardened over time to form carbonate rocks (limestones and dolomites). Three rock formations from ancient offshore seas are exposed today at or near Natural Bridge (fig. 2).

About 474-450 million years ago, a line of volcanic islands—much like Japan or Indonesia today—collided with proto-North America in a mountain-building event called the Taconian (or Taconic) Orogeny. The collision resulted in great mountains adjoining what geologists call foreland basins covered by shallow seas. For tens of millions of years, marine sediments accumulated in the foreland basins and hardened into carbonate rocks overlying the older offshore carbonates. Then the eroding Taconian Mountains filled the basins with sediments that became what geologists call clastic rocks—mudstones, shales, siltstones, sandstones, and more.

The upshot was a huge column of rock, ranging from older carbonate rocks from offshore seas to younger carbonate rocks from foreland basins capped by thick layers of clastic rock topped by sandstones. The rock column was thousands of feet thick and relatively flat. Figure 3 gives you some idea—the Cambrian strata were offshore carbonates, the Ordovician carbonates were mainly from shallow seas in the foreland basins, and the turbidites (from submarine land-



Figure 1—*Natural Bridge in Rockbridge County, VA. For scale, note the people on the trail along Cedar Creek, which flows under the bridge. Photo: Hutch Brown.*

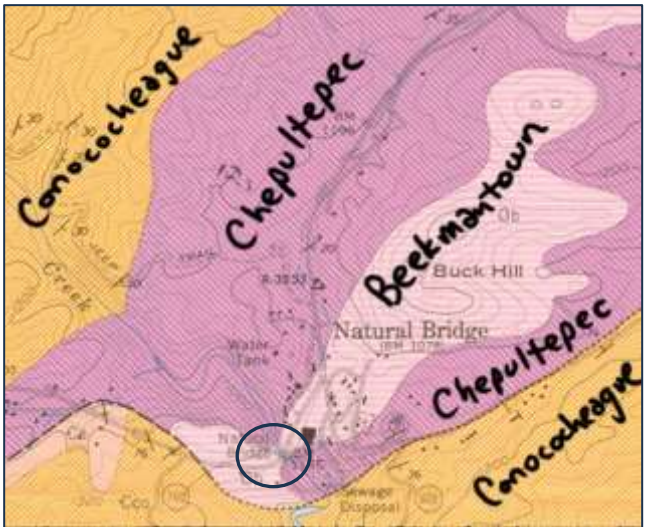


Figure 2—*Detail from a geologic map showing bedrock types near Natural Bridge (circled). Beekmantown dolomite (pink) overlies Chepultepec limestone (rose), which overlies the Conococheague Formation (orange). Source: Bentley (2013).*

