



The Mineral Newsletter

Meeting: May 17 Time: 7:45 p.m.

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



Kyanite

São José da Safira, Minas Gerais, Brazil

Source: Mindat.

Deadline for Submissions

May 30

Please make your submission by the 30th of the month! Submissions received later might go into a later newsletter.

Volume 62, No. 5

May 2021

Explore our [website!](#)

May meeting program:

Paraiba Tourmaline

(details on page 8)

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Mineral of the Month Kyanite

by Sue Marcus

Our Mineral of the Month is kyanite, which is known to some of us, including a few who have been lucky enough to collect specimens. Its name comes from the ancient Greek word *kyaneos*, referring to a dark hue of blue or green—or even brown. Light blue was a different word (*glaukos*), which referred to a shade rather than a specific color, so it might also mean light green, brown, or yellow.

Kyanite was first described and named by Abraham Gottlieb Werner in 1789. He named it for the blue color for which most specimens are known, taking an ancient word for blue and placing it into a more modern context. An alternative spelling, cyanite—presumably referring to the cyan blue color—was also used during the 19th and part of the 20th centuries. Cyanite can still be found in some references for the mineral kyanite.

The typical long blades of kyanite crystals give this mineral an alternate name—disthene (two strengths) for the difference in hardness parallel to the length of the blade (6.5–7 on the Mohs scale) and at 90 degrees to the long axis of the blade (4.5–5.5). The physical characteristic of differing hardness in different directions is called anisotropy; kyanite is an anisotropic mineral.

Typically, kyanite is vibrant blue, though crystals can be blue with white zones; rarer forms of red or green kyanite can be translucent and gemmy.

Kyanite forms under high temperatures and pressures. It is usually found in metamorphosed rocks, such as those that were originally siltstones. When the metamorphic rocks erode, fragments of kyanite can mix in with sediments that form sedimentary rocks. This is a good example of the rock cycle: a mineral formed from a sedimentary rock when it was metamorphosed can then be found in a sedimentary rock, which can then be metamorphosed again.

Kyanite is found with staurolite and corundum in metamorphic rocks. Kyanite is the high-pressure form of aluminosilicate (Al_2SiO_5). Two other minerals with the same formula, known as polymorphs, are andalusite, the high-temperature form, and sillimanite, the

Happy Memorial Day!

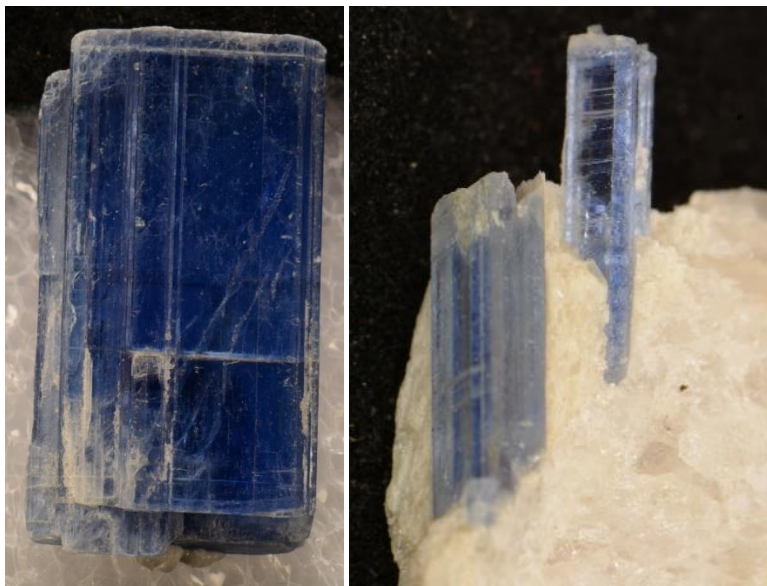


Northern Virginia Mineral Club members,

No in-person social events for now!



Kyanite with staurolite, Sponda Alp/Pizzo Forno, Chironico Valley, Ticino, Switzerland. Source: Mindat.



Left: Kyanite, Barro do Salinas, Minas Gerais, Brazil. Right: Sponda Alp/Pizzo Forno, Chironico Valley, Switzerland. Photos: Bob Cooke.

low-temperature form (there is no low-pressure polymorph).

Kyanite is not a rare mineral. It is found in metamorphosed rocks in many parts of the world. Virginia is the main source of kyanite in the United States, the world's leading kyanite producer. So Virginia is the world's top natural kyanite producer and exporter. The Kyanite Mining Corporation extracts kyanite from two pits near Dillwyn, in Buckingham County, VA. Willis Mountain kyanite is relatively pure Al_2SiO_5 , giving it a pale blue to white color. Production from this source began in 1922. Kyanite comprises 10 to 40 percent of the quartzite in part of the Chopawamsic Formation (early Cambrian in age, about 570–530 million years old). The quartzite was probably squeezed or recrystallized during metamorphism of felsic and mafic volcanic rocks. Felsic rocks are mostly feldspars and silica (quartz); mafic rocks are darker, heavier, and rich in amphiboles and pyroxenes containing magnesium and iron. Another Virginia kyanite deposit, at Baker Mountain, is more blue-green than at Willis Mountain, with chromite or iron providing the colorant. Differences in the chemistry of the kyanite and the deposits suggest that the host rocks are from different original sources. Mining began at Baker Mountain in the 1920s; both properties are owned by Kyanite Mining Corporation.

Smaller deposits in North Carolina, including on the Pisgah National Forest, have yielded some zoned and some gemmy crystals along with the more usual crys-

tal aggregates. Spruce Pine, NC, more noted for emeralds, has also been a source of kyanite. In Pennsylvania, kyanite can still be found (though infrequently) at Prospect Park in Delaware County. The Judd's Bridge, CT, locality is old and probably overgrown. It produced specimens with kyanite crystal blades up to about 6 inches long. Small kyanite occurrences in New Mexico produced nice specimens, for example from the Petaca District in Rio Arriba County, though photographs may be as difficult to find as recent specimens. Kyanite, with mica and quartz, grew outward from the wallrock into the vein as parallel adjacent crystals. In other parts of the Petaca District, kyanite occurs as a main mineral in schist, as randomly oriented blades and aggregates, and as porphyroblasts in the metamorphic host rocks. Porphyroblasts are larger, commonly euhedral crystals of a mineral within a finer grained groundmass of metamorphic rock. Curved crystals up to 18 inches long were reported from the Kiowa View II deposit. An economic analysis of this district was conducted in 1960. Tonnage and grade of the kyanite-bearing material were estimated without any drilling to confirm the information. The study identified a deposit but much smaller and lower grade than the Virginia deposit.

