THE NORTHERN VIRGINIA MINERAL CLUB INC

The Mineral Newsletter

Next meeting: September 7 (Labor Day) Time: 7:30 p.m.

Virtual Meeting Through Zoom Only



Phenakite

Ermakovskoe Deposit, Buryatia, Russia

Source: Mindat. *Photo: Martin Slama.*

Deadline for Submissions

September 20

Please submit to the editor by the 20th of the month. Submissions received later might go into a later newsletter.

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September 2026

Explore our website! Find us on Facebook!

September Meeting Program:

Club member-dealer forum

Details on page 10.

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Mineral of the Month
Phenakite

by Sue Marcus

The Mineral of the Month for September is phenakite (pronounced FEN-uh-kite), a mineral that many of us do not have in our collections. Phenakite is uncommon, and micromounters are more likely to come across crystals than collectors who seek larger specimens.

Name

The type locality of phenakite is the Izumrudnye Kopi area, Malyshevo, Sverdlovsk Oblast, Russia. According to one source, it was originally called kokovinite after Ya.V. Kokovin. Kokovin discovered the mineral in the early 1800s, when he commanded Russia's Yekaterinburg Imperial Lapidary Workshop. He shared the samples with L.A. Perovskii, Vice President of the appanage (grants and privileges) department of the Russian Empire and Minister of Internal Affairs. Perovskii distributed specimens to several mineralogists, including N.G. Nordenskiöld, the Finnish Superintendent of Mines.

Nordenskiöld might have known the material as kokovinite. Still, in 1833—possibly after Kokovin's death—Nordenskiöld proposed the name phenakite for the new mineral. The name derives from the Greek word *phenakos* (φέναξ), meaning "deceiver." Phenakite can be mistaken for quartz—or diamond—and often was.

Environment

Pegmatite intrusions are the most common hosts for phenakite, which crystallizes from fluids rich in beryllium. Beryl, tourmaline, topaz, and rare beryllium minerals like bertrandite can form from the same fluids and occur with phenakite.

Another geologic environment conducive to phenakite formation is mica schist. Chrysoberyl (variety alexandrite) and beryl (variety emerald) can also be found in schists containing phenakite. Alexandrite and emerald are more sought after than phenakite.

High-quality phenakite crystals are so clear that they are difficult to photograph. Kudos to the photographers who did it successfully so that we can all enjoy specimens we will never see in real life.

Fall is almost here!

Northern Virginia Mineral Club members,

Our next club meeting will be on **Monday, September 7, 7:30 p.m.** We won't have our usual meeting place on Labor Day, so the meeting will be online only through Zoom. We are not meeting for dinner beforehand.

See program details on page 11.



Phenakite on muscovite, Lord Hill Quarry, Stoneham, Oxford County, Maine. Source: Mindat; photo: Martin Slama.

Localities

United States

Virginia. As I write this article, I'm learning that phenakite often forms under conditions that also form microcline (a feldspar). Many Virginia collectors are familiar with the Morefield Mine in Amelia County. Some of us are lucky (and old) enough to have collected there; others know it by reputation as a prominent source of robin's-egg-blue-green amazonite, a variety of microcline. Part of the mine is replicated in the Smithsonian Institution's geology halls. At the Morefield Mine, according to Cook (2010), 5-centimeter-long (~2-in-long) phenakite crystals occurred, although microcrystals were more common.

Minor amounts of phenakite have also been found at the Rutherford Mine. At Irish Creek in Rockbridge County, grains of phenakite replace grains of beryl.

Maine. Many collectors know about the famous pegmatites of Maine. These rocks have produced beryls and tourmalines—and phenakite. At least two mines in Oxford County have produced fine phenakite specimens. At the Orchard Quarry near Buckfield, rare small (about 2-centimeter (~0.8-in)) clusters of transparent to occluded lustrous euhedral crystals form exquisite specimens. The property is owned and operated by Coromoto Minerals, LLC.

Most phenakite specimens found at the Lord Hill Quarry near Stoneham are micromounts. Phenakite is usually associated with quartz, often forming overgrowths on quartz.

New Hampshire. The Conway Granite has produced phenakite specimens from at least two localities. One, called the South Baldface Phenakite locality by Mindat, produced several small (greater than 1-cm (>0.4-in)) phenakite crystals.

At the other locality, mineralizing fluids deposited microcrystals of the beryllium-bearing silicates phenakite, bazzite, and helvine at the Iron Mountain Mines near Barlett.

A separate New Hampshire locality, called the North Sugarloaf Mountain locality by Mindat, has produced few specimens. This rather obscure locality has probably produced one of the largest phenakite crystals found in the United States. The colorless gemmy crystal, 4.5 centimeters (1.8 in) across, is now part of the Smithsonian's collection.



Phenakite, North Sugarloaf Mountain locality, Bethlehem, Grafton County, New Hampshire. Source: Mindat; photo: Rob Lavinsky.

Connecticut. The Strickland Quarry near Portland produced a few phenakite micromounts.

Wisconsin. Phenakite crystals up to 3 centimeters (1 in) long occur in pegmatite veins in granitic rocks that are part of the Wausau Intrusive Complex in Marathon County. They were found at the Beilke and Schuettes Quarries and at Rib Mountain, all in Marathon County. Phenakite from Wisconsin forms unusual but relatively unattractive specimens because most of the crystals are iron stained. Rutile is an accessory mineral in some specimens.

Colorado. Mount Antero is well known to mineral collectors, especially those in Colorado. It has produced fine beryl crystals, usually the aquamarine and goshenite varieties. This clues us in to the presence of beryllium in the mineralizing fluids that formed the pegmatite host rocks. Other beryllium-bearing silicate minerals found here include phenakite, bertrandite, bazzite, and (rarely) euclase and helvine.

Many phenakite crystals from Mount Antero are highly lustrous. They range from white and mostly opaque through colorless and translucent. Some phenakite crystals are short and squat, while others form small pencil-like crystals. A few phenakite crystals are doubly terminated. Crystals grew up to ~2.5



Phenakite, Mount Antero, Chaffee County, Colorado. Source: Mindat; photo: Rob Lavinsky.

centimeters (1 in) in length, with matrix specimens often sporting several smaller phenakite crystals on the associated minerals, such as quartz, fluorite, microcline, and muscovite. Similar fine euhedral phenakite crystals have come from Mount White, about a mile from Mount Antero.

Phenakite is also reported from the Crystal Peak area and Taryall in Park County; Topaz Butte near Florissant; and Crystal Park and Specimen Rock in El Paso County.

Montana. Doubly terminated phenakite crystals were collected by William C. van Laer in 2013. These crystals are attractively contrasted with schorl. They come from the boron-rich pegmatite related to the Boulder Batholith in Homestake Pass, Jefferson County.

Idaho. Phenakite occurs with smoky quartz, albite, and topaz in cavities in granitic host rock near Upper Cramer Lake in central Idaho.

Nevada. The Mount Wheeler Mine in White Pine County extracted tungsten from the deposit in the 1950s. In 1959, analyses determined that the ore was also rich in beryllium. Phenakite crystals form microcrystals at this locality.



Phenakite on schorl, Homestake Pass, Boulder Batholith, Jefferson County, Montana. Source: Mindat; photo: William C. van Laer.

California. San Diego's pegmatites are famous for the tourmalines and beryls, as specimens and gemstones, that come from the many pegmatites there, especially in the Pala area. Only one phenakite crystal is known from these prolific deposits.

The Katerina Mine on the southwest flank of Hiriart Mountain is best known for spodumene and beryl. The lone 1-centimeter (0.4-in) phenakite specimen shown on Mindat is yellow and opaque, and it sports two lustrous euhedral crystals. The property is likely claimed and might be actively worked. Phenakite probably also occurs in other pegmatites in the region.

Wyoming. Little is known about the occurrence of phenakite near Casper Mountain in Natrona County. Cook (2010) shows a 13-centimeter (5-in) crystal, and Mindat shows a lovely crystal reportedly from pegmatite at the Catherine Mine on Casper Mountain. The Catherine Mine was a gold mine; perhaps pegmatites were discovered during underground gold mining.

There was also a Catherine No. 1 pegmatite mine on Casper Mountain. The relationship between the two Catherine mines is unknown to me. Crystals longer than 3 centimeters (1 in) were found, probably in the 1990s, in the Catherine No. 1 pegmatite, but they need analytical confirmation. If they are phenakite, then they are among the largest known in the United States.

Other States. Cook (2010) mentions many other phenakite occurrences in the United States. These localities never produced significant numbers of specimens, but some produced a few rare and beautiful phenakite crystals.

Afghanistan

Badakhshan Province forms a long finger extending east from the main body of Afghanistan. Translucent white to golden euhedral crystals occur there, but analyses are needed to determine whether they are definitely phenakite. The crystals are all about 2 centimeters (0.8 in) across. The locality or localities are not specified on Mindat. Afghanistan is noted for beryl, and emeralds occur there too, so perhaps associated phenakite will be recovered as well.

Australia

In Western Australia, phenakite was found at the Wonder Well emerald prospect. The deposit has been worked for gemstones intermittently since the 1970s. Although emeralds and other beryls were the main minerals of interest, gem-quality phenakite crystals were also extracted. The largest known phenakite crystal from this locality is a translucent euhedral crystal 7 centimeters (2.8 in) across. A Mindat photo shows a 3-centimeter (1.2-in) crystal. There must be more from this locality, but few specimens are known.

Austria

Austria has several phenakite localities. Collectors seeking emeralds probably came across phenakite at a prospect at Leckbachgraben, near Bramberg. Most phenakite crystals are small, but some crystal groups grew to 6 centimeters (2.4 in).

A specimen of granular phenakite with emerald and beryl (variety aquamarine) was sliced and described on Mindat by Dr. Günter Grundmann. He states that the phenakite was "partially corroded by aquamarine and emerald." This provides an interesting insight into what minerals formed earlier (phenakite) than others (beryls) because the younger minerals "corroded" the older one.

A single, highly etched phenakite crystal is shown on Mindat as coming from another site near Bramberg. The crystal is 7 centimeters (2.8 in) long. At that size, the fluids that formed it were abundant enough to crystallize without flowing away or altering chemically. This implies that other phenakite crystals probably formed during this same depositional event.



Phenakite with beryl (var. emerald), Leckbachgraben, Zell am See District, Salzburg. Source: Mindat; photo: Martin Slama.

Mindat shows elongated crystals with included chlorite from Popberg Alp. The crystals grew to at least 7 centimeters (2.8 in) long.

A similarly thin, chlorite-included phenakite crystal, only 0.1 centimeter (0.04 in) long, was recovered from a locality in the Große Fleiß valley. It would be lovely for micromounters.

Minor phenakite occurs elsewhere in Austria, including Stubnerkobel, Kesselfall, Dick Quarry, Bärenfall Dam, and Lachegg Gorge, all near Salzburg,

Brazil

Colorless to white phenakite crystals from Rio Piracicaba would be attractive additions to any collection. Individual crystals up to 5.1 centimeters (2 in) long and groups of crystals up to 11 centimeters (4.3 in) in size have been extracted. The Talho Aberto pegmatite is the likely source of most specimens, but some also come from the more general Rio Piracicaba and São Miguel de Piracicaba localities.