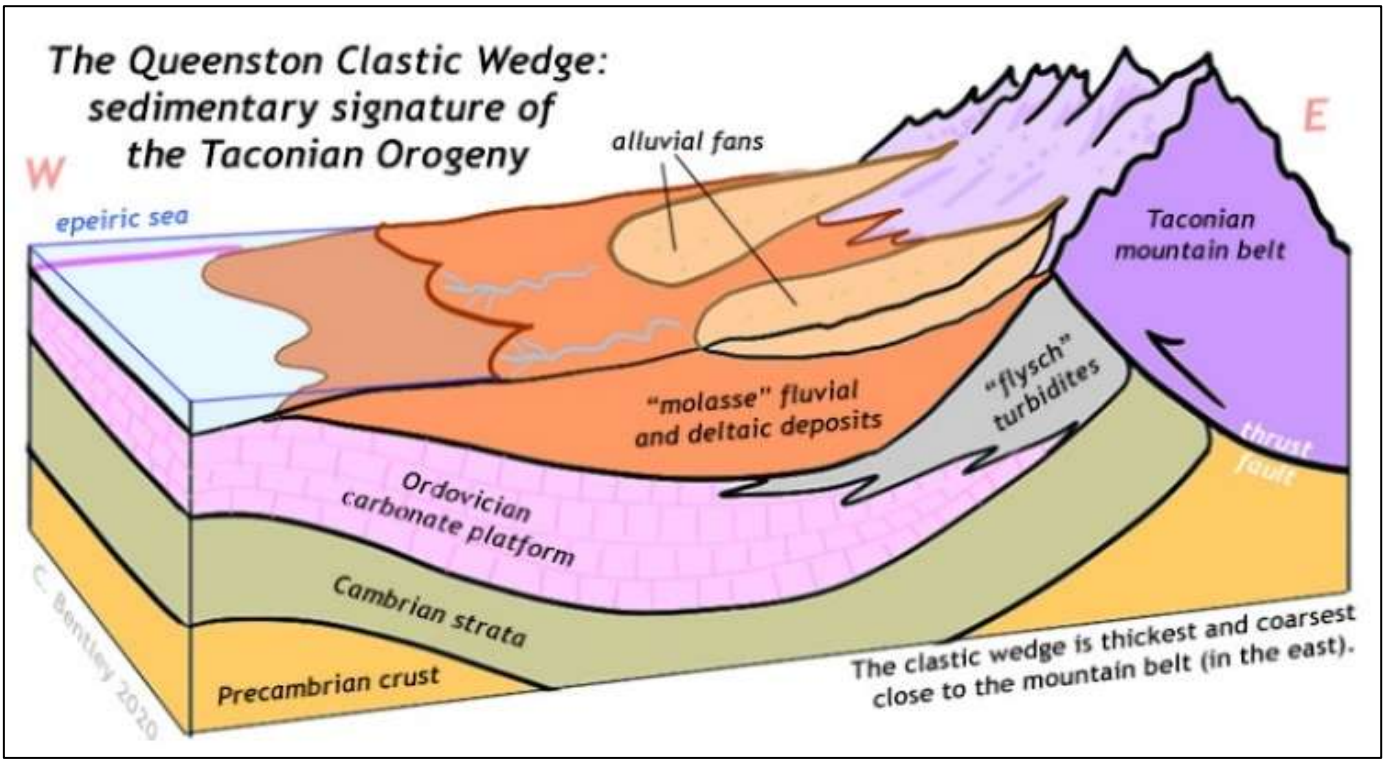


Figure 3—*Graphic of the Queenston Clastic Wedge in Ontario, Canada, showing a sedimentary response to the Taconian Orogeny (the response in our area was much the same): Cambrian strata, including carbonates from offshore seas, cover the ancient continental margin; Ordovician carbonates from marine foreland basins cover the offshore carbonates; and the eroding Taconian Mountains are covering the carbonates in the foreland basins with clastic sediments, rounding out the column of sedimentary rocks overlying the pre-Cambrian crust. Source: Bentley (2020).*

slides) and fluvial/deltaic (river) deposits were mainly clastic sediments eroded from the Taconian Mountains. Last to erode was quartz; quartz sandstones capped the great column of rock.

But that isn't what we see today. The area near Natural Bridge has nothing but carbonate formations that appear to lie side by side (fig. 2), and they are uptilted rather than flat (fig. 4).

How could that be? What moved the rocks to where they are today while uptilting them?

The Alleghanian Orogeny

The answer is the Alleghanian Orogeny, an even bigger mountain-building event than the Taconian.

The Alleghanian Orogeny began about 320 million years ago when proto-Africa crashed into proto-North America, closing the Iapetus Ocean (fig. 5). Proto-Africa slid up over the continental margin, forming mountains as high as the Himalayas today.

In the process, proto-Africa broke off sections of the underlying bedrock and pushed them inland in a series of great, nearly horizontal thrust faults. The result was an enormous rock train that relocated the bedrock across our area. For example, the metamorphic roots of the Taconian Terrane broke free and moved dozens of miles inland along thrust faults, leaving a train of upturned metamorphic rock formations across the Piedmont (fig. 5).



Figure 4—*Limestone bedrock at Natural Bridge uptilted by geologic forces. Photo: Hutch Brown.*