Brazilian kyanite crystals come in diverse collectible forms. Although I haven't seen all specimens from all localities, the ones from Bahia most impress me. Along with the usual, roughly parallel deep blue bundles, this locality produces gorgeous, unusually translucent single crystals that are lighter colored, sometimes clear on their outer faces, with a blue stripe in the center. The zoned crystals grow to at least 3 inches, with some having translucent blue or green outer faces, although the center is apparently always blue. I could not determine when these unusual crystals were



*Kyanite from Willis Mountain, Dillwyn, VA.
Photo: Kyanite Mining Corporation.*



Far left: Kyanite, Barro da Salinas, Minas Gerais, Brazil; source: Mindat. Left: Kyanite on quartz, Barro da Salinas, Minas Gerais, Brazil; photo: Bob Cooke. Top: Kyanite, Sponda Alp/Pizzo Forno, Chironico Valley, Switzerland; photo: Bob Cooke.

extracted, though I saw none for sale and photo publication dates ranged from 2005 to 2018.

Minas Gerais, Brazil, produces many gemstones and lovely crystals of a large variety of minerals from the pegmatite veins there. Sheaves of kyanite crystals are also found in some of these areas, probably in schists that host the pegmatites. Translucent, deep blue kyanite suitable for lapidary work comes from some of these localities. In the Barra do Salina District, crystals reach lengths of up to at least 10 inches, with gemmy ones of up to 4 inches.

Also in Brazil, near the city of Goiás in Goiás state, blocky and sometimes gemmy kyanite crystals have been discovered. These include one pictured on Mindat and described as blue-green (though it looks green to me, not blue) and therefore more unusual for this species. Emeralds are also reported from the prospects here, but kyanite production does not seem to have been large or to have been reported in readily available English sources after the 1980s.

Our final Brazilian kyanite deposit is another with an unusual color—black or grey, from Ribeirão da Folha in Minas Gerais state. Many (most?) of us would misidentify a specimen if we saw one. It is locally called “witch’s broom,” an apt description of the appearance of the crystal sheaves. A proposed cause of the color

is graphite inclusions. It could be a novelty in any collection—and a fun test specimen for visitors.

The type locality (where a mineral was first found) for kyanite is Pizzo Forno, Switzerland. Kyanite from this locality occurs with staurolite crystals. The best specimens are translucent blue, long, bladed crystals,



Kyanite, São José de Safira, Minas Gerais, Brazil. Photo: Bob Cooke.



Left: Kyanite, Ilakaka, Ilhorombe, Madagascar. Right: Kyanite, Nani, Loliando, Arusha, Tanzania. Photos: Bob Cooke.

with attractively contrasting brown nontwinned staurolite crystals in white quartz or quartzite matrix. In the Alps, kyanite specimens have also come from Mt. Greiner, Austria. To the north, Norway is home to several small kyanite localities, including one in a roadcut. All of these produced attractive blades of blue kyanite. Perhaps the best of these is the Åfjord Formation in the hills north of Nordsandfjorden, Troms og Finnmark, Norway.

Russia is a vast, mineral-rich country, but kyanite specimens are well known only from two locations. Specimens from Borisovskie Sopki, Plast, Chelyabinsk Oblast also provide some novelties. Cabinet-size specimens of blue kyanite contrast with green fuchsite, a variety of muscovite mica, and an unspecified reddish fine-grained mineral, providing a colorful piece to display. Kyanite crystals can be translucent, and some rare ones are “butterfly twins” (joined at the base but flaring into separate individual crystals). Near the Arctic Circle in the Russian Republic of Karelia, Khit Island’s dark biotite schists contrast nicely with blue lathes of kyanite, small red garnets (species unknown), and white quartz. The kyanite crystals might be small but can be gemmy in some samples.

Nepal was a surprise and revelation to me. It is a source of stunning deep blue, translucent to transpar-

ent kyanite—think of the color of heat-treated tanzanite. Not surprisingly, kyanite from small workings in Daha (Jajarkot) and from the Kali Gandaki River Gorge are used as gemstones. These are also extremely difficult localities to access, with the latter purported to be the deepest gorge in the world due to the high Himalayas. Kyanite from Afghanistan is similar to what is reported from Nepal, although locations seem harder to pinpoint; many Afghan localities are notoriously vague. Afghan kyanite has an unusual property—it fluoresces! Kyanite has been reported from China, but I have been unable to find information about specimen-producing localities.

Last month, we learned that Tanzania hosts unusual colors of prehnite. This month, the same is true—kyanite from Tanzania is a unique, beautiful orange! Prospects in the Ngorongoro district were opened for similarly colored spessartine garnets and revealed these unusual kyanite specimens. Twinned crystals take several forms and most photos show crystals without matrix. A large specimen from this locality appears to be about 2 inches. I found several small specimens for sale on internet websites.

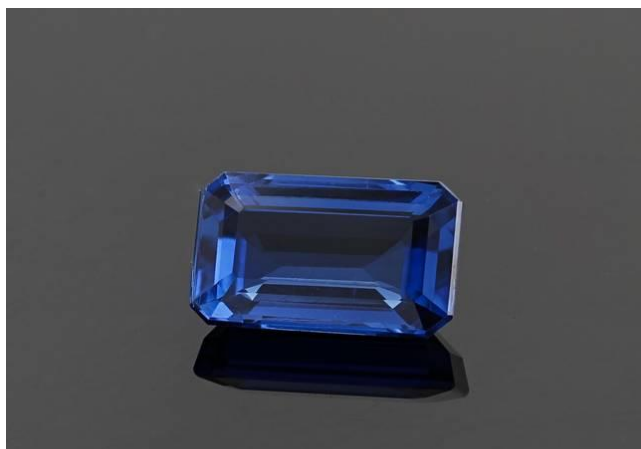


Kyanite twin, Nani, Loliando, Arusha, Tanzania. Photo: Bob Cooke.