A 1961 U.S. Geological Survey report on the geology of the region states that the phenakite occurrence in the Talho Aberto pegmatite might be exhausted. That pegmatite was intermittently worked for phenakite and amazonite in a mine with two adits. It was discovered in about 1900, with the most notable finds occurring in the 1940s-50s. When examined in 1959



Phenakite, Rio Piracicaba, Minas Gerais, Brazil. Source: Mindat; photo: Rock Currier.

and 1961, the adits had caved in and were partly filled with water, but intermittent mining still occurred. Many specimens are floaters (with no matrix or evident point of attachment). Chlorite or green mica inclusions occur in some phenakite crystals. Fluid inclusions were also noted in some 2- to 3-centimeter (~1-in) phenakite crystals. Clear quartz crystals, euhedral microcline (variety amazonite), xenotime, zircon, and other minerals are associated with phenakite. One amazonite crystal reached 120 centimeters (47 in) long! Other beryllium minerals have not been reported from this locality.

China

Unusual radiating sprays of phenakite crystals with blue octahedral fluorite crystals were found at the Huanggang Fe-Sn deposit in Inner Mongolia. The sole specimen shown on Mindat was at the 2012 Munich Show. Although the individual phenakite crystals are small, the 8.5-centimeter (3.3-in) sprays cover the surface, so more specimens were probably discovered at the same time.

The Dajishan Mine near Ganzhou is a niobium-tantalum deposit with associated rare earth minerals. Only one phenakite specimen is known from this locality, but it is worth noting. The phenakite crystals are doubly terminated and twinned. The largest crystal is at least 2 centimeters (0.8 in) long. The crystals are translucent to transparent and colorless to pale golden yellow, similar in color to the well-known gypsum (variety selenite) crystals from Winnipeg, Manitoba, Canada.

Madagascar

The Anjanabonoina Pegmatite Field west of Antsirabe is composed of zoned subhorizontal dikes. The field is unusual because it includes both major types of rare earth pegmatites, those enriched in lithium-cesium-tantalum and those enriched in niobium-yttrium-fluorine. (The acronyms LCT and NYF are commonly used in mineralogical publications.) The result of this unusual geologic situation in the Anjanabonoina region is the formation of beautiful crystals of interesting minerals. The area is best known for zoned tourmalines like watermelon crystals with pink or red cores and green external surfaces or for vertically zoned tourmaline crystals and even purplish tourmaline crystals.

The finest phenakite crystals occur either as colorless floaters (not attached to matrix) or broken off from the mineralized pockets where they grew. Multiple crystals more than 2 centimeters (0.8 in) long have been extracted, with one reaching 5.7 centimeters (2.2 in) long. Larger crystals are more likely to have cloudy areas, especially towards their bases. Doubly terminated phenakite crystals are also found at this locality. Quartz, dravite, and schorl are the most common minerals associated with phenakite here.

Myanmar

Phenakite crystals from Myanmar are eye candy to mineral collectors. The Momeik Township in Shan State has been the most prolific producer of fine phenakite crystals, most coming from the aptly named Phenakite Mine. Most crystals are shorter than 2 centimeters (0.8 in), though colorless crystals as long as 3.7 centimeters (1.5 in) have been extracted. Many individual crystals have occluded or cloudy bases, becoming water-clear towards their terminations. White to cream-colored crystals have also been found associated with quartz and albite or other feldspars.

Namibia

Tsumeb is probably the best-known mineral locality in Namibia. Since the mines there closed 30 years ago, Erongo has supplanted Tsumeb as Namibia's premier source of crystals. The Erongo Mountains are known for the pegmatite minerals found there, notably large, lustrous schorl (black tourmaline) crystals.



Phenakite, Phenakite Mine, Kyaukme District, Myanmar. Source: Mindat; photo: Michael Roarke.



Phenakite on feldspar, Phenakite Mine, Kyaukme District, Myanmar. Source: Mindat; photo: Martin Slama.

At the Stiepelmann Mine, phenakite came from a pegmatite zone worked through a short adit or tunnel. Crystals are transparent and colorless to white and translucent in places. A variety of crystal habits were found, including elongated, equant, doubly terminated, and penetration twinned crystals. Crystals of phenakite are perched on quartz or feldspar (microcline, orthoclase, and rarely albite) in some specimens. By 2019, the property was inactive.

Nigeria

Water-clear, gemmy phenakite specimens shown on Mindat, mostly extracted in 2009-10, are from the Jos Plateau near the center of Nigeria, specifically from a deposit called the Salistone Mine. Locally, phenakite is known as okuta-didan, meaning shining stone in Yoruba. Euhedral crystals seem very rare, but the complex faces (if I can call them that) are sharp and often stepped, like the stepped faces seen in some garnet crystals. The locality is important because it has produced stunning gem-quality specimens at relatively large sizes for this mineral. The locality was discovered in 2008 by Tunde Jimba, lead miner for Salistone Ventures. According to Dr. Michael Wise of the Smithsonian Institution, highly eroded pegmatites in the hosting granite are the likely source of the phenakite specimens (Wise, personal communication,



Phenakite, Salistone Mine, Jos Plateau, Nigeria. Source: Mindat; photo: Rob Lavinsky.

August 21, 2026). According to the only description of the locality that I could find (Matt Dunkle, personal communication, August 20, 2026), phenakite was found under 45 feet of soil, though how is not clear. Most specimens shown on Mindat are 2 to 4

centimeters (0.8-1.6 in) long; one image shows a 5.1-centimeter (2-in) specimen. The phenakite specimens seldom have any points of attachment and appear to be floaters. Most specimens are colorless and totally transparent, although a few are pale yellow.

Norway

Phenakite occurs in a few Norwegian localities. The Norwegian crystals are notable for their size. At a site called the Tangen Feldspar Mine, near Kragerø, crystals more than 3 centimeters (1.1 in) long were not uncommon. The Geological Museum of Oslo owns a matrix specimen with a phenakite crystal 20 centimeters (7.9 in) long, probably a record holder. The crystals are usually opaque and white to slightly green or gray, so they don't match the quality of phenakite crystals from some other countries. Many phenakite crystals from Tangen are broken and healed, often with later quartz filling in the fractures in the phenakite. At Sætre, some twinned phenakite crystals have a bow-tie habit.

Other phenakite localities in Norway include Bakstevalåsen, the Håkonhals Quartz Quarry (where a pegmatite is enriched in niobium), the Follestad industrial site, and Sætre.

Russia

The world's largest phenakite crystal, according to Petrova (2017), measures 22 by 15 by 8 centimeters (8.7 × 6 × 3 in); it is in the collections of the St. Petersburg Mining Museum. The Ural Geological Museum in Yekaterinburg owns a 7-kilogram (12-lb) whopper! The specific localities for each specimen were not provided.

The type locality for phenakite is the Izumrudnye Kopi area northeast of Yekaterinburg in the Sverdlovsk Oblast. Most crystals are lustrous but have internal fractures or cloudiness, so they appear white with colorless areas.

Rob Lavinsky posted a photo on Mindat of a single 8-centimeter (3-in) phenakite crystal that weighs almost 325 grams (0.75 lb)! The caption implies that phenakite crystals were cut to resemble diamonds. This was done many years ago, before better analytical techniques were available to readily distinguish diamonds from less valuable stones.

Several other large phenakite crystals came from this locality. Beryllium enrichment formed precious varieties of beryl (emerald) and chrysoberyl (alexandrite),



Top: *Phenakite, Malyshevo, Sverdlovsk Oblast, Russia.* **Bottom:** *Phenakite (raw and faceted), Izumrudnye Kopi area, Malyshevo, Sverdlovsk Oblast, Russia. Source: Mindat; photos: Rob Lavinsky.*

which were the economic drivers of commercial extraction, with phenakite as a minor constituent. Intermittent gem-bearing pods occur along a 40-kilometer-by-3-kilometer (25-mi × 2-mi) zone, including the Malyshevskoe (Malyshevo) emerald and chrysoberyl (variety alexandrite) deposit. Some workings are now flooded.

Farther west, the Russian republic of Buryatia has beryllium-enriched rocks in several places. One of the world's largest beryllium deposits, Ermakovskoe or Ermakovo, was mined from about 1975 to 1989. Phenakite occurs as unusual radiating crystals forming spherules at this location. Purple fluorite, usually massive, provides a nice color contrast to the white or cream-colored phenakite.

The Snezhnoe deposit, also in Buryatia, has been explored for sources of beryllium, tantalum, and niobium/columbium. Phenakite alters to beryl, according to Martin Slama on Mindat. Fluorite is associated with phenakite at this locality.

South Africa

At the Blesberg Mine (also known as Jackal's Water) in the Northern Cape Province, crystals up to 11 centimeters (4.3 in) long formed from the dissolution of beryl, according to Cook (2010).

Spain

Phenakite crystals from Spain are scarce and not particularly attractive, although some from A Franqueira in Galacia are large—up to 3 centimeters (1.2 in) long.

Sri Lanka

Sri Lankan phenakite seems to usually occur in alluvial deposits (Petrova 2017). Some of the abraded phenakite found there is faceting grade. One 1,470-carat stone with inclusions was cut into a 569-carat faceted stone plus several smaller stones.

Switzerland

The main Swiss locality for phenakite is along the Furka Pass near Oberwald. Doubly terminated crystals from here sometimes have chlorite inclusions. The Bern Natural History Museum owns the largest known Swiss phenakite crystal, which is either 4 or 10 centimeters (1.6 or 3.9 in) long: the two photos on Mindat appear to show the same specimen, with each caption noting that it is the largest crystal but providing differing lengths. Other Swiss localities have occasionally produced phenakite crystals.

Ukraine

An underground mine in the former Khoroshiv Raion in the Zhytomyr Oblast exploited a pegmatite body that had large cavities containing topaz, heliodor (a yellow variety of beryl), and—less often—phenakite.



Phenakite on perettite, Phenakite Mine, Kyaukme District, Myanmar. Source: Mindat; photo: Martin Slama.

Squat, colorless, euhedral phenakite crystals occurred with albite, microcline, and pyrite. Several crystals shown on Mindat exceed 1 centimeter (0.4 in) in length. The Khoroshiv Raion was abolished in 2020,

but it is still useful as a location of the pegmatite. Most phenakite, along with heliodor and topaz, have come from the Volodarsk-Volynskii pegmatite field, also called the Volyn deposit in the former Khoroshiv Raion.

Other Countries

Cook (2010) reported phenakite as microcrystals in Quebec. In addition, phenakite has been reported on Mindat as microscopic crystals from Argentina; the Canadian provinces of British Columbia and Ontario; England; Finland (Murskelouhos pegmatite and Topaz quarry); France (Savoie and Grand Est); Germany; Italy; Kazakhstan; Pakistan; Portugal; Slovakia; and Sweden. The two Finnish localities are on opposite sides of the Kymi Airfield near the town of Kota. Both sites are abandoned quarries where topaz was the primary mineral of interest, though macroscopic phenakite crystals were also found.