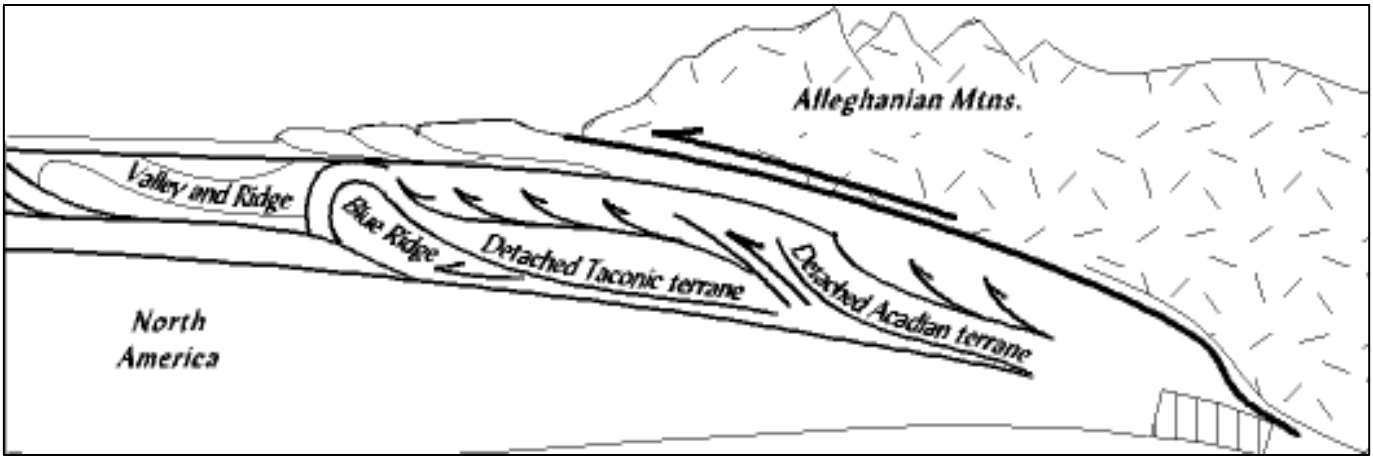


Figure 5—*The Appalachian Orogeny, with proto-Africa sliding over proto-North America and raising mountains. In the process, the bedrocks in our area were broken off and pushed westward in a great rock train. A series of thrust faults emplaced the Valley and Ridge, Blue Ridge, and Piedmont rocks where they are today. Source: Fichter and Baedke (1999).*

At the head of the rock train were the Valley and Ridge rocks (fig. 5). Next came the Grenville basement rock, the oldest rock in our area; the orogeny broke off parts of it from deep underground and pushed them up to form the core of the Blue Ridge Province. Last in the train were the rocks from the Taconian Terrane and from a later terrane called the Acadian, which together form most of the bedrock for today's Piedmont and Coastal Plain.

So where do the carbonate rocks of Natural Bridge fit in?

Sedimentary Rock Train

Figure 6 shows major thrust faults in western Virginia near Natural Bridge (red star). Natural Bridge lies between two great thrust faults: the Blue Ridge (**BR**) and Staunton/Pulaski (**SP**).

The Blue Ridge Thrust Fault divides the Blue Ridge Anticlinorium (a huge upfold in the rock about 20 miles across) from the Massanutten Synclinorium (a comparable downfold to the west) (fig. 7). Natural Bridge lies to the south in the same synclinorium as Massanutten Mountain. Similarly, the Staunton/Pulaski Thrust Fault divides the great syncline containing Natural Bridge and its carbonate rocks from a smaller anticline/syncline pair capped by clastic rocks to the west.

Figure 8 shows the area in cross-section. The Alleghanian Orogeny pushed offshore carbonate rocks (fig. 8, orange) up along the Staunton/Pulaski Thrust Fault. East of the fault is the downfold of the great

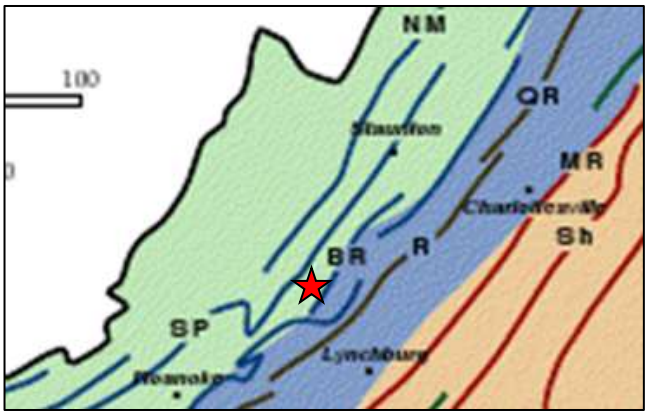


Figure 6—*Major thrust faults near Natural Bridge (red star). Green = Valley and Ridge; blue = Blue Ridge; orange = Piedmont; BR = Blue Ridge, SP = Staunton/Pulaski, NM = North Mountain Thrust Faults. Source: Bailey (N.d.).*