Over in Kenya, kyanite at the Sultan Hamud deposit in the Uмба Valley forms single blue crystals up to about 7 inches long. Descriptions of the color of Kenyan kyanites usually call it teal. Very pale blue to white kyanite in radiating aggregates was reported as early as 1925 from the Luisha copper mine in the Democratic Republic of Congo (then Belgian Congo). Erosion of metamorphic rocks in the Ilakaka region southwest of Isalo National Park in Madagascar created placer deposits containing sapphires, chrysoberyl, garnets, and kyanite, as well as other minerals.

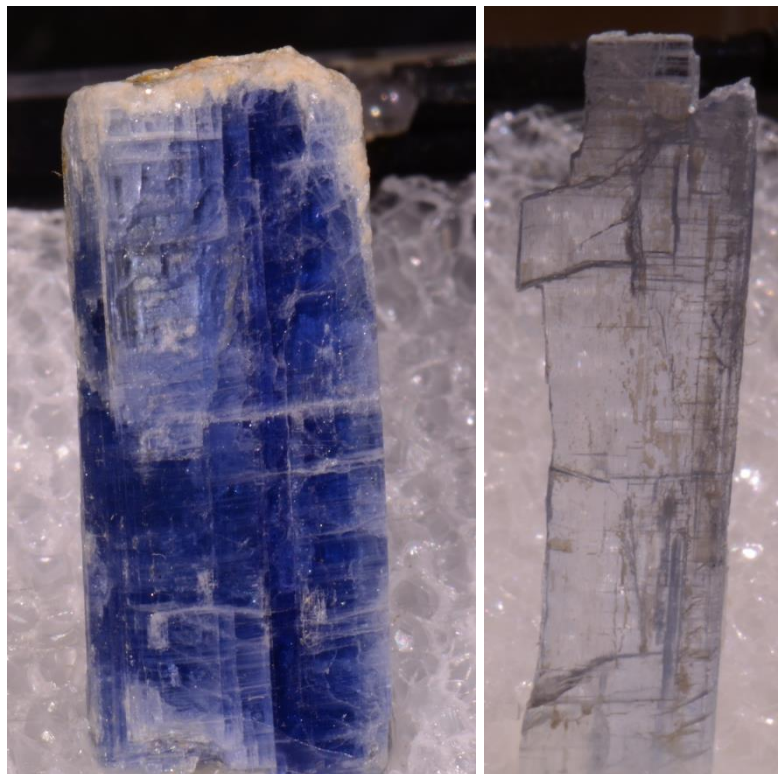
Fluorescent mineral collectors, do you have kyanite in your collection? I have kyanite in my collection, though not the fluorescent kind. Kyanite from Brazil and Nepal may fluorescence red under longwave ultraviolet light and much brighter red under LED longwave. I do not know whether some, most, or all of the material from these localities fluoresces. Kyanite that fluoresces green is reported from Pech, Afghanistan. The Fluomin.org website reports that weakly fluorescing kyanite has been found at the Celio Mines in Burnsville, NC, and at Piestewa Peak (formerly Squaw Peak), AZ. Kyanite from other localities may fluoresce too; check your specimens.

Kyanite forms at high pressure, so it is used in ceramics and other products that must withstand high pressures, like molds for metal products, firebricks, and kiln liners. Kyanite may be calcined or treated with high heat in an oxidizing (vacuum) environment that converts it to mullite, a rare natural mineral. Synthetic mullite is used for familiar products like the ceramic parts of some spark plugs, brake shoes, bathroom ceramic fixtures, and other forms of porcelain.



Kyanite from Nepal, 7.43 carats.

Source: Smithsonian Institution. Photo: Greg Polley.



Left: Kyanite, Demirci Pass, Anatolia, Turkey. Right: Kyanite, Barra do Salinas, Minas Gerais, Brazil. Photos: Bob Cooke.

As a lapidary material, kyanite is tough, and I don't mean simply hard. It is challenging to cut because of its anisotropy (remember—different hardness in different directions). It also splinters.

Kyanite's colors can be lovely. When translucent or transparent and large enough, cut stones are attractive. Beads, cabochons, and faceted stones can be made, although kyanite is more of a novelty than a common gemstone. Faceted stones of up to 20 carats have been reported, as have rare cat's eye kyanite cabochons. Gem-quality kyanite has been found in Brazil, Russia, Kenya, Madagascar, and at the Eldorado Strip Mine in Montana.

I will end with a few words about kyanite in your collection: by all means, include it! Kyanite is affordable: anyone should be able to acquire small specimens. The Kyanite Mining Corporation has opened its property to mineral collectors in the past; perhaps we can persuade them to do so again. Exotic kyanite crystals come in rare colors or even multicolored.

You can start with what you can find, in person or using the "silver pick" (money). If you do consider an internet purchase, *look carefully at the size of the*

specimen; I've been disappointed to find the beautiful close-up photographs were accurate but highly magnified. I paid more than I expected for a smaller than expected specimen. ➤

Technical Details

Chemical formula Al_2SiO_5
Crystal formTriclinic
Hardness4.5–5.5 parallel to long axis;
6.5–7 on long axis
Density3.53–3.67 g/cm³ (measured); 3.67 g/cm³ (calculated)
ColorBlue; less commonly white, green, gray; rarely pink, orange, yellow
StreakWhite
Cleavage1 perfect on {100}; imperfect on {010}
FractureSplinters
LusterPearly, vitreous

Acknowledgment

Mike Morris of the Kyanite Mining Corporation graciously responded promptly to questions and provided photographs of specimens from the Dillwyn site.