Uses

Beryllium is refined into a metal that is used in space technology because it is lightweight and strong. It is used in lasers, nuclear reactors, and the windows in X-ray machines. Many of us used the old Corningware or Pyrex casseroles and glassware. Those contained beryllium to withstand high temperatures.

The U.S. government considers beryllium to be a critical mineral, although our country is currently self-sufficient in it. Phenakite could be used as a beryllium ore, but it does not occur in adequate quantities to be economically extractable for the purpose. We'll enjoy it as an attractive mineral and as a gem.

Gems

Phenakite's high refractive index means that it sparkles brilliantly when faceted. That makes it an attractive gemstone, especially since it is relatively hard and therefore durable. Wikipedia informs us that a raw 616.9-carat (~1/4-pound!) stone found in Sri Lanka was valued at close to $5 million. The British Museum owns faceted phenakite gemstones weighing 43 and 34 carats.

Cut phenakite prices depend on the size and quality, as with other gems. One-carat cut stones were advertised at $150 or less, and an 8-carat stone was offered for $1,600. A 2.33-carat stone from Russia was advertised for $349. If you are interested in purchasing a faceted phenakite, be careful and go to a reputable vendor. Remember that phenakite resembles quartz.

Cat's eye phenakite has also been found in Sri Lanka and cut into cabochons.

Prices were found online on August 12, 2026.

Collectible Specimens

If you care to drop $15,000, Arkenstone has a beautiful 3.6-centimeter (1.4-in) specimen from Montana, formerly owned by lifetime club member George Loud.

A South African crystal 4-centimeters (1.6 in) long, lustrous and golden colored but subhedral and mostly opaque, can be purchased for $140. Smaller crystals may be available for less.

Prices were found online on August 13, 2026.

Technical Details

Chemical formula ..... Be_2SiO_4

Crystal system .....Triclinic

Hardness.....7.5-8

Specific gravity.....3

Color .....Colorless, white, pale yellow, green, brown, or pink, or gray

Streak .....White

Cleavage.....1 distinct, 1 imperfect

Fracture .....Conchoidal

Luster .....Vitreous

Acknowledgments

Terry and Marie Huizing, the power couple behind *Rocks & Minerals* magazine, graciously provided me with a copy of Bob Cook's article on Mount Antero, CO (see below). The article includes useful information about other localities too. I took the opportunity to renew my subscription. You may want to do that too.

Martin Slama has focused his collecting interests on beryllium-bearing minerals. He has a very broad collection of phenakite from around the world and has shared his excellent photographs of them on Mindat. I am grateful for his prompt responses to my questions.

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Club Member-Dealer Forum
September 7 Program

We are planning to hear from some of our member-dealers on how they got into this as a business rather than just a hobby.



Meeting Summary
June 1 Club Meeting

by Almas Eftekhari, Secretary

President Jason Zeibel welcomed members, noting the high turnout and the club's ongoing growth. He asked for guests to introduce themselves and tell us about their interest in our hobby.

Max said he was interest in microcrystalline varieties of quartz. He collects jaspers, cherts, and chalcedonies. ***Eric and Caitlyn*** came to the meeting from Front Royal. Eric introduced Caitlyn as an active rockhound, thanking her for getting him interested. Eric has Cherokee heritage and owns a traditional medicine bundle of crystals. He discussed his longstanding fascination with the metaphysical and natural energies associated with quartz and hematite. ***Lindel and her fiancé Charlie*** like collecting unusual rocks.

Jason announced our annual club picnic in August. The club will supply hot dogs, hamburgers, veggie burgers, and condiments. He asked attendees to bring a side dish or dessert to share, along with their own drinks, including any alcoholic beverages. Trading and selling tables will be set up. Members must clearly label materials as for purchase, trade, or giveaway. We will also have a swimming pool and yard games. Noah and Xavier, our new team for club equipment, can hopefully bring some of the club's lapidary saws to the picnic for some stone cutting exhibitions.

Because the first Monday of September coincides with Labor Day, our usual firehouse meeting place will be closed and our September meeting will be fully virtual. Our next semi-annual club auction is scheduled for the first Monday in October.

Sign-ups for autumn club hoodies will begin at the August picnic and continue throughout September, with delivery anticipated before the onset of cold weather.

Jason told members who are new and still aren't getting the club emails to see Craig Moore to ensure that he had their proper email addresses. He told anyone

Surprise Mineral Find in Arlington



In August 2026, while collecting stream water samples in Lubber Run, Alex Brown (who works for Arlington County in stormwater management) found this smoky quartz specimen partially buried in soil alongside riprap on an eroded streambank. The specimen is about 4 × 5 × 3 inches in size; it is entirely quartz, with no matrix attached. The bedrock, Sykesville Formation sedimentary melange (a metamorphic rock), is not exposed there along the stream, but elsewhere it contains veins and lenses of quartz. The specimen might have broken off from a hidden pegmatite or large quartz vein within the bedrock, possibly during suburban development in the 1930s-50s. Or it might have come from a discarded mineral collection.

Either way, you never know what you might find if you keep an eye out along our local streams!

ready to join the club to see Treasurer Roger Haskins to submit their applications and pay your dues. He also asked longstanding members who hadn't paid your dues for the year to please do so.

Field Trip Co-Coordinator Katy Johnson confirmed that the next field trip would be on Saturday, June 13, at the National Limestone Quarry and Mount Pleasant Mills in Pennsylvania. The quarry is the only operational locality for collecting wavellite. The drive is about 4 hours. Members who sign up to go on field trips must be in good standing with fully paid 2026 dues and submit the required registration form.

For anyone who went on the last field trip at the Texas Quarry, helmet stickers are available from Katy.

Peggy Fouts asked about Virginia Rockhounding 101, a course that Dr. Thomas Hale was offering in summer 2026. The program was to run once a week for 6-7 weeks, concluding with field trips at the end of summer. The course provided an excellent grounding in regional mineralogy and geology.

Jason reminded members that the club has a $250 travel reimbursement scholarship program. Funding is available to any student or junior member seeking to attend national-level geological events, such as Wildacres, the Tucson mineral show, and other nonlocal symposia. Upon return, scholarship recipients deliver a brief presentation to the club about their experiences. (Interestingly, Thomas Hale received a club scholarship in about 2015.)

Youth Coordinators Celia Zeibel and Maria Nopo announced the launch of the new official Instagram account, Nova Mineral Club. The account will feature meeting reminders, postmeeting photographs, and fun videos over the summer.

Vice President Jennifer Grimes introduced guest speaker Mitch Hunter-Scullion, CEO and founder of the Asteroid Mining Corporation (AMC), who presented remotely from Scotland. AMC is the UK's only company dedicated to commercial extraction of space resources. It is now an eight-person team specializing in astronomy, engineering, IT, and finance.

Mitch outlined his personal journey, beginning with his 2016 undergraduate dissertation at Liverpool Hope University on the case for asteroid mining, which prompted him to register the company. He detailed AMC's subsequent scientific partnerships, including a collaboration with Liverpool John Moores University and the Astrophysics Research Institute.



Prototype of an asteroid-mining robot.

A single platinum-bearing metallic asteroid that is a kilometer in diameter can possess material assets valued at about $30 trillion, which equates to roughly ten times the gross domestic product of the UK. Primary extraction targets include platinum-group metals (essential for hydrogen fuel cell catalysis, catalytic converters, and smartphones) and water. Water is highly valuable in orbit because it can be electrolyzed into hydrogen and oxygen to serve as spacecraft rocket propellant and used as protective radiation shielding for deep-space travel.

According to a 2018 study, space-based platinum extraction would generate far fewer carbon dioxide emissions per kilogram than terrestrial mining. Off-world extraction also bypasses ethical issues related to artisanal mining in the global South and avoids the ecological devastation associated with deep-seabed mining. Since 2016, the number of identified near-Earth asteroids has more than doubled from 16,000 to over 35,000, about 1 percent of which are minable metallic candidates.

During the exceptionally close 2029 flyby of the asteroid Apophis (expected to pass within 32,000 kilometers of Earth, closer than geostationary satellites), AMC has proposed a high-Earth orbit satellite mission to track and photograph the asteroid. This flyby will serve as proof-of-concept for future prospecting runs.

Mitch discussed his participation in the Hague International Space Resources Governance Working Group, which drafted the foundational building

blocks for space resource utilization. The building blocks have since influenced domestic space resource policies globally, including in pioneer countries like Luxembourg.

To conclude his presentation, Mitch showcased several physical meteorite specimens from his personal collection, representing the diversity of compositions found in space. The featured meteorite specimens were from Chelyabinsk, Russia, in 2013; Canyon Diablo, Arizona; Campo del Cielo, Argentina; and elsewhere. They included diogenite from the Sahara Desert in 2013.

Jason thanked Mitch for staying awake until 2 a.m. local time in Scotland to deliver his insightful presentation.



China's Chang'e-5 Moon Samples Contain Perplexing Minerals

by Sharmila Kuthunur

Editor's note: *The article is from Space.com (8 February 2024). Thanks to Sue Marcus for the reference!*

Old and new minerals found in lunar samples brought home by China's Chang'e-5 lunar mission (return capsule shown above after landing in Inner Mongolia) are helping scientists better understand the moon's history.

In 2020, Chang'e-5 returned 3.8 pounds of rocks and dust from Oceanus Procellarum, the largest dark region on the moon, which can be seen on its western edge. An analysis of these samples has revealed a new mineral, which has been named changesite-(Y). Changesite-(Y), discovered by researchers at the Beijing Research Institute of Uranium Geology (BRIUG), is the sixth new lunar mineral ever found.

Sad News

John S. White, mineralogist, Smithsonian curator, and founder of *The Mineralogical Record*, died on August 3. John was known to many collectors in our club and throughout the world, either personally or by reputation. You can find a gracious tribute to John and his legacy here.



John at the Smithsonian in 2017.

The moon is pocked with craters from asteroid strikes preserved intact due to the lack of atmospheric and geologic activity on the moon. The intense pressures and temperatures from asteroid impacts change the composition of the top layer of lunar rock and dust, called the regolith, which scientists study to piece together the moon's turbulent history.

Changesite-(Y) formed in the aftermath of one such asteroid strike, leaving a crater from 1.9 miles to 20 miles wide, depending on the impact angle. A previous analysis pinned the age of the rocks collected by Chang'e-5 at 1.97 billion years.

The new research was described in a paper published in the journal *Matter and Radiation at Extremes*. … *Read more.*



President's Message

by Jason Zeibel

Greetings, NVMC, and welcome back from a hot and busy summer! For my family, summer was punctuated with lots of travel across the country. We started with our annual Fourth of July vacation to the Outer Banks of North Carolina. After that, there were stops in Denver, CO; Cimarron, NM; Dallas, TX; Tucson, AZ; Glen Jean, WV; New Hampshire and Connecticut; and Dayton, OH. These trips represented a mix of work and personal travel.