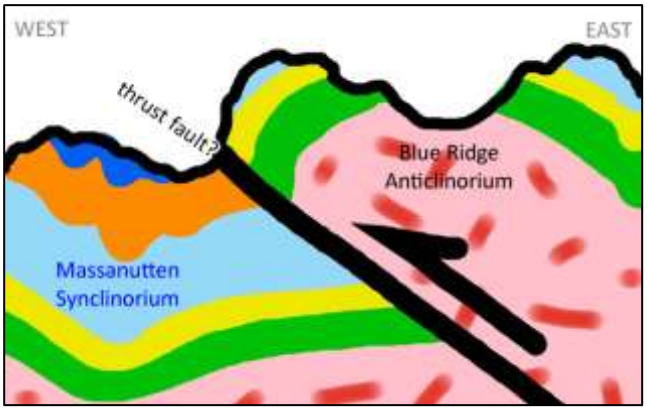


Figure 7—*Blue Ridge Thrust Fault. The Grenville basement rocks form an overturned anticline over sedimentary rocks, which form a syncline in Shenandoah Valley. Source: Bentley (2012).*

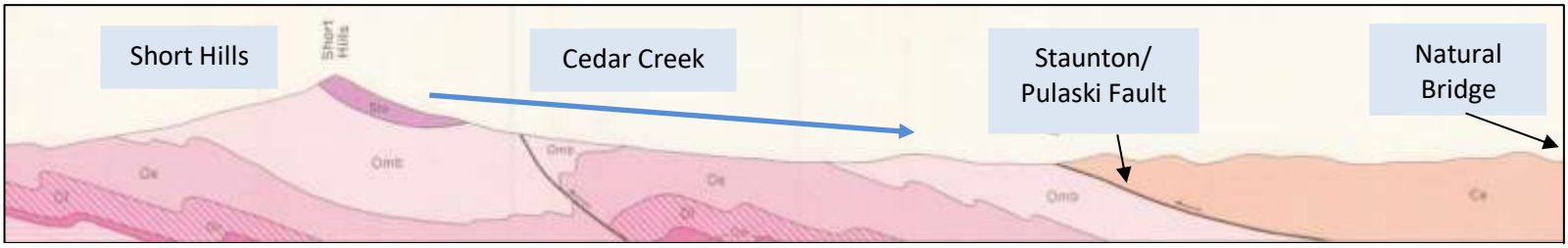


Figure 8—*Detail from a geologic map showing the area west of Natural Bridge in cross-section. Cedar Creek originates on a ridge called Short Hills formed by the clastic Martinsburg Formation (***Omb***) capped by Tuscarora sandstone (***Stu***). The creek flows eastward toward Natural Bridge across the Staunton/Pulaski Fault. Orange = Cambrian carbonate rock from offshore seas; shades of pink = Ordovician/Silurian clastic rocks and carbonate rocks from the Taconian foreland basins. Source: Spencer (1968).*

syncline containing Natural Bridge—here, it's called the Natural Bridge Synclinorium.

West of the fault is an anticline/syncline pair (fig. 8, pink), with carbonate rocks from the Taconian foreland basin overlain by clastic rocks capped by a sandstone ridge called Short Hills. The ridge gives rise to Cedar Creek, which flows east to Natural Bridge.

Before the Alleghanian Orogeny, the Short Hills rocks covered the older Natural Bridge rocks. The orogeny transported the younger rocks and pushed them up in sequential folds (synclines and anticlines) along the North Mountain fault (fig. 6, **NM**). Next came the older rocks of the Natural Bridge Synclinorium, pushed up in sequence along the Staunton/Pulaski fault (fig. 8, **SP**). In the process, the limestone at Natural Bridge was uplifted (fig. 4).

So that's the story of the great Alleghanian rock train. But how did Cedar Creek manage to tunnel through solid rock to form Natural Bridge?

Karst Landscape

After starting in Short Hills, Cedar Creek flows east through Natural Bridge and into the James River. After crossing the Staunton/Pulaski fault line onto carbonate rock, the creek forms a gorge that gradually widens and deepens all the way to Natural Bridge, where the sheer rock walls are hundreds of feet high.

Geologists call it a karst landscape because the bedrock dissolves in water. Austrian scientists first described the process in the Karst region, now in Italy and Slovenia but then part of Austria-Hungary. The researchers published in German, so the German term *Karst* became synonymous with the processes of weathering and deposition in carbonate rocks.

Weathering begins with rainwater filtering through organic topsoils and taking up dissolved carbon dioxide. The water then reacts with limestone to form calcium bicarbonate dissolved in water ($Ca(HCO_3)_2$). In effect, the rainwater leaches away the limestone, creating sinkholes, caves, and underground streams.