Sources

Corey, A.F. 1960, Kyanite occurrences in the Petaca District, Rio Arriba County, New Mexico. Bull. 47. Socorro, NM: New Mexico Bureau of Mines and Mineral Resources New Mexico Institute of Mining & Technology Campus Station.
Database of Luminescent Minerals. No date (N.d.). [Kyanite](#).
DMME, Division of Geology and Mineral Resources. N.d. [Kyanite](#).
Gemdat. N.d. [Ilakaka gem deposit, Madagascar](#).
Gemdat. N.d. [Kyanite \(cyprine\)](#).
International Gem Society. N.d. [Kyanite value, price, and jewelry information](#).
King, H.M. N.d. [Kyanite](#). Geology.com.
Marr, J.D., Jr. 1981. Geologic investigations in the Willis Mountain and Andersonville Quadrangles, Virginia, Commonwealth of Virginia, Department of Conservation and Economic Development, Division of Mineral Resources. Pub. 29. 83 p.
Mindat. N.d. [Disthene](#).
Mindat. N.d. [Kyanite](#).

Mindat. N.d. [Kyanite from Afghanistan](#).
Minerals.net. N.d. [The mineral kyanite](#).
Smithsonian Institution. N.d. [Geogallery: kyanite](#).
Tanner, A.O. 2018. [Mineral resource of the month: kyanite](#). Earth Magazine.
U.S. Geological Survey. 2021. Mineral commodity summaries 2021: Kyanite. Reston, VA: USGS: 92–93.
Webmineral. N.d. [Kyanite mineral data](#).
Wikipedia. N.d. [Blue](#).
Wikipedia. N.d. [Kyanite](#).
Wikipedia. N.d. [Mullite](#).

Definitions

What Is a Rock?

by Dave Woolley

Editor's note: The article is adapted from the newsletter of the Gem and Mineral Society of Lynchburg, VA, March 2019, p. 5.

A rock is a fragment composed of one or more minerals. If you break a rock into small enough pieces, you might have just one mineral.

Some kinds of rock are mainly made up of just one mineral, like quartzite (quartz) or dunite (olivine). Most rocks have more than one kind of mineral, like granite (which has quartz, plagioclase feldspar, orthoclase feldspar, and a little muscovite or hornblende).

Some rocks have crystals so tiny that they can't be seen; you need a microscope or x-ray diffraction to detect them. Sometimes, indirect observations are sufficient: agate is translucent and jasper opaque; both are composed of microscopic quartz crystals. A few rocks have no crystals, like obsidian or opal.

Igneous rocks formed from molten materials along with dissolved water and gases; **intrusive** igneous rocks crystallized belowground and **extrusive** igneous rocks hardened aboveground.

Sedimentary rocks formed from sediments ranging in size from silt to cobble.

Metamorphic rocks formed from existing rock altered by changes in heat and/or pressure.

Most rocks are composed of minerals in eight easily identified mineral families: quartz, olivine, calcite, feldspar, mica, amphibole, and pyroxene. ➤



President's Collected Thoughts

by Tom Kim

I used to teach at Burgundy Farms, a small private school just off of Telegraph Road in Alexandria. The school has a mountain campus in West Virginia, a kind of nature preserve, and the highlight of the sixth grade was often a fall trip there. We would always start that trip with Stone Soup.

As many of you know, Stone Soup is an old folktale about a stranger who walks into a small village asking for food. Everyone turns him away until he then begins making a broth in the center of town flavored by a “special stone.” As it’s boiling away, curious onlookers begin contributing vegetables, seasonings, and other ingredients as this magical soup begins to look more and more promising. Eventually this collaborative effort is shared happily by all.

I’ve always had a lot of sympathy for the villagers in this story. I don’t think they were particularly selfish or callous to the stranger at the start of the story. It’s not a crime to be cautious or noncommittal, especially when you look around and all your neighbors are being equally circumspect. They turned out to be quite generous once they got beyond their initial apprehension.

The mineral club is essentially a Stone Soup. We only exist because of the voluntary efforts and talents of our members. Our past auctions alone have been terrific events because of the quantity and quality of donated items.

But we need more cooks in the kitchen! A number of upcoming logistical concerns are straining the scope and capabilities of our current crew of dedicated officers, and we need to solicit the deep bench of talents elsewhere in the club.

We need one or more lawyers to proofread and update past contract templates.

We need educators to help refresh our past kids’ activity materials for club shows or perhaps design outreach initiatives to schools and youth organizations.

We need intrepid explorers and fussy coordinators to organize one or a few local field trips.

We need porters and custodians to help set up and break down one or a few swap meets.

And we need even more folks to envision and enable future activities, presentations, and service contributions.

I’m hoping that as the cicadas finally rear their heads, the rest of us will also rejoin one another (safely). The mineral club has been simmering for a while now, but we could use a couple more things in our cauldron—not only more rocks but also some technical knowhow, time, labor, energy, and enthusiasm. From the codgers to the kids—if we all chipped in a little, we can ensure a pretty tasty rest of the year.

As ever, you can reach me with any suggestions at president@novamineral.club. ↗

Tom

Tourmaline From the Paraiba Mine May 17 Program

Our May program will come to you from Brazil—if all goes as planned! Christian (Dino) from the Paraiba Mine will join us to share the wonders of tourmaline, for which the mine is world famous.

Tourmaline from this mine is frequently referred to as “Paraiba blue,” described as neon in brightness. What makes Paraiba tourmaline different? What are the geological circumstances that formed it? Dino will explain the tourmaline and its geologic setting to us.

Paraiba is an active mine. This program gives all of us the rare opportunity to visit an active gem mine in another country. We are grateful to the Brazil Paraiba Mine for creating this presentation for us. ↗





The Rocks Beneath Our Feet **Virginia's Historic Quarry for Aquia Creek Sandstone**

by Walter Nicklin

Editor's note: The article is adapted from The Washington Post, 2 April 2021. Thanks to Bob Cooke for the reference!

Watching the January 6 riot at the U.S. Capitol, I was struck by a jarring contrast: noisy, violent chaos playing out against the silent and solemn stonework of the building's classical architecture. Though windows, doors, and decorations were smashed and shattered, the stones still stood, stately and untarnished.

Imagine how devastating it would have been had the stonework itself been defaced and left in ruins—a universal, visual trope for civilization's collapse. I wanted to know more about those sturdy stones. Do

they have a name? What kind of rock are they, exactly? Where did they come from? Whose hands quarried and shaped them? What deep-time geological forces shaped the rock?