But now that the school year is starting up again, some of that travel will likely abate. I hope that you all had a relaxing summer and a chance to sit by a pool, beach, lake, or mountain and reset. The coming months will likely once again accelerate as the gravity of the holidays accelerates our schedules. While the weather is still warm and the days still long, do try to get outside and spend some time in nature—maybe even finding a rock or fossil in the process!

We do have a treat for club members as the calendar turns to fall. We have an upcoming club trip to Willis Mountain on September 26. Willis Mountain is renowned for its kyanite deposits, but you can also find pyrite, hematite, rutile, and a host of pretty quartz varieties. Reach out to our field trip co-chair Katy if you are interested in going and get your name on the sign-up list. Just a reminder that you must have your dues current to attend.

Our club picnic was scheduled for August 16, but that would have been a complete washout. We decided to push it back one week to the following Sunday, August 23. Hopefully, that will work out better with Mother Nature. I look forward to hosting the picnic each year because it is a great opportunity to relax and swap rocks and stories on a lazy Sunday afternoon. Since the new date is now after the newsletter cutoff for September, you will have to wait patiently to find out if our new and improved date for the summer picnic worked out; you will likely see pictures from the event in the October newsletter.

We plan to start taking orders for club hoodies at the picnic and will do so for a few weeks afterwards. The goal is to have them in time for the fall show in November. If you want one, be sure to watch your email or reach out to our club secretary, Almas.



Figure 1—*Club president Jason Zeibel and his daughter Celia at the summit of Pikes Peak in Colorado. All photos: Jason Zeibel.*

Speaking of the club show, don't forget to mark your calendar before school starts and fall weekends get booked. The dates this year are November 20-22. For those who haven't experienced our show yet, it is an all-members-on-deck activity with lots of opportunities to help out. In exchange, you get free access to a wonderful local show, with exhibits, kids' activities, and (of course) lots of treasures for sale.

In my wanderings around the world, I try to stop at interesting places that seem to have some unique geological connection. This July, I had the opportunity to take my daughter Celia to look at some colleges in the Mountain West and for her to do some Scouting. Since the West is jam-packed with interesting geology, I had a hard time not stopping at 50 different spots during our trip.

After flying into Denver and touring the University of Colorado in Boulder, we headed south down I-25. Just west of Colorado Springs and only 20 minutes off of I-25 lies Pikes Peak, one of the most famous mountains in the United States. We stopped for the night in Manitou Springs, CO. Manitou Springs is famous for its carbonated mineral springs, powered by precipitation that filters down through fractured granite and limestone, then rises again through artesian springs. Carbonation in a karst landscape gives the waters their natural effervescence.

We took the Cog Railway up to the summit of Pikes Peak the next morning (fig. 1). I had tried twice before back in 1997 to drive up to the summit but was



Figure 2—*Jason and Celia at Philmont Scout Ranch in Cimmaron, NM. The Tooth of Time is in the background.*

stopped by blowing snow both times (in July!). This time, we took the railway and made it with no issues.

Pikes Peak is quite old, formed about 1.1 billion years ago. Pikes Peak granite solidified deep underground as an intrusive igneous rock born from a colossal underground magma chamber called a batholith. The distinct pink hue of the rocks making up Pikes Peak comes from an abundance of large potassium feldspar crystals that grew slowly underground over millennia. According to club member Sue Marcus, Pikes Peak is noted among mineral collectors for its robin's-egg-blue microcline (amazonite) and smoky quartz.

The main purpose of our trip out West was for Celia to experience a week at Scouting America's preeminent outdoor reservation, Philmont Scout Ranch in Cimarron, NM (figs. 2, 3). Philmont covers over 140,000 acres in northern New Mexico, making it the largest youth camp facility in the world. Philmont was donated in the late 1930s by Tulsa oilman and philanthropist Waite Phillips (founder of Phillips 66) because he believed deeply in the power of the outdoors to build self-reliance, character, and patriotism in young people. Philmont sits on the historic Santa Fe Trail, just east of Taos, NM. The trail was traveled by miners, settlers, American Indians, and ranchers for most of the 19th and early 20th centuries.

The famous geologic feature that dominates views at Philmont is known as the Tooth of Time, a striking dacite porphyry igneous intrusion. Formed 22-40 million years ago during the Paleogene Period, it resulted from magma pushing into Earth's crust. Softer overlying sedimentary rock later eroded away, leaving this hard rock monolith towering over the valley below.

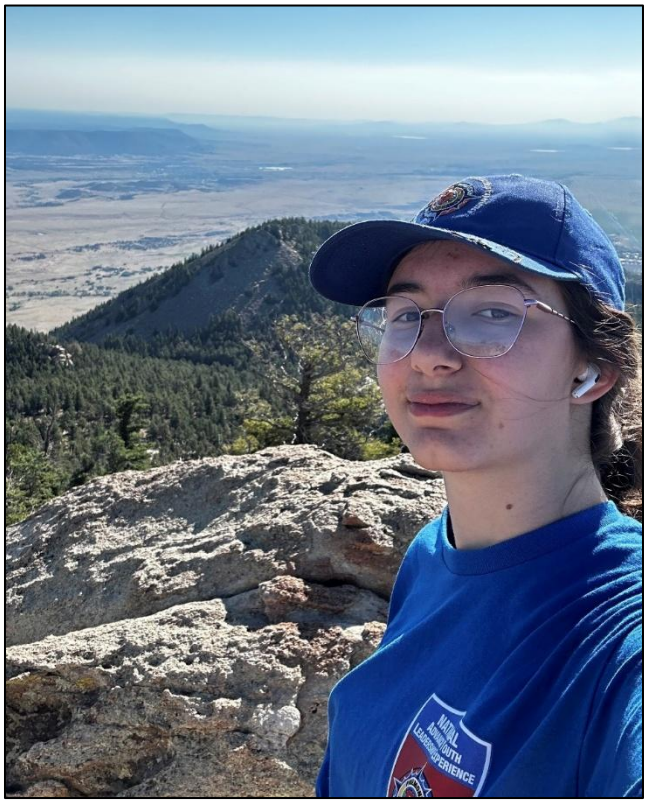


Figure 3—*Celia at the summit of Tooth of Time.*

Most Scouts who hike at Philmont do a day-long pilgrimage up the Tooth of Time. They leave base camp at 6,500 feet elevation around 4:30 a.m. and hike up to the summit at 9,003 feet before returning in time for dinner. Celia managed to complete the grueling hike as part of her week at Philmont participating in the National Advanced Youth Leadership Experience (fig. 3).

After leaving Celia for her week at Philmont, I headed north towards Denver and my flight home. I managed to fit in one more geological side quest when I visited the Capulin Volcano National Monument in the northeastern corner of New Mexico. The Capulin Volcano is part of the Raton-Clayton Volcanic Field (RCVF) in northeastern New Mexico and southern Colorado (fig. 4). The RCVF is located in the Great Plains physiographic province near the Sangre de Cristo Mountains, a range in the Rocky Mountains.

Eruptions in the RCVF began about 9 million years ago and continued until less than 60,000 years ago

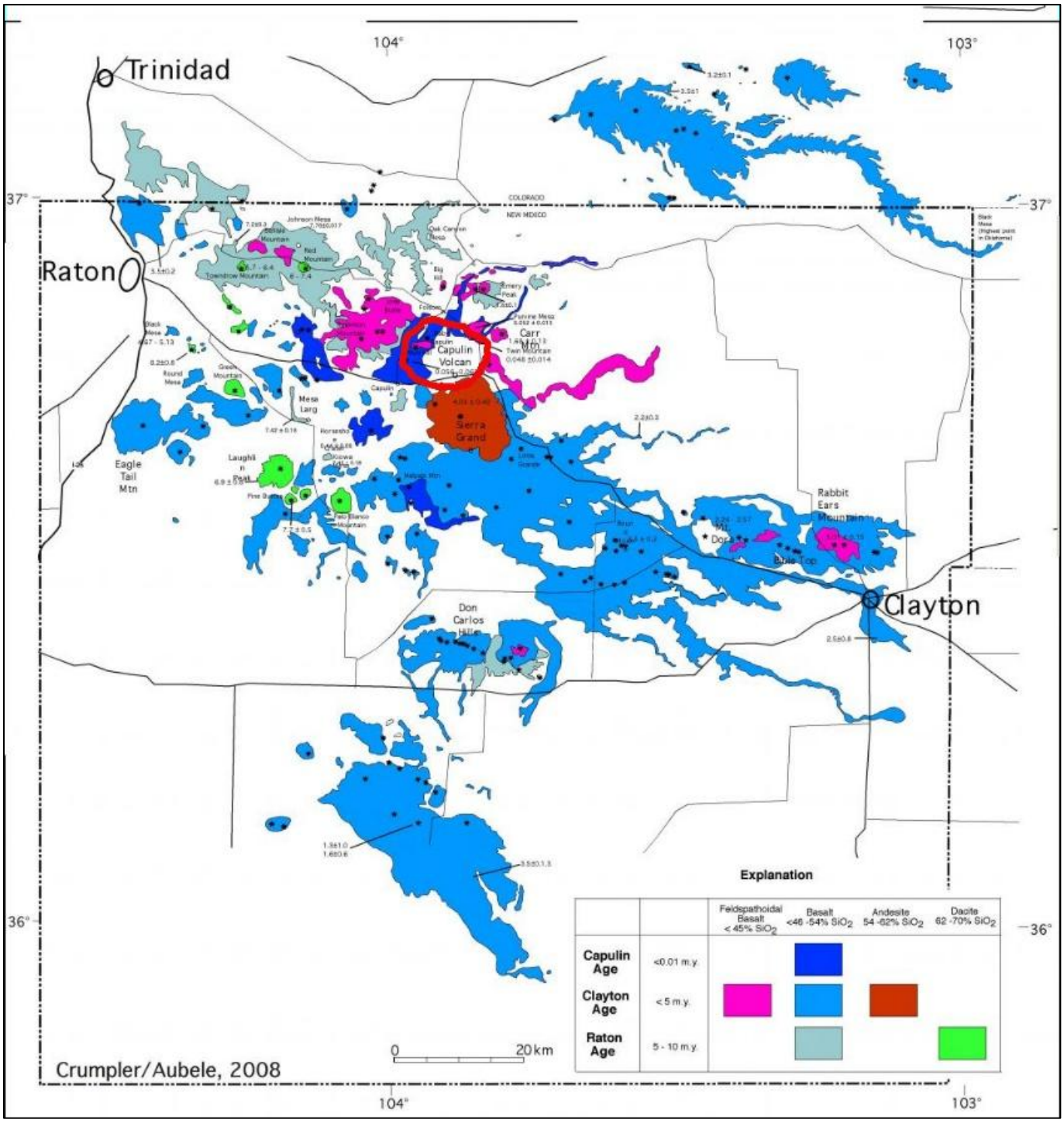


Figure 4—*The Raton-Clayton Volcanic Field. The Capulin Volcano is circled in red. Source: NMMNHS (no date).*

(Sayre and Ort 1999). The RCVF erupted in three phases: the Raton phase, Clayton phase, and Capulin phase (Baldwin and Muehlberger 1959; Stroud 1997). The Capulin phase began about 1.7 million years ago and continued until a few thousand years after the eruption of the Capulin Volcano; it might not have ended but simply be in eruptive hiatus (Sayre and Ort 1999; Stroud 1997). The Capulin phase included the eruption of the Capulin Volcano and other basaltic cinder cones, basanites, and small fissure eruptions



Jason at the entrance to Capulin Volcano National Monument.

near the center of the volcanic field. Other volcanoes that erupted during the Capulin phase include Mud Hill, Horseshoe Crater, Carr Mountain, Emery Peak, Eagle Tail Mesa, Twin Mountain, Baby Capulin, and Purvine Mesa (NPS 2025).