Figure 9—*Braided waterfalls near Natural Bridge. The braiding is from weathering (limestone bedrock dissolution upstream) and deposition (travertine formation downstream). Photo: Hutch Brown.*

The reverse can also happen: the dissolved calcium bicarbonate ($Ca(HCO_3)_2$) releases carbon dioxide (CO_2), leaving water (H_2O) and calcium carbonate ($CaCO_2$). The calcium carbonate then precipitates out of the water as calcite. The result is calcite deposits of various kinds, such as stalactites in caves.

Figure 9 shows an example—braided waterfalls in a Cedar Creek side stream near Natural Bridge. The stream dissolves limestone bedrock, then deposits

calcite in the form of travertine on the waterfall bedrock, braiding the stream.

Figure 10 illustrates a karst landscape with a stream much like Cedar Creek. The stream starts on clastic rock; where it reaches carbonate rock, it finds a sinkhole and goes underground. The underground stream further dissolves the rock, forming a system of caves. Where the water level has dropped as the karst bedrock weathered away, dry caves remain. The stream finally emerges from a cavern.

Similarly, Cedar Creek emerged from the mouth of an ancient cavern after going underground many miles upstream on carbonate bedrock east of the Staunton/Pulaski fault (fig. 8). The underground stream weathered away the carbonate bedrock over millions of years, forming a system of caverns.

Precipitation gradually dissolved the cavern roofs, forming sinkholes. The sinkholes spread and combined, collapsing the cavern roofs to create the Cedar Creek gorge. The only remaining part of the ancient cavern system is Natural Bridge itself.

The Upshot

The story of Natural Bridge begins about 500 million years ago in ancient offshore seas, where its carbonate bedrock formed. Tectonic forces placed the bedrock where we see it today, and a karst landscape resulted. Cedar Creek did the rest, forming a system of caverns, with Natural Bridge now all that remains.

Interestingly, the Cedar Creek gorge is deep enough to form an unusual microclimate for a tree that is rare in our area—northern white-cedar (fig. 11). The tree largely left our area after the last Ice Age ended about 18,000 years ago. As the weather warmed, boreal trees like northern white-cedar moved north.

But you can still find relict populations in habitats with special characteristics; the Cedar Creek gorge is one of them. Northern white-cedar likes cool climates, and the gorge is relatively cool year-round. The tree also likes habitats with seeps (common in karst), and it particularly likes soils derived from limestone. So a cool karst landscape is perfect.

The tree grows very slowly, and it doesn't get very big. But it does get very old, up to a thousand years in age. Some northern white-cedars along Cedar Creek are that old.

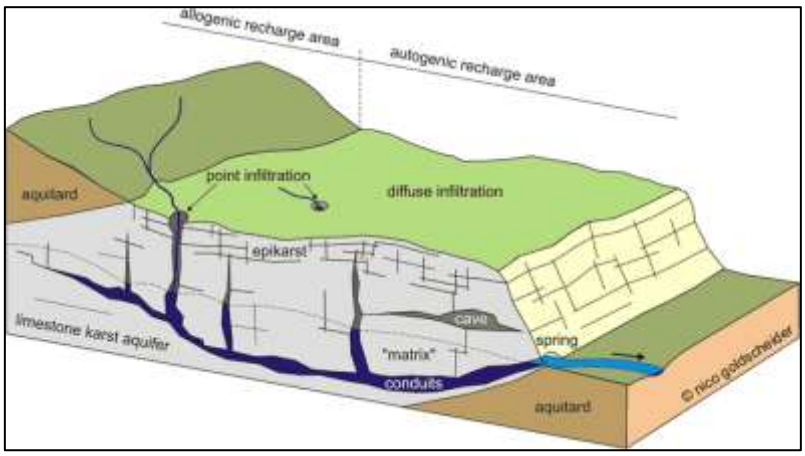


Figure 10—*Graphic illustration of karst topography. Headwaters drain onto carbonate rock, where weathering forms sinkholes and underground passages. As the water table drops, the stream drops with it, widening the passages. Further weathering leaves dry caves, and the stream finally emerges from a cave far from its original source. Source: IAH (2013).*



Figure 11—*Northern white-cedar near Natural Bridge. The cool Cedar Creek microclimate sustains a relict population of this boreal tree. Photo: Hutch Brown.*

Natural Bridge is still weathering away, and highway engineers worry about the road that crosses the arch. It has weight limits and is sometimes closed. You might consider a visit as long as the arch is still there.

Visiting Natural Bridge is easy, but it's a rather long drive—about 3 hours by car—so you might consider an overnight stay. The site is right off Interstate 81 about an hour south of Harrisonburg, VA. The highway offramp is well-marked.