Curiosity—that animating impulse behind all travel—need not be diminished by the pandemic. To the contrary, being stuck at hermitage-like home finds me wondering about things that otherwise never would have captured my attention. In this instance, I was led through some Internet sleuthing to the discovery of something called Aquia Creek sandstone—which, in turn, led to yet more discoveries about building blocks of iconic places around the world.

Aquia Creek—after which this particular kind of sandstone takes its name—is a tidal tributary of the Potomac River about 40 miles south of Washington, DC. Although I live nearby, a historic stone quarry on Aquia Creek was news to me. The quarry is even on the National Register of Historic Places, with a 17-



A limestone “cliff” remains where building blocks for the U.S. Capitol were split away in the Aquia Creek Quarry.

acre park now known as Government Island. It made for a perfect pandemic day trip on a warm afternoon in early March.

My car followed the smartphone's directions down Interstate 95 to Exit 143A. There, it was led around suburban subdivisions to a culdesac with an almost empty parking lot. Understated but informative signage confirmed that I had arrived at the Stafford County park called Government Island. Actually a peninsula rising 25 to 35 feet above the surrounding wetlands, the site can nonetheless claim to be a metaphorical island in the heart of suburbia, accessible only on foot, with more waterfowl and wildlife than people.

At the trailhead, I stepped onto a pedestrian boardwalk. Elevated above scrub vegetation and marsh, it would take me to the historic quarry. It is a loop trail of less than 2 miles, and I had the place pretty much to myself except for some young couples with kids and/or dogs in tow.

The first thing I learned from the pathway's interpretive signs was that George Washington, who lived just upriver at Mount Vernon and who grew up at Ferry Farm only 10 miles away, would have been familiar with Aquia Creek sandstone. Easy to carve and freely split in any direction without shattering, the stone was commonly used throughout Virginia for pediments, quoins, and other decorative details in 18th-century houses and churches.

So it's no surprise that Pierre L'Enfant leased the island in 1791 to quarry stone for the new capital city. Then it was known as Brent's or Wigginton's Island after the families who owned it. Visitors today can experience the island pretty much as it was then because there's no huge hole in the ground usually associated with the word "quarry." Instead, the trail follows the island's gentle contours around rocky outcrops that seem to sprout up everywhere, often under a canopy of trees.

Where those rocks have been shaved into sheer small-scale cliffs, there is evidence of the manual labor (sometimes done by an enslaved person) required to "rough-cut" the sandstone into manageable blocks. Before modern machinery, sledgehammers, wedges, and chisels were the only tools available. You get a sense of the strength of will and imagination required to build not only a governmental temple from scratch but also a brand-new country as well.

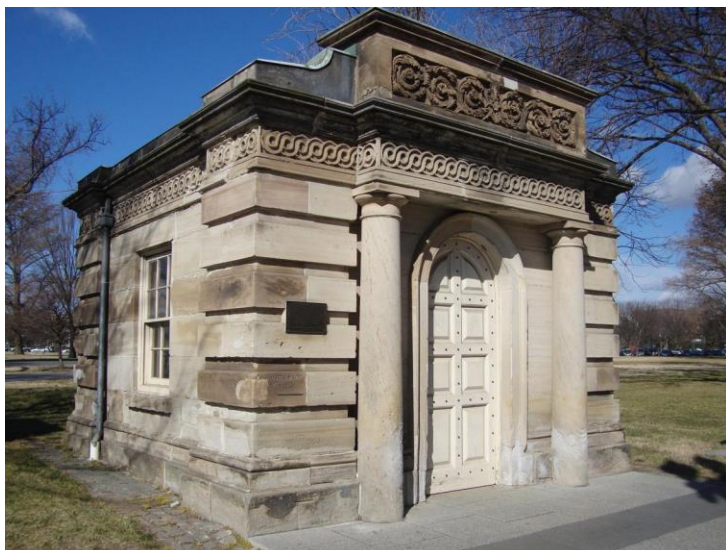


Indentations left by chisels and other tools used to quarry the stone are still visible on rock faces.

Carved initials—R.S.—from one 18th-century mason are still clearly visible on a stone set near the water's edge. Scattered on the ground near that stone, alas, was other (impossible-not-to-notice) evidence of humans' imprint on the island: 21st-century plastic bottles and foam. I should have picked up the litter and carried it away, but I didn't—finding ready rationalization in possible COVID-19 contamination.

To transport the sandstone blocks to the new federal city, skids—or what were sometimes called "stone boats"—were pulled by oxen to a wharf. Small shallow-draft scows then took the stones to much bigger schooners or sloops, anchored in deeper water, for the trip up the Potomac. The work wasn't easy: each cubic square foot of stone weighed about 120 pounds.

On September 18, 1793, President Washington laid the cornerstone—made of Aquia Creek sandstone—for the Capitol building. Like many of his contemporaries, Washington was a Freemason, so the ceremony was colored with Masonic pageantry. The cornerstone's exact location is now unknown; during the January 6 insurrection, the symbolic cornerstone of American democracy—the peaceful transfer of power—was also momentarily lost.



Capitol Gatehouse, made of Aquia Creek sandstone. Note the intricate scrollwork, feasible because the rock is easily cut in any direction. Note also the signs of weathering and repair. Photo: Wikipedia.

The evenly grained Aquia Creek sandstone is known as a “freestone” because it can be freely cut and chiseled in any direction without shattering or splitting. Designs by architect Benjamin Henry Latrobe can be seen today in some of the Capitol building’s most elaborate carvings, such as the fluting on interior columns to resemble cornstalks.

But what makes Aquia Creek sandstone easy to shape also makes its exterior susceptible to weathering and erosion. Thus, after the Capitol was burned during the War of 1812, reconstruction made use of marble—a harder, metamorphic rock found on the upper Potomac. I was learning that a rock is not just a rock. Wanting to know more, I reached out to retired University of Virginia geology professor Thomas H. Biggs.

The Aquia Creek sandstone, he explained, was created from riverborne sediments over 100 million years ago, during the Cretaceous Period. It forms part of the Patuxent Formation—named after the eponymous Maryland river—running north-south along the fall line. Its heavy concentration of feldspar grains—known as arkose—means the rock is inevitably prone to chemical decay.