The full RCVF covers an 8,000-square-mile area of volcanic activity containing over 100 volcanoes and volcanic vents (fig. 4; NPS 2025). The lava flows were basalt derived from magma, yet quartz and sandstone are common in the rocks erupted from the Capulin Volcano—even though quartz does not crystallize in basaltic magma (NPS 2025), nor does sandstone form in it. Geologists call such foreign rock fragments xenocrysts (quartz) and xenoliths (sandstone), from ancient Greek *xenos* ("foreigner"). The xenoliths and xenocrysts probably came from Dakota sandstone, a bedrock type in the Capulin area (NPS 2025), with the quartz and sandstone incorporated into the magma not long before eruption.

The Capulin Volcano is a unique cinder cone in the National Park System. Its boca, or mouth, at its western flank is more complex than in most cinder cones. The volcano is very accessible, with a paved road to its rim, and it has become a well-established stop for both tourists and university geology field trips, including my own visit (figs. 5, 6).

The Capulin Volcano erupted about 60,000 years ago over a period of a month to a few years (Sayre and Ort 1999). The first lava flows came out of small vents, followed by the eruption of cinder to make the volcanic edifice itself. After the cone grew to its present height, more lava erupted from the western base of the volcano, forming the boca, which consisted of



Figure 5—*Parking on the Capulin Volcano at the edge of the caldera, popular with visitors.*



Figure 6—*Jason at the highest point on the Capulin Volcano rim: 8,182 feet above sea level.*

several vents, lava lakes, and lava tubes. These flows soon surrounded the volcano.

After about 60,000 years of erosion and encroaching plant life, the shape of the cinder cone is still clearly visible, and outcrops of sharp volcanic rock are everywhere. The maximum extent of the lava flows is clearly delineated and visible from the rim of the caldera (fig. 7, top). The interior of the caldera has the most plant life because it is somewhat sheltered from the winds and catches the relatively sparse rainfall (fig. 7, bottom). I was able to complete the mile hike around the caldera in a little over an hour, pausing frequently to take in the views and take pictures of the scenery and local wildlife (fig. 7).

Just a reminder that our September meeting is indeed on Labor Day and is virtual on Zoom because the

meeting hall is closed to the public for the holiday. We are planning to hear from some of our member-dealers on how they got into this as a business rather than just a hobby (look for details elsewhere in the newsletter). Coming up in October is our biannual club mineral auction, so start saving your nickels and dimes for that one!

Jason

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Figure 7—*The Capulin Volcano.* **Top:** *Lava flows from the volcano spill out into the valley below. The black line in the distance (center/left) marks the outermost extent of the flows.* **Bottom:** *Looking down into the caldera.*

National Limestone Quarry Field Trip Report

by Katy Johnson, Field Trip Co-Coordinator

Always a special place, National Limestone Quarry once again did not disappoint.

To start with, the weather was absolutely perfect. We gathered in the parking lot in front of the office to sign waivers and a thank you card while marveling at the enormous calcite-covered nodules at the edge of the property. Right on time, we walked into the office and were greeted by quarry owner Eric Stahl. Eric allows clubs with proper insurance to collect onsite and hear his ministry as he shares the Gospel and his sincere love of Jesus Christ.

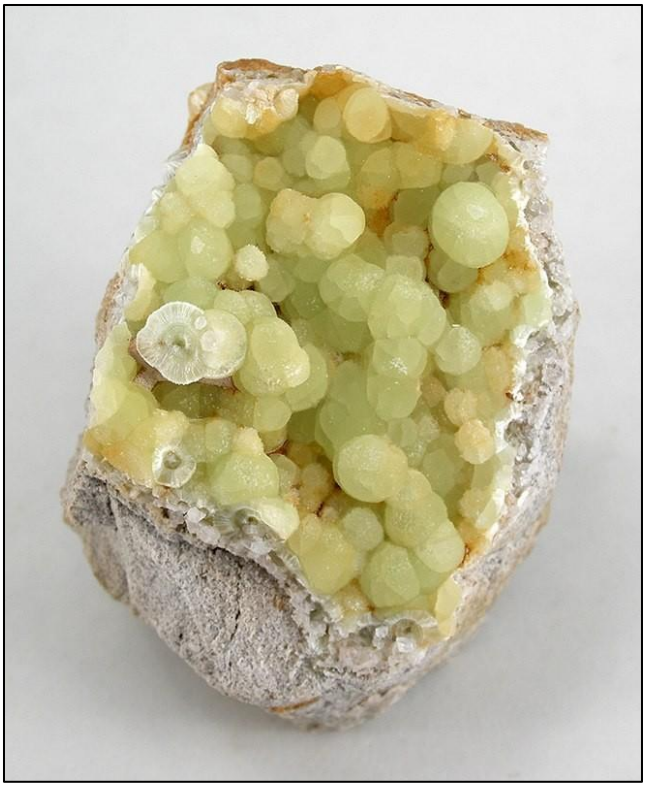
We listened to Eric's message, then embarked on our adventure. Instead of chasing wavellite right out of the gate, we started at the main quarry in search of flowstone and dark purple fluorite. We made our way through the quarry and filled our buckets with glorious stones of all shapes and sizes. Many of us were in search of the perfect yard rocks and some in search of the perfect specimens.

After much exploration of the main quarry, the group decided to head over to Mount Pleasant Mills. We could not pass up the opportunity to search for wavellite! We found our way to the wavellite pit, putting us right were we needed to be to bring home some beautiful wavellite specimens.

Overall, a perfectly successful day! Already looking forward to next year's trip!

Upcoming Field Trips

- ***September:*** Willis Mountain (full, with waitlist)
- ***October:*** TBD (likely October 10 or 11)
- ***November:*** TBD (possibly November 28 at John Wolf Memorial in Odessa, DE, for petrified wood)
- ***December 5:*** History (noncollecting) of Latrobe's Potomac Marble Quarry, led by Paul Kreingold (author of *Potomac Marble: The History of the Search for the Ideal Stone*)



Wavellite from Mount Pleasant Mills. Photo: Rob Lavinsky.

Be on the lookout for upcoming field trip forms from Jason Zeibel, NVMC President. Field trips are for members in good standing with current dues paid. Field trips are filled on a first-come, first-served basis via the forms. Volunteers in leadership positions get the first chance to sign up.

If a field trip is full, be sure to follow the link to the waitlist form and request to be added. We have been able to add participants from the waitlist for most if not all of our field trips.

Serving in the club is an excellent way to increase your chances of attending field trips and having a ton of fun with great people along the way!!

Good for Kids: Dinosaur Park

Hours: The park's fossil site is open on the first and third Saturday of the month (Sep 5, 19; Oct 3, 17; Nov 7, 21; Dec 6, 19). The playground is open daily, dawn to dusk.

The park is free and open to people of all ages. Please confirm times and dates with the park.

34th Annual GEM, MINERAL AND FOSSIL SHOW

Presented by The Northern Virginia Mineral Club, Inc. | www.novamineralclub.org/show

Sponsored by the Dept. of Atmospheric, Oceanic and Earth Sciences at GMU

Date:	November 21 & 22, 2026
Place:	Dewberry Hall, Johnson Center George Mason University - Fairfax Campus GPS: www.bit.ly/3fBZfh8 (takes you to GMU's Lot A)
Hours:	Saturday 10am-6pm, Sunday 10am-4pm
Admission:	Adults: $6, Seniors (65+): $5, Teens (13-17): $4 Children 12 & under, accompanied by adult are FREE GMU Students & Faculty w/valid ID are FREE. Scouts in uniform are FREE.

Scan This Code to Register for Free Parking Permit in Lot A

Features: Demonstrations, Exhibits, Kids Activities, and Door Prizes.
Mini-mines for children to dig in and get free fossils and minerals.
SILENT AUCTION on SUNDAY
Approximately 20 Dealers with Gems, Minerals & Fossils for sale.

$1 OFF
Adult admission with this card (applies to all adults & seniors in your group)

Enter Lot A @ Mattaponi River Lane off Patriot Circle
Look for our Courtesy Shuttle & Designated Walking Path to Mineral Show





Junior Geologists in Warrenton, VA

by Sue Marcus

Where do kids and parents gather? On July 11, it was at the Warrenton library for a Junior Geologists show-and-tell. Our group of geo-types included Roger Haskins, Sue Marcus, Dave Nanney, Ken Rock, and Susie Weidner, all led by the intrepid John Weidner.

John had responded to an email from the children's librarian asking whether one of the local mineral clubs would present an interactive program for kids. John rounded up some of the volunteers who conduct the same program monthly at the King's Park Library in Burke, VA.

About 40 kids and parents enjoyed hands-on activities that included rock identification; the uses of minerals; creation of a fossil timeline; which rocks fizz in weak acid and what the differences between them are; fluorescent minerals (aka glo-rocks); and more. There was coloring dinosaurs and other prehistoric beasts for the littlest kids, the artistically inclined, and parents.

A primary activity for the Junior Geologists is always "Show us your rock." We encourage kids to bring one or more rocks and tell us what they know about them. We ask where they found the rocks and what colors and textures they see and feel. We somewhat more experienced folks try to explain how the rocks formed. The kids tell the stories of their rocks and we tell them stories about their rocks—a mutual learning experience!

We welcome others to join us at the regular King's Park Library gig every third Wednesday of the month. Whether or not you join us, stop by the library to see Tom Taaffe's marvelous display of fossils. It includes at least one specimen from every geologic era.



Fossil Display at King's Park Library

You might have seen a great fossil display right here in our local area, at the Kings Park Library in Burke, VA. Tom Taaffe, assisted by club member John Weidner and Kendall Hall from Kings Park Library Youth Services (shown in the photo above), created a wonderful educational exhibit of fossils from every geologic period from Cambrian through Pleistocene. Some fossils were self-collected, and each one told a story on "A Walk Through Geologic Time," the title of the display.

Tom and other club members had been joining John Weidner for monthly Junior Geologists events at the library. Library staff asked whether they would be interested in putting on a display about fossils, a library reading theme for the summer. Tom agreed if John and Kendall would assist.

Tom already had the specimens, posters, and museum toys that became part of the display. Kendall fabricated the signs and most of the labels, and John helped with design and layout. The library offered a perfect venue for presenting this aspect of our hobby. Patrons could learn more about the history of Earth by checking out books that were only steps away. The exhibit ran from July 6 to August 31.