Long privately owned, Natural Bridge is now a Virginia state park welcoming visitors. From the visitor center, you can take a trail under Natural Bridge for a mile or so upstream along Cedar Creek, where you can enjoy some of the unique sights of a karst landscape (figs. 1, 9, 11-12).

An interpretive site along the trail introduces you to the American Indian people who once lived in the area, the Monacans. You can also visit caverns nearby, called the Natural Bridge Caverns.

If you can find the time, it's well worth a trip!

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Figure 18—*Sights along Natural Bridge Trail.* ***Top:*** *Side stream emerging from a nameless cave.* ***Bottom:*** *View from the end of the trail of Cedar Creek deepening its gorge. Photos: Hutch Brown.*

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.

AUCTION BID SLIP

ITEM # _____
DESCRIPTION_____
FROM _____
Starting bid amount:_____
Bidders: You need to bid on this item if you want it to be auctioned! Place bid below.
NAME/BID

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AUCTION BID SLIP

ITEM # _____
DESCRIPTION_____
FROM _____
Starting bid amount:_____
Bidders: You need to bid on this item if you want it to be auctioned! Place bid below.
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AUCTION BID SLIP

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FROM _____
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NAME/BID

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AUCTION BID SLIP

ITEM # _____
DESCRIPTION_____
FROM _____
Starting bid amount:_____
Bidders: You need to bid on this item if you want it to be auctioned! Place bid below.
NAME/BID

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SUMMARY SHEET FOR AUCTION ITEMS SUBMITTED BY_____

Initials	Item #	Description	Minimum bid	Final sale price
	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			
	16			
	17			
	18			
	19			
	20			

April 2025—Upcoming Events in Our Area/Region (see details below)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2 MSDC mtg	3	4	5 Show, Johnson City, NY
6 Show, Johnson City, NY	7 **NVMC spring auction**	8	9	10	11	12
13	14 GLMSMC mtg	15	16	17	18	19 **NVMC nature walk**; show, MD
20	21	22	23 MNCA mtg	24	25 Show, Richmond, VA	26 Show, Richmond, VA
27 Show, Richmond, VA	28	29	30			

Event Details

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

5-6: Johnson City, NY—Annual show; New York Southern Tier Geology Club, Inc; Johnson City Sr Ctr, 30 Brockton St; Sat 9-5, Sun 10-4; adults $4 ($3.50 w/coupon), kids under 12 free; info: Donald Tuttle, 607-369-7323, sginkusa@gmail.com, https://efmls.org/clubdetails/new-york-southern-tier-geology-club-inc/.

7: Dunn Loring, VA—Northern Virginia Mineral Club; info: https://www.novamineralclub.org/.

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

19: Accotink Gorge, Springfield, VA—NVMC nature walk, 10-noon; exposures of Occoquan granite and quartz; details on p. 13.

19: W. Friendship, MD—Annual show; Chesapeake Gem and Mineral Society; Howard County Fairgrounds, 2210 Fairgrounds Rd; Sat 10-4; free admission; info: Lynne Emery, chesapeakegemandmineral@gmail.com.

23: Burke, VA—Micromineralogists of the National Capital Area; info: http://www.d centimetersicrominerals.org/.

26-28: Richmond, VA—Retail show; Treasures of the Earth, Inc; Richmond Raceway Complex, 600 E Laburnum Ave; Fri 12-6, Sat 10-5, Sun 10-5; Adults $8, sixteen and under free; info: Ellen White, 804-642-2011, Ellen.White@TreasuresOfTheEarth.com, www.TreasuresOfTheEarth.com.



Brookite from Pakistan. Source: Wikipedia; photo: Ewa Jastrzębska.

The Northern Virginia Mineral Club, Inc.

Visitors are always welcome at our club meetings!

EXPLORE OUR WEBSITE! FIND US ON FACEBOOK!

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).

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

RENEW YOUR MEMBERSHIP!

SEND YOUR DUES TO:
Roger Haskins, Treasurer, NVMC
4411 Marsala Glen Way, Fairfax, VA 22033-3136

OR

Bring your dues to the next meeting.

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

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2025 Club Officers

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Vice President: Craig Moore
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Secretary: Almas Eftekhari
secretary@novamineral.club
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Greeter/Door Prizes: Vacant
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Tech Support: Tom Burke
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Webmaster: Casper Voogt
webmaster@novamineral.club

Meetings: At 7:30 p.m. on the first Monday of each month at the Dunn Loring Fire Station, 2148 Gallows Road, Dunn Loring, VA.* (No meeting in July or August.)

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

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