This deep-time perspective can add appreciation and levels of meaning to any travel destination, I realize. Even during the pandemic, from the laptop in my

Notes on the Geology

by Hutch Brown, Editor

As editor, I reserve the right to change the language and usage in any article for style, clarity, and consistency. In this case, I did not correct for factual errors, and the article contains some:

1. The Aquia quarry contains no limestone. The “limestone cliff” noted in the caption for the first image is actually sandstone. (Likely an editorial oversight, which happens—I know.)
2. The rock used to rebuild the Capitol after the War of 1812 was not marble (a metamorphic rock) but rather a sedimentary rock known as “Potomac marble.” Potomac marble is a limestone conglomerate from the Triassic Basin near Leesburg, VA. It forms the lovely columns you can see in the Capitol today.

Aquia Creek sandstone has the same Cretaceous riverine origins (140–100 million years ago) as the Potomac Formation in our area. You can see the Potomac Formation along eroded creekbeds; it is densely packed and hard to pick apart, but it is not rock and you can’t quarry it.

The Aquia Creek sandstone is part of older sediments called the Patuxent Formation. Up to tens of millions of years older than the overlying Potomac Formation, it was under more and longer pressure to consolidate.

Yet it remains relatively soft. In buildings on the National Mall, the Aquia Creek sandstone is notorious for weathering.

home, I can roam the world through excursions into geology.

Take the Notre Dame Cathedral in Paris, for example. Being rebuilt from the 2019 fire, it is not yet open to the public, so I might as well “visit” from the other side of the Atlantic. The cathedral’s building blocks are Lutetian limestone, unique to this part of France, formed in a shallow sea during the Eocene Epoch about 45 million years ago.



Then-Representative John Lewis (D-GA) and then-House Minority Leader Nancy Pelosi (D-CA) look at the Slave Labor Commemorative Marker in February 2012. The marker, made from Aquia Creek sandstone, acknowledges the role that enslaved people played in the construction of the Capitol building.

The descriptor comes from the Roman name for the place that would become Paris—Lutetia. Much Parisian architecture, from the Louvre to Haussmann's 19th-century renovations, relied upon this cream-gray limestone of varying brightness, creating the "City of Light" ambiance.

Many of the original quarries and mines, now depleted, lie beneath the city itself. Some were converted into catacombs. More recently, quarries about 30 miles north of Paris specialize in an especially hard variety of Lutetian limestone fashionable in upscale building projects around the world. Like wine or cheese producers, the quarries have even applied for an *appellation contrôlée* designation.

What I keep learning is that stones, when useful and cherished, seldom stay in one place. Like human travelers, they have stories to tell.

One of the best known is Stonehenge, the Neolithic monument on England's Salisbury Plain (southwestern England). As in all good stories that take on the quality of myth, mysteries are never fully explained, and so it is with Stonehenge: archeologists and historians are always finding new clues in the rock record.

The latest findings seem to confirm the 12th-century Arthurian legend about the wizard Merlin's capture of a magical stone circle to resurrect it many miles away as a memorial to the dead.

Stonehenge's familiar ring of vertical standing stones is made of sarsen, a local sandstone; each stone weighs roughly 25 tons. Inside is yet another ring, dating back at least 2,000 years, made of so-called bluestones—igneous rocks, each weighing between two and four tons, not from the area.

Bluestone can be found in abundance 150 miles away in the Preseli Hills of Wales. Newly discovered remnants of a nearby stone circle seem to confirm the theory that a stone shrine was dismantled and somehow moved to the Stonehenge site, there to be venerated anew.

The impulse to move rocks and make a mark on the landscape remains very much alive today, as evidenced by cairns left by tourists, whether on the Maine coast or in Alpine passes. Written not in words but in stones are perhaps the world's most enduring travel stories. ↗



Marking History on Stone

by Jennifer Haley, AFMS Historian

Editor's note: The article is adapted from the AFMS Newsletter, May 2021, p. 5.

Mount Antero, a 14,245-foot mountain in Colorado, is known around the world since the 1880s as the highest mineral locality in North America. The mountain is known for its aquamarine, smoky quartz, rock crystal (clear quartz), fluorite, and feldspar, to name a few of its precious beauties.

The largest sphere of rock crystal in existence in 1893 was put on display at the Chicago World's Fair, along with a marvel of invention of the time, the Ferris wheel. The crystal came from Mt. Antero.

In 1938, the Colorado Mineral Society maintained a summer field camp at Mount Antero. In 1948, the president of the Colorado Mineral Society, Richard Pearl, formed a committee to study a proposal for commemorating the famous collecting area. In 1949, with the permission of the U.S. Forest Service, nine members of the Colorado Mineral Society climbed Mt. Antero over a weekend to mount a bronze plaque set on granite on the peak. A proclamation was read stating the significance of the mountain to mineral collectors. The first to reach the summit was a 14-year-old in the society's group.

The plaque, weighing 35 pounds, reads as follows:

MT. ANTERO MINERAL PARK
WORLD FAMOUS LOCALITY FOR SUPERB
CRYSTALS OF AQUAMARINE, PHENAKITE,
BERTRANDITE
COLORADO MINERAL SOCIETY 1949

Amazing Scientific Discovery

Editor's note: This joke has long been passed around through mineral club newsletters.

Nearly every mineral collector can give the chemical formula for quartz without even looking it up. Quartz, as everyone knows, is silicon dioxide (SiO_2).

In an amazing turn of events, recent studies with the most sensitive scientific equipment have produced new findings! The Roman scientist Pliny the Elder was right: quartz is petrified dihydrogen oxide (H_2O).

That's right: quartz is actually water. Why is there so much quartz in your local creek? Now we know! Quartz is frozen water (ice) in a different form.



Scientists around the world are stunned and embarrassed to learn that quartz is water that froze so hard for so long during the Pleistocene Epoch that it actually became stone. Quartz and ice are polymorphs, like calcite and aragonite (both calcium carbonate).

See for yourself: Place your finger on a quartz crystal on the hottest summer day and you will instantly feel that it is cool to the touch! Now we know why!