GeoWord of the Day

(from the American Geoscience Institute)

einkanter

A *ventifact* or windworn stone having only one face or a single sharp edge; it implies a steady, unchanging wind direction. Etymol: German *Einkanter*, "having one edge" (from *Kante*, "edge"). Pl: einkanters; einkanter.

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



Ancient Sea Containing Ammonites Once Flooded North America's Interior

by Riley Black

Editor's note: *The article, abridged and edited, is from* Smithsonian Magazine *(10 July 2026). Thanks to Sue Marcus for the reference!*

South Dakota has no oceanfront, yet signs of saltwater are there, enclosed in rocks laid down by a long-vanished seaway that once split North America in two. More than 70 million years ago, what's now prairie was a warm sea full of marine lizards, knife-toothed sharks, and gorgeous coil-shelled ammonites jetting through the sunny waters.

Some of those shining cephalopod shells are now part of an exhibition at the Smithsonian's National Museum of Natural History called "From These Lands," which showcases hundreds of specimens and artifacts from across the United States.

While fossils such as sharks' teeth and prehistoric corals are found along America's coasts, ocean has touched every part of the country at some time or another in the deep past. The South Dakota ammonite shells, such as the one shown in the photo, come from a period when pterosaurs still flew through the air and immense dinosaurs still trod through forests. In the inland seas, the now extinct shelled cephalopods proliferated in huge numbers, often serving as food for the large aquatic reptiles of the time.

The ammonites selected for the display are so delicately preserved that they continue to shine because of the material ammonites used to make their shells. Many ammonite shells were at least partly composed of nacre, the same material that creates oyster pearls. The material, also known as mother-of-pearl, refracts and bounces light back. The fossilization process allowed the mother-of-pearl to be better exposed than it would have been during the ammonite's life.

The water that the South Dakota ammonites jetted through, the Western Interior Seaway, existed for more than 30 million years. Around 100 million years ago, during the hothouse world of the Cretaceous, sea levels rose to the point that ocean water spilled down the middle of North America—from the Arctic Ocean down to what's now the Gulf Coast. The waters were relatively shallow, no more than 3,000 feet deep compared with the average ocean depth of about

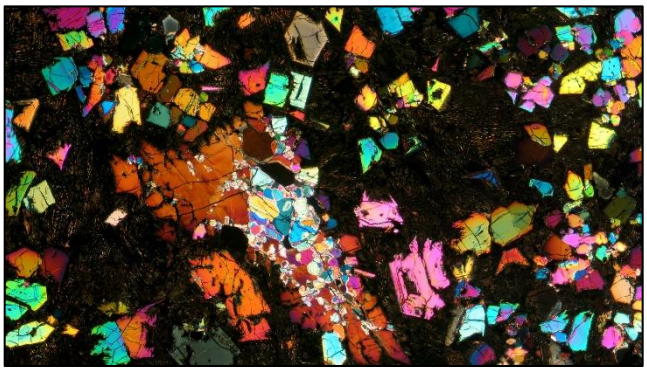


12,000 feet now, but they hosted so much life that paleontologists to this day find gigantic seagoing reptile specimens in Kansas and reef-building clams the size of toilet seats in Utah. And all this life isn't just ancient history: the fossil-filled rocks weathered into the nourishing soils that allowed the Midwest to become so agriculturally important. The seaway eventually vanished as the planet cooled at the end of the Cretaceous and as polar ice formed. Sea levels dropped, and the two split subcontinents finally joined by land in what we now recognize as North America.

Researchers are constantly unearthing new fossils from the layers of the long-lost Western Interior Seaway. Countless discoveries of mosasaurs have been made in Kansas and surrounding states. With such a large sample, experts can better study how the anatomies and diets of the various seagoing lizard species that lived in those waters differed.

The continent's rocks hold more than the remains of this ancient sea. Thanks to continental drift, changing sea levels, and the nature of fossil-bearing rock formations, America's geologic layers contain the vestiges of various bodies of water from before the time of the Cambrian explosion through the Ice Age. Paleontologists and amateur fossil hunters can find traces of some of the earliest animal life in the deserts of Utah, reefs that witnessed the emergence of some of the first fish in Ohio, and the teeth of 20-million-year-old sharks in South Carolina.

Some states rest entirely on what's left of past oceans. The bedrock beneath Ohio is made up of various rocks that formed during the time when plants were only just beginning to grow on land and our ancestors had yet to live on it. … *Read more*.



Meteorite Found in Sahara Desert Points to Lost Solar System World

by Sharmila Kuthunur

Editor's note: *The article is from Space.com (4 June 2026). Thanks to Casper Voogt for the reference!*

A rare meteorite (thin section shown above under cross-polarized light), recovered from the Sahara Desert, contains the first definitive evidence of a long-lost world that might have rivaled the moon in size and existed just a few million years after the solar system formed 4.5 billion years ago, according to a new study.

The meteorite, known as Northwest Africa (NWA) 12774, is a roughly 1-pound rock discovered in the Sahara Desert in 2019. Scientists classify it as an angrite, a rare type of meteorite that ranks among the oldest volcanic rocks in the solar system. This particular chunk of space rock preserves an unusual chemical signature that suggests some of the solar system's earliest worlds developed differently from other rocky planets, researchers say.

By measuring tiny radioactive elements within them that act like natural clocks, scientists know that angrites formed alongside the young sun more than 4.5 billion years ago. As such, they preserve valuable clues about how planets formed and evolved, according to NASA. They are also remarkably scarce—only 68 of more than 80,000 meteorites recovered on Earth are known angrites.

This research is described in a study published in the journal *Earth and Planetary Science Letters*. … *Read more*.

Save the Date

Desautels Micromount Symposium

The Baltimore Mineral Society

70th Paul Desautels Memorial Micromount Symposium

October 9-11, 2026

Natural History Society of Maryland, 6908 Belair Rd, Baltimore, MD 21206

Friday, October 9

7 p.m. Registration, coffee, and treats

8 p.m. Fellowship with other micromounters; short talks and slide shows

Saturday, October 10

9 a.m. Symposium opens: trading, giveaway tables, mineral sales

10 a.m. Silent auction

12 noon Light lunch (provided)

2 p.m. Voice auction

3 p.m. **Micromounters' Hall of Fame induction**

Conducted by Quintin Wight, Manfred Seitz, and Alan Pribula

Announcement of next year's honorees

A Life Without Minerals: Possible but Lacking in Substance

Presented by Manfred Seitz

5 p.m. Dinner (at local restaurants on your own)

7:30 p.m. **I'm Not Going to Become a Micromounter and Other Lies I've Told Myself**

Presented by Alan Pribula

9 p.m. Adjournment

Sunday, October 11

9 a.m. Trading, giveaways, conversation

12 noon Symposium concludes

Questions? Mike Seeds (mseeds@fandm.edu)
Symposium Chair

The Rocks Beneath Our Feet

Geology of Seneca Creek Sandstone

by Hutch Brown

Editor's note: *This is a revised version of an article that appeared in* The Mineral Newsletter *in March 2014.*

Many of us visit (and some of us volunteer at) the Smithsonian Institution's National Museum of Natural History—especially its Hall of Geology, Gems and Minerals—on the National Mall in Washington, DC. Across the mall is the Smithsonian Castle (fig. 1, top), the original building for the Smithsonian Institution and itself a monument to geology, in a way.

The Castle was designed by architect James Renwick, Jr. Completed in 1855, it was initially an isolated building, but it became the anchor for the National Mall as creeks and marshes were piped or drained and other federal buildings went up nearby.

Unlike most federal buildings, the Castle is made up of red sandstone blocks. The sandstone was quarried along the Potomac River near Seneca, MD, a town named for Seneca Creek, a tributary of the Potomac not far upstream from Washington, DC.

Although the abandoned sandstone quarries are overgrown by forest and hard to find, you can still see the ruins of the old sandstone mill near Seneca Creek, where the stone blocks were cut (fig. 1, bottom).

What's the backstory for the quarries and mill? And how did the sandstone get there in the first place?

Manassas Sandstone

Let's start with the geology—the sandstones and other sedimentary rocks laid down during the Triassic Period (about 252-201 million years ago) in an ancient depression that geologists call Culpeper Basin, named for the town of Culpeper, VA.

The USGS geologic map for the Seneca Quadrangle shows Seneca Creek flowing over Manassas Sandstone (fig. 2, left, **Trmp**), a formation of sandstones, siltstones, and conglomerates formed from sediments laid down in Triassic lake beds and river bottoms within Culpeper Basin. A cross-section of the area (fig. 2, right) shows the Poolesville and Reston members of Manassas Sandstone overlying and adjoining much older rocks of the metamorphic Marburg Formation (**CZmb**). Manassas Sandstone starts as a thin wedge where metamorphic rock exposures end near



Figure 1—*Buildings constructed from Seneca Creek sandstone.* ***Top:*** *The Smithsonian Castle on the National Mall.* ***Bottom:*** *Sandstone mill ruins near Seneca, MD. Photos: Wikipedia, Ajay Suresh (top); Hutch Brown (bottom).*

Seneca Creek. It gradually thickens to the west, becoming thousands of feet deep.

All this suggests a sequence of geologic events that began more than 300 million years ago:

1. An orogeny (mountain-building event) emplaced uptilted metamorphic rocks in the Piedmont—schist, metagraywacke, and more (fig. 2, right).
2. Continental rifting for the Atlantic Ocean caused part of the metamorphic bedrock to sink (fig. 2, blue arrows), forming Culpeper Basin.
3. Erosion filled the basin with Triassic sediments that hardened over time into sedimentary rock (fig. 2, **Trmp**, **Trmr**).