Publishing companies around the world are scrambling to reprint their field guides and textbooks with this new information. College professors are offering extra lectures to clear up the confusion in class. Mineral collectors around the world are making new labels for all their quartz specimens!

This new information teaches us three things:

1. Science is always growing and developing, and new discoveries can happen at any time.
2. Scientists must always be ready to work with new information, even if it completely changes our understanding of the world around us.
3. *And*, most important ... don't believe everything you see in print because—let's face it—water is water and quartz is quartz (silicon dioxide). ↗



Giant Kyanite and Ilmenite Crystals in Connecticut

by Harold Moritz

Editor's note: The article is adapted from EFMLS Forward, May 2021, pp. 10, 13–16.

A locality of giant kyanite (up to 40 centimeters in size) and ilmenite (up to 20 centimeters) porphyroblastic crystals was recently rediscovered in northeast Litchfield, CT, along U.S. Route 202. The former owners graciously allowed me and other interested parties to study and document the crystals. They have since moved away and all specimens, including the large boulders, have been sold or donated and the site is no longer accessible or productive.

The kyanite and ilmenite crystals occur as deformed subhedral porphyroblasts in schist and conformable quartz-rich boudins or as undeformed euhedral crystals embedded in discordant 1- to 10-meter quartz masses. These masses are common in the schists of western Connecticut. Structures and parageneses (sequences of crystallization) shed light on their origin.

Geology

The site is underlain by Cambrian/Ordovician Rowe schist (fig. 1): light gray to silvery, fine- to medium-grained quartz-muscovite-biotite-albite schist that originated from pelitic siltstone/subgraywacke and shale. Interbedded within the Rowe schist is black or mottled massive amphibolite and hornblende gneiss that originated from ocean-floor basalt.

These rocks underwent Barrovian metamorphism to amphibolite facies (staurolite grade) during the Ordovician Taconian and Devonian Acadian Orogenies (about 450 million and 350 million years ago, respectively). Merguerian (1985) documents two metamorphic events, with the larger porphyroblastic crystals formed during the second (Acadian) event. The site is near both the Cameron's Line Thrust Fault (fig. 1), folded during the Acadian Orogeny, and regional normal faults that are probably of Mesozoic origin (beginning about 245 million years ago). Outcrops show structures related to all these events.

Mineralogy

The Rowe schist is primarily muscovite and quartz, with subordinate biotite and albite. Within the schist are porphyroblasts of kyanite, ilmenite, staurolite,

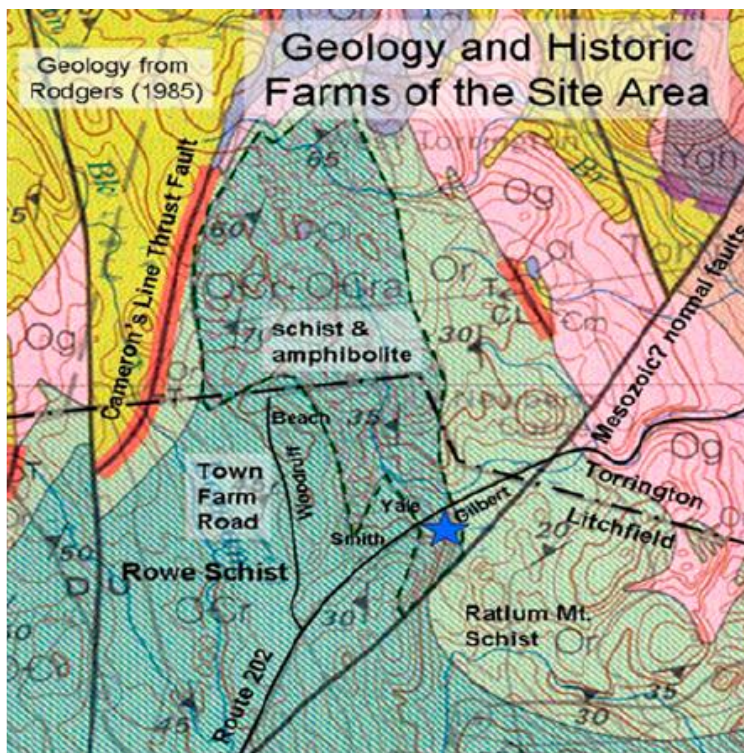


Figure 1—Geology near the site (blue star) in Litchfield, CT. The bedrock (blue-green area on the map) is Rowe schist, Ordovician or Cambrian (OC) in age.

albite, biotite, and almandine up to 10 centimeters in size. Gates and Christensen (1965) noted the prevalence of kyanite in the area but make no mention of the large quartz masses, which here are up to a few meters thick and 20 meters long. Discordant, white, pure quartz masses are common, as are conformable quartz boudins rich in kyanite, ilmenite, and albite porphyroblasts.

Historically, these porphyroblastic minerals are well known, especially in quartz masses. Robinson (1825) reported that kyanite was found in Litchfield “in large and beautiful blue and white crystals, or in crystalline masses, in mica slate, associated with quartz, talc, feldspar, mica, [staurolite], and garnets. A detached, crystalline mass of cyanite [sic] was found in this town, supposed to weigh 1500 lb.”

Gaines (1887) described specific ilmenite localities in Litchfield on the Yale and Smith farms northwest of U.S. Route 202, including “a mass of white quartz rock” in an open field with “fine crystals of washing-tonite.” At the Yale farm, Brunet (1977) described “one giant coarsely-shaped ilmenite crystal being all



Figure 2—Randomly oriented kyanite porphyroblasts in schist with albite, 5 to 10 centimeters in size.

of 2 1/2 inches by three inches and 1/2 inch in thickness, in an 8" by 5" by 4" [quartz] matrix." The kyanite and ilmenite crystal concentrations and sizes at this new locality certainly match or exceed the historical finds.

Gates and Christensen (1965) mentioned a belt of "distinctive kyanite-bearing rock ... only 50 to 200 ft wide" in the Rowe schist along its eastern contact with the Ratlum Mountain schist in the area. The porphyroblasts include gray to blue kyanite crystals 5 to 10 centimeters in size within the layers of schist (fig. 2), where they are mostly randomly oriented or in lenticular quartz-rich boudins. (Boudins are rocks that have been stretched and pinched like sausages.) Ilmenite can also occur in the schist as thin warped plates only a few millimeters thick and up to 10 centimeters across, especially where discontinuous and boudinaged albite and/or massive quartz are intermingled with schist (fig. 3).