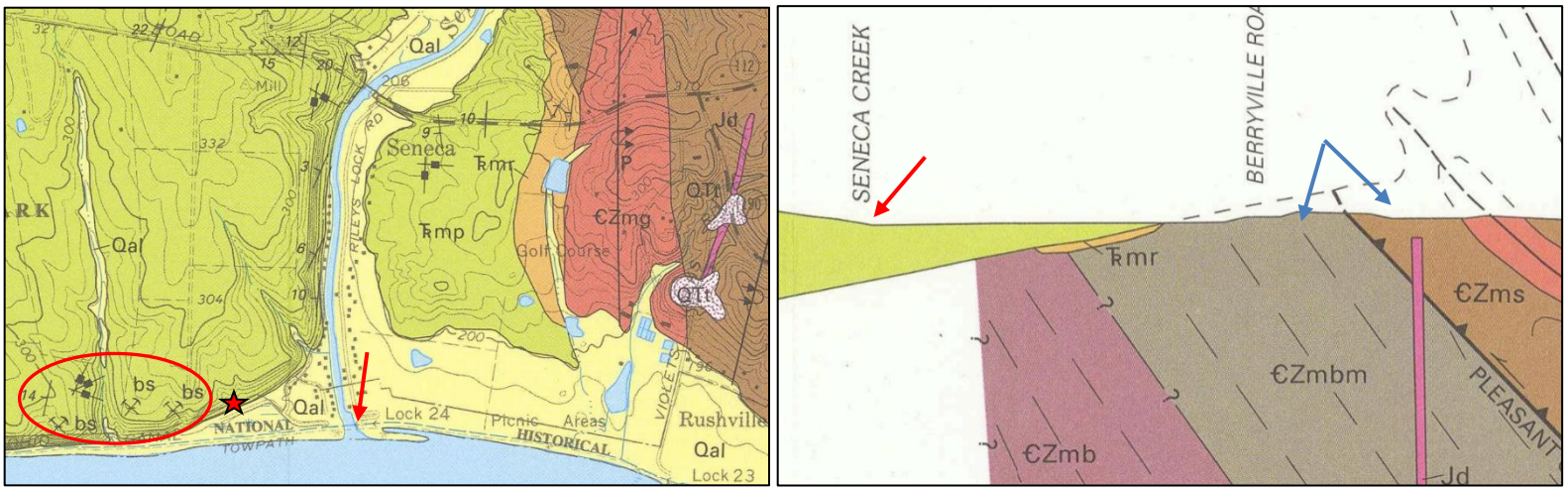


Figure 2—*Details from a geologic map of the Seneca Quadrangle showing the area near the mouth of Seneca Creek (**red arrow**). **Left:** Bedrock in the area of the Seneca Creek sandstone quarries (**red circle**—**bs** = building stone) and the sandstone mill (**red star**). **Right:** Cross-section showing flat Triassic sedimentary rocks overlying sharply uptilted Proterozoic/Cambrian Piedmont rocks. The map shows the downramp (**blue arrows**) for Culpeper Basin over Marburg Phyllite, with the hinge in Mather Gorge schist. **Colors/symbols:** Olive (**Trmp**) = Poolesville member of Manassas Sandstone (**Tr** = Triassic, **m** = Manassas, **p** = Poolesville); orange (**Trmr**) = Reston member of Manassas Sandstone (**r** = Reston); brown (**CZms**) = Mather Gorge schist (**C** = Cambrian, **Z** = Proterozoic, **m** = Mather Gorge, **s** = schist); red (**CZmg**) = Mather Gorge metagraywacke (**g** = metagraywacke); burgundy (**CZmb**) = Marburg Formation, undivided; gray (**CZmbm**) = Marburg Formation muscovite phyllite (**m** = muscovite); magenta (**Jd**) = Jurassic diabase (dike); lilac (**QTr**) = Quaternary terrace deposits; yellow (**Qal**) = Quaternary alluvium. Source: Drake and others (1999).*

Tectonic Events

Bull Run Mountain offers a clue as to how it all happened. The "mountain" is actually a ridge at the eastern edge of the Blue Ridge Province. Drive west on I-66 for an hour or so and you pass right through the ridge at Thoroughfare Gap. You can see metamorphic rocks there (metabasalt, phyllite, and quartzites), a sharp difference from the sandstones, siltstones, and other sedimentary rocks in adjacent Culpeper Basin.

The metamorphic Bull Run rocks first formed from basalts and overlying sediments laid down more than half a billion years ago in an ancient ocean (forerunner of the Atlantic) on the edge of proto-North America's granitic basement rocks. Over the next several hundred million years, lines of volcanic islands—the rough equivalent of Japan or Indonesia today—collided with proto-North America and grafted new rock formations (what geologists call terranes) onto the continent, forming much of the bedrock for today's Piedmont and Coastal Plain Provinces.

About 320 million years ago, proto-Africa closed a residual ocean and collided with proto-North America in a great mountain-building event called the Alleghanian Orogeny. The tremendous pressure of the collision broke off entire sections of terrane rock and transported them dozens of miles inland, pushing them up along a series of thrust faults and depositing uptilted metamorphic rock formations where we find them in the Piedmont today (fig. 2, right).

The Alleghanian Orogeny also broke off the Bull Run rocks and the underlying granitic basement rocks, which are more than a billion years old. The great Alleghanian rock train carried the basement and Bull Run rocks inland ahead of the Piedmont rocks, pushing them up into the great anticline of the Blue Ridge Province. It's an upfold about 20 miles across, with Bull Run Mountain on its eastern edge and the Blue Ridge Mountains proper on the western side.

Atlantic Rifting

By about 280 million years ago, our area lay deep within a supercontinent called Pangaea (pronounced pan-JEE-uh) under mountains as high as the Himalayas today. Even the highest mountains weather away in a few tens of millions of years, and supercontinents inevitably break up. By the late Triassic Period (about 230 million years ago), the mountains were gone and our entire area was relatively flat, much like the Serengeti Plain in East Africa today.

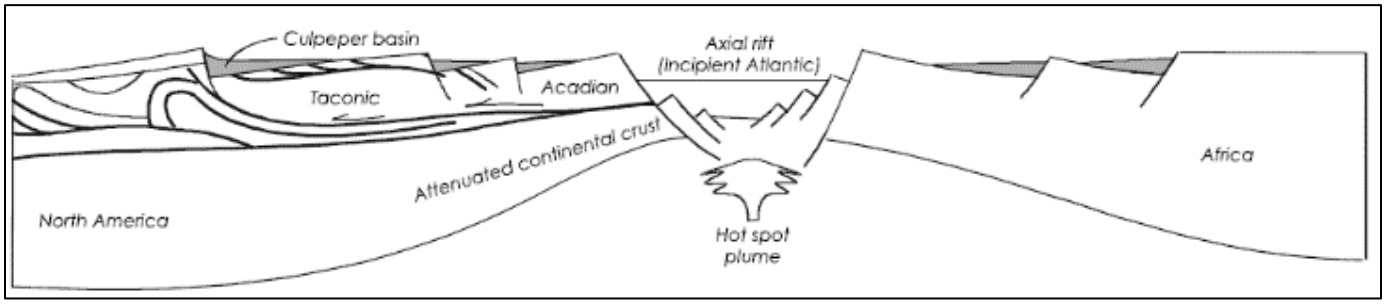


Figure 3—*Triassic rifting in our area beginning about 230 million years ago. A hotspot of magma domes the area, thinning and stretching the overlying rock and reactivating fault lines, including ancient suture zones between the continental bedrock and the accreted terranes of the Piedmont. Great blocks of rock slide down along the reactivated faults, forming the widening Atlantic Ocean and a series of smaller half basins in our area, including Culpeper Basin. Source: Fichter and Baedke (1999).*

Like in East Africa, a hotspot of upwelling magma domed the overlying rock in our area (fig. 3), stretching and thinning Earth's crust. The doming, stretching, and thinning reactivated ancient fault lines—weaknesses in the rock—including the suture zone between the continental bedrock of the Blue Ridge and the accreted terrane of the Piedmont.

The hotspot was centered under what became the main rift zone between Africa and North America, what geologists call the axial rift (figs. 3, 4). A so-called full graben (from German *Graben*, "trench") took shape. Lava spewed from the center of the graben, which filled with water and continued to spread, forming the Atlantic Ocean (figs. 3, 4). Rifting continues today at the mid-Atlantic Ridge.

Culpeper Basin

As the upwelling magma broke through the overlying bedrock to form the graben (axial rift), great slabs of rock dropped down the reactivated faults. They formed what geologists call half grabens, with major faults on one side only (fig. 3). Their remnants are the Triassic basins across our area today (fig. 4, red and pink), including the rift valley at the foot of Bull Run Mountain—Culpeper Basin.

Culpeper Basin took shape as continental rifting reactivated the ancient fault line between the continental bedrock of the Blue Ridge, including the Bull Run rocks, and the accreted terrane of the Piedmont. The Piedmont rocks slid down the Bull Run rocks along the ancient fault line as if on a hinge (figs. 3, 5).

The Bull Run rocks formed what geologists call a horst (from German *Horst*, "eyrie" or "eagle's nest

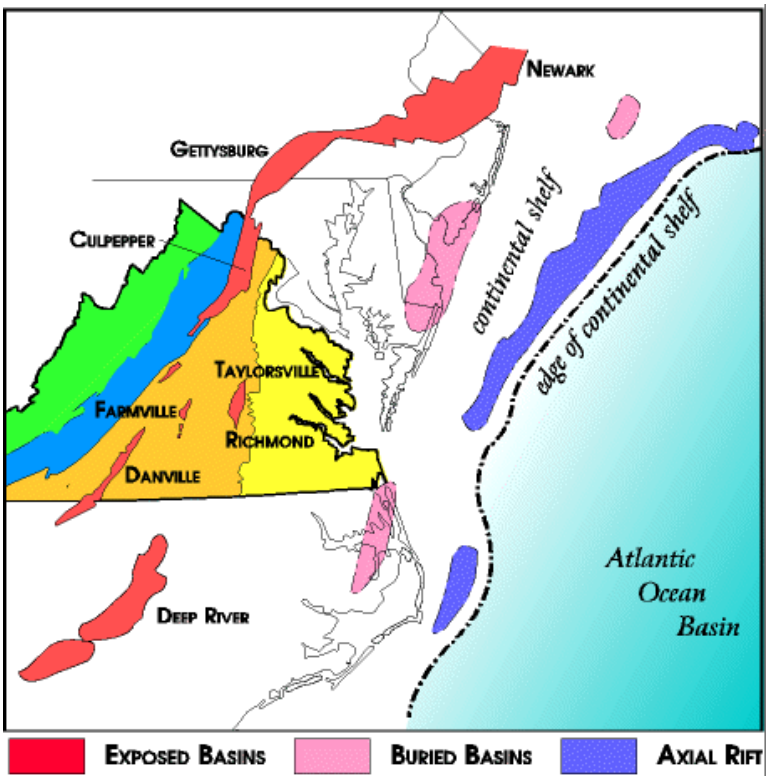


Figure 4—*Triassic basins in our area. As Africa broke away from North America beginning about 230 million years ago, the crust stretched and ruptured along major fault lines in the bedrock, forming a series of rift valleys, along with the axial rift (blue) of the spreading Atlantic Ocean. Sediments have since buried the rift valleys of the Coastal Plain (pink), but the basins and their sedimentary rock are well exposed in the Piedmont (red), including Culpeper Basin. (Culpeper is misspelled as Culpepper in the graphic.) Source: Fichter and Baedke (1999).*

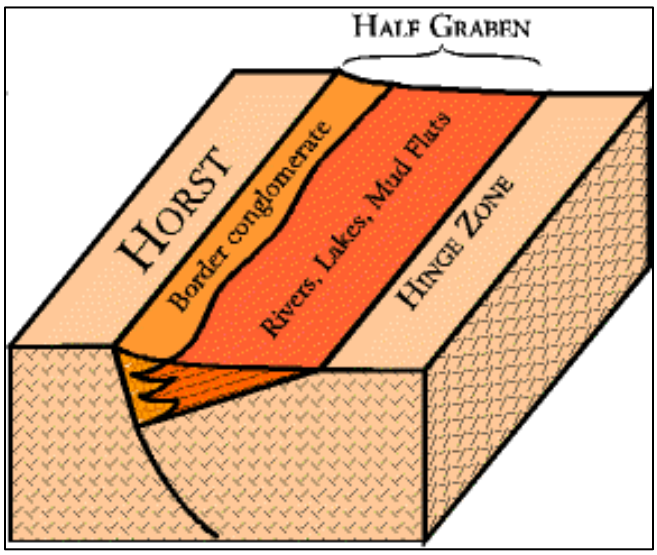


Figure 5—*Schematic drawing of a half graben. The rock sinks along a reactivated fault line as if on a hinge, forming an escarpment overlooking a valley. Rivers and lakes take shape in the valley, gradually filling it with sediments from the horst and hinge zone. Source: Fichter and Baedke (1999).*

perch")—a huge escarpment looming over the half graben (fig. 5). The rift valley in Culpeper Basin extended from what is now Frederick, MD, to about 40 miles south of Manassas, VA, and as far east as Reston, Manassas, and the part of the Quantico military base where metamorphic bedrock exposures begin. The three localities (Reston, Manassas, and the western part of the Quantico base) form a rough line from northeast to southwest, demarcating the hinge zone for the Piedmont rock as it sank down the horst (the Bull Run rocks). In Maryland, the geologic map for the Seneca Quadrangle (fig. 2, blue arrows) shows part of the hinge zone located in Mather Gorge Schist just east of Seneca Creek.

Volcanic activity accompanied the rifting and formation of the half grabens. You can see the same processes going on in East Africa today: the flat and featureless Serengeti Plain; volcanoes such as Mount Kilimanjaro; and the Great Rift Valley, with its huge horsts looming over valleys filled with lakes and rivers, including vast marshes and bottomland forests teeming with African wildlife.

Sedimentary Rock Formation

Even while Culpeper Basin was still forming (which took tens of millions of years), it was already filling in (fig. 6). Streams washed gravels, sands, and silts from the horst in great alluvial fans, eroding the escarpment. Rivers and lakes formed in the basin, which filled with lacustrine (lake bed) and fluvial (river bottom) sediments even as the bedrock continued to sink along the horst.

Over millions of years, the sediments consolidated into various kinds of sedimentary rock: shales, siltstones, sandstones, conglomerates, and more, some with Triassic dinosaur footprints. The result was sedimentary rock wedges that started in the hinge zone and thickened to the west as the basin continued to sink (figs. 2, 5-6). Rifting was associated with rising magma that filled fractures in the overlying rock, becoming dikes and sills of diabase (fig. 6, black bars).

The effects of rifting, erosion, and sediment deposition went on for about 55 million years. When the rate of deposition finally exceeded the rate of subsidence, the basin gradually filled in.

Seneca Creek sandstone—part of the Poolesville member of Manassas sandstone (fig. 2)—came from a sandstone lens formed from sands laid down by a large Triassic river near the eastern edge of Culpeper

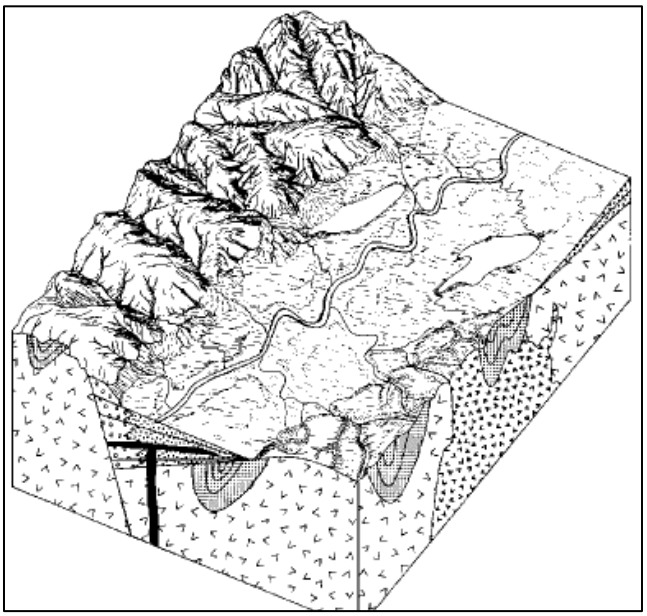


Figure 6—*Schematic drawing of Culpeper Basin about 200 million years ago. The basin is gradually filling with sediments eroded from the horst and hinge zone, carried in by the river that drains the basin. The fault and hinge are visible in the cross-section, as are a dike and sill of intrusive diabase (black bars). The Vs indicate bedrock before rifting began; the dots on the right indicate igneous plutonic rock (an ancient granitic intrusion) on the hinge. Source: Fichter and Baedke (1999).*

Basin. According to one source, Seneca Creek sandstone is composed of quartz and feldspar sands with a dark red to reddish purple clayey silt matrix containing mica. The broader Manassas Sandstone unit contains quartzite pebbles and quartzite conglomerate lenses that came from the horst (the Bull Run rocks).

According to another source, the red color of Seneca Creek sandstone came from sediments rich in iron, also found in other kinds of Culpeper Basin rock, such as Balls Bluff Siltstone. In a wetter climate, the feldspar and silt matrix components would have weathered into clay; but Seneca Creek sandstone solidified in an arid climate, with enormous desert flats, much like California's Mojave Desert. The intermittent groundwater helped the sandstone absorb iron-rich minerals over tens of thousands of years. In effect, the sandstone "rusted."

The sedimentary rocks of Culpeper Basin, including Manassas Sandstone, are softer and more erodible than the metamorphic and igneous rocks of the Blue Ridge Province. About 5 million years ago, gentle uplift began across much of our area, from the Piedmont to the Allegheny Plateau. As the sedimentary rocks of Culpeper Basin wore away and gentle uplift continued, Bull Run Mountain started to loom over landscapes to the east, coming to resemble the great rift valley escarpment that it once was.

Building Stone

Seneca Creek sandstone was chosen as building stone for the Smithsonian Castle and other structures for three reasons:

1. It was soft enough for easy quarrying, yet after exposure it became hard and weather-resistant enough to hold up walls.
2. After quarrying, it changed color over time from its natural grayish purple to a pleasing deep red.
3. It was close to the nation's capital and easily accessible by river barge, the main way of transporting goods and materials before roads improved and railroads arrived in the 19th century.

The first quarry, known as the Seneca Quarry (fig. 7, top), was located on a sandstone bluff along the Potomac River just west of Seneca Creek. Quarrying began in the 1780s, providing stone for a canal built around the falls of the Potomac; you can still see Seneca Creek sandstone in the locks on the Virginia side of Great Falls. Seneca Creek sandstone was also used



Figure 7—*Quarrying and use of Seneca Creek sandstone for construction.* ***Top:*** *The Seneca Quarry in about 1890.* ***Center:*** *Bridge/aqueduct for the C&O Canal over Seneca Creek, built in the early 1900s.* ***Bottom:*** *House for the keeper of Lock 24 along the C&O Canal. Photos: Peck (2013) (top); Hutch Brown (center/bottom).*

to build infrastructure for the C&O Canal in Maryland (fig. 7, center/bottom), a venture that operated until 1924, when it finally failed, mainly due to competition from railroads.

Quarrying Seneca Creek sandstone succeeded for more than a century due to the workability, durability, and coloration of the stone and its proximity to the Potomac and C&O Canal. The most profitable year for quarrying was 1871, when 850,000 tons of stone were transported by canal. According to the Geological Survey of Maryland in 1879, Seneca Creek Sandstone was still "one of the best Triassic sandstones." The biggest quarries of sandstone in Triassic rock at the time were all in Seneca Creek Sandstone.

End of an Era

But the extent of sandstone in Culpeper Basin was limited to alluvial fans from the ancient horst and to the relatively narrow river beds and floodplains in the ancient rift valley. The best sandstone was in a wide and deep lens from the Triassic river that once flowed near what is now Seneca Creek. By 1900, that sandstone was largely gone, and use of the C&O Canal was declining. Moreover, demand for highly colored stone was falling.

In 1901, the Seneca Quarry closed. Production of Seneca Creek sandstone continued, but only at smaller quarries that supplied a limited amount of material to local communities. Demand for building materials shifted to the light-colored marbles, granites, and limestones you can see in most monuments and federal buildings in Washington, DC.

Source

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Seneca Creek Sandstone used in construction. ***Top:*** *The C&O Canal at Lock 24 near Seneca, MD.* ***Bottom:*** *Ruins of the mill near Seneca, MD, where sandstone blocks were cut and loaded onto barges for transport on the C&O Canal, after being first used to build the mill itself. Photos: Hutch Brown.*

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September 2026—Upcoming Events in Our Area/Region (see details below)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2 MSDC mtg	3	4	5
6	7 **NVMC mtg (Zoom only)**	8	9	10	11 Show: Winston Salem, NC	12 Show: Winston Salem, NC
13 Show: Winston Salem, NC	14 GLMSMC mtg	15	16	17	18 Shows: NC, VA	19 Shows: NC, VA
20 Shows: NC, VA	21	22	23	24	25	26 Shows: PA, MD
27 Shows: PA, MD	28 MNCA mtg?	29	30 MNCA mtg?			

Event Details

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

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

11-13: Winston Salem, NC—Annual show; Forsyth Gem & Mineral Club; Winston Salem Fairgrds (Edu'l Bldg), 421 W 27th St, Gate 9; Fri 10-6, Sat 10-6, Sun 11-5; adults $5, 18 & under free; info: Jeanne Schlottman, contact@forsythgemclub.com, https://forsythgemclub.com.

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

18-20: Swannanoa, NC—Show; Mountain Area Gem & Mineral Ass'n; Land of Sky Shrine Club, 39 Spring Cove Rd; Fri 9-6, Sat 9-6, Sun 9-5; free admission, parking; info: Richard Jacquot 828-779-4501, rickjacquot@gmail.com.

18-20: Fishersville, VA—Show/sale; Shenandoah Valley Gem & Mineral Society; The Augusta Expo, 277 Expo Rd; Fri 2-6, Sat 10-6 Sun. 11-5; $5 adults, $3 seniors/students, under 12/Scouts/military in uniform free; info: Scott Gregory 727-542-9723, sgregory357@hotmail.com

26-27: Harrisburg, PA—Annual show; Central Pennsylvania Rock & Mineral Club; Zembo Shrine Audit., 2801 N Third St; Sat 10-6, Sun 10-4; $5 w/show card (online), $6 without, 12/under free; info: Brittany Fussell, 22gneiss@gmail.com.

26-27: W Friendship, MD—Annual show; Gem Cutters Guild of Baltimore; Howard County Fairgrds, 222210 Fairgrds Rd; Sat 10-6, Sun 10-5; adults $6, Scouts in uniform/kids 12 & under free; info: Kay Kron, classes@gemcuttersguild.com.

28/30?: Burke, VA—Micromineralogists of the National Capital Area (meeting date varies based on room availability); info: http://www.dcmicrominerals.org/.

The Northern Virginia Mineral Club, Inc.

Visitors are always welcome at our club meetings!

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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).

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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 club member).

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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.*