Another kind of kyanite and ilmenite crystallization is more impressive due to better crystal size, orientation, and paragenetic association. The kyanite crystals in the discordant quartz masses can be more than 40 centimeters long, with most in the 15- to 30-centimeter range. They also tend to have parallel orientation and to occur in pure concentrations tens of centimeters thick in boulders that are a meter or more in size (fig. 4).

Tabular, undeformed, euhedral ilmenite crystals are found within the perimeter of large, semiconformable pure quartz masses (fig. 5). These crystals can be on-



Figure 3—Concentration of warped, thin, platy ilmenite crystals in quartz/albite boudins. (The lens cap is 6 centimeters across.)

ly millimeters thick, but many are a few centimeters thick and can reach 20 centimeters across. They tend to occur rooted in concentrations of fine-grained chlorite just outside the quartz and extend into the quartz perpendicular to the contact with the schist.

Clues from Exposures

The deformed kyanite and ilmenite crystallized within the schist, and the conformable associated quartz-rich boudins appear to be related to compressional metamorphism, given the temperatures and pressures required for their formation. Merguerian (1985) suggests that they are Acadian. But the much larger euhedral crystals found in the discordant quartz masses, though also deep seated, require a different explanation. Exposures here provide clues to the origin of these discordant quartz masses.



Figure 4—Huge, subparallel, undeformed kyanite crystals in massive quartz. (The lens cap is 6 centimeters across.)



Figure 5—Euhedral, undeformed ilmenite crystal (right) in massive quartz rooted in a dark, chlorite-rich contact with schist (bottom and left). The specimen is 5 by 3.5 centimeters in size.

One of the exposures is a vertical cut into the quartz masses within the schist. The quartz appears to mostly cross-cut the host schist foliation, with the latter appearing to interfinger and fade into the quartz (fig. 6). A shear zone extends into and cuts part of the schist along part of the quartz/schist contact. Although the sense of motion along the shear is not obvious from this feature alone, the ragged portions of the contact give the impression that the schist was separated by ductile extension.

Supporting this interpretation are the large euhedral ilmenite and kyanite crystals along some of the contacts. The crystals are rooted in the schist (in a contact zone of pure chlorite) but must have grown out into an open (liquid-filled) space to have such perfect and undeformed shapes. Eventually, the interstitial spaces solidified into massive quartz and remained undeformed.

When did these quartz masses form? Because the minerals also occur in the schist, the extension must have occurred when the P-T conditions were still suitable for kyanite and ilmenite crystallization, which would rule out the shallower, brittle Mesozoic faulting event. The contacts where the ilmenites are rooted are rich in presumably retrograde metamorphic chlorite, suggesting formation during post-orogenic collapse rather than during collision.



Figure 6—Wall of a 19th-century mine shaft exposing a quartz mass in Rowe schist. The contact on the right is ragged, with the schist foliation fading into the quartz. The contact on the left is mostly a shear zone that extends into and cuts the schist below. The features suggest that the schist was torn open by extension. View is about 2 meters across.

Sources

- Brunet, W.M. 1977. Ilmenite occurrences in Litchfield, Connecticut. *Rocks & Minerals* 52(11): 415–20.
- Cleaveland, P. 1822. *Elementary treatise on mineralogy*. Boston: Cummings and Hilliard. 2 vols.
- Gaines, M.R. 1887. Notes on some mineral locations in Litchfield, Connecticut. *American Journal of Science* 34: 406–07.
- Gates, R.M.; Christensen, N.L. 1965. The bedrock geology of the West Torrington Quadrangle. *State Geological and Natural History Survey of Connecticut Quadrangle Report* 17.
- Merguerian, C. 1985. Geology in the vicinity of the Hodges Complex and the Tyler Lake granite, West Torrington, Connecticut. In: Tracy, R.J., ed. *77th New England Intercollegiate Geological Conference*, New Haven, CT. *Connecticut Geological and Natural History Survey Guidebook* 6: 411–442.
- Robinson, S. 1825. *A catalogue of American minerals, with their localities*. Boston: Cummings, Hilliard, & Co.
- Rodgers, J. 1985. *Bedrock Geological Map of Connecticut*. *State Geological and Natural History Survey of Connecticut*.

June 2021—Upcoming Events in Our Area/Region (see details below)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2 MSDC mtg (remote)	3	4	5
6	7	8	9	10	11	12
13	14 GLMSMC mtg (re-mote)	15	16	17	18	19
20	21	22	23 MNCA mtg (remote)	24	25	26
27	28 NVMC mtg (remote)	29	30			

Event Details

2: Mineralogical Society of the District of Columbia—meetings via Zoom until further notice; info: <http://www.mineralogicalsocietyofdc.org/>.

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

23: Micromineralogists of the National Capital Area—meetings via Zoom until further notice; info: <http://www.dcmicrominerals.org/>.

28: Northern Virginia Mineral Club—meetings via Zoom until further notice; info: <https://www.novaminalclub.org/>.

Disclaimer

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

Hutch Brown, Editor
4814 N. 3rd Street
Arlington, VA 22203



**Mineral of
the Month:
Kyanite**

PLEASE VISIT OUR WEBSITE AT:

<http://www.novamineralclub>

2021 Club Officers

President: Tom Kim
president@novamineral.club
Vice President: Sue Marcus
vicepresident@novamineral.club
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secretary@novamineral.club
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show@novamineral.club
Tech Support: Tom Burke
tech@novamineral.club
Webmaster: Casper Voogt
webmaster@novamineral.club

The Northern Virginia Mineral Club

Please send your newsletter articles to:
hutchbrown41@gmail.com

RENEW YOUR MEMBERSHIP!

SEND YOUR DUES TO:

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

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

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

Meetings: At 7:45 p.m. on the fourth Monday of each month (except May and December)* at **Long Branch Nature Center**, 625 Carlin Springs Road, Arlington, VA 22204. (No meeting in July or August.)

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

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