THE NORTHERN VIRGINIA MINERAL CLUB INC

The Mineral Newsletter

Next meeting: May 1   Time: 7:30 p.m.

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

Okenite

Khandivali, Maharashtra, India

Source: Wikimedia Commons.   Photo: Didier Descouens.

Volume 63, No. 4
May 2023
Explore our website!

May Meeting Program:

Rockhounding on Mars

Details on page 6

Deadline for Submissions

May 15

Please make your submission by the 15th of the month!
Submissions received later might go into a later newsletter.

In this issue …

Mineral of the Month
Okenite

by Sue Marcus

Together, we will explore okenite as our May Mineral of the Month. I like zeolites because they are attractive and varied in species, colors, and crystal forms; also, zeolite specimens are usually affordable.

In addition, okenite is fun because it is somewhat “petable”—by which I mean that the acicular tufts are flexible and can be *gently* touched without breaking. Let’s stress gently because I once had to replace a specimen that was worn down by handling.

Though I like zeolites, okenite is not a member of the zeolite mineral group. Zeolites are defined by their crystal structure (oxygen tetraheda, with three oxygen atoms surrounding one cation). Okenite doesn‘t fit that definition, but its mode of formation in extrusive, low-temperature basalts parallels that of zeolites. Okenite is usually found with zeolite minerals.

The type locality is on Disko Island, Greenland, part of Denmark. Since okenite often forms rounded tufts of acicular crystals, I wonder whether these could be called Disko balls. (Sorry—showing my age.) The type specimens came from Kudlisat, now Qutdligssat, in the Waygat region. “Ockenite” was the original name, honoring Lorenz Ocken (or Oken or Ockenfuss), a German naturalist who was still living when the name was bestowed by Franz von Kobell in 1828. Kobell stated that he was “taking the liberty of honoring Mr. Hofrth Ocken,” using the honorific *Hofrath* (court-councilor). When Ocken changed his name to Oken, ockenite became okenite. (Disclasite and bordite are discredited names for okenite.)

Okenite occurs in vesicular basalt and the equivalent. The vesicles, also called amygdules or vugs, form when gas is trapped in the cooling basalt. As the gas bubbles cool and condense, voids are created. The beautiful, collectible minerals that result grow in those voids.

Okenite crystals are usually flexible—meaning that touching them *gently* will allow them to bend and spring back. They are also fragile. The lovely colorless tips break when not handled carefully, leaving the opaque matted cores. The crystals look furry, and it is fun to have a crystal spring back after touching it.

Happy Memorial Day!

Northern Virginia Mineral Club members,

The May club meeting will be in person at the Dunn Loring Fire Station at 2148 Gallows Road in Dunn Loring, VA, on **May 1, 7:30 p.m.** For meeting details, see page 6.

Okenite with chabazite(?), Queertarsuaq, Disko Island, Qeqertalik, Greenland. Source: Mindat; photo: Torben Kjeldgård.

But: Never handle someone else’s specimen without permission. With okenite, ask before touching and especially stroking a specimen. I do not know whether all okenite crystals are originally flexible.

Local collectors should note that okenite has been reported from northern Virginia. The Vulcan Manassas Quarry and the Centerville (Sislers or Fairfax) Quarry are listed as okenite localities in the recent book *The Northern Virginia Trap Rock Quarries*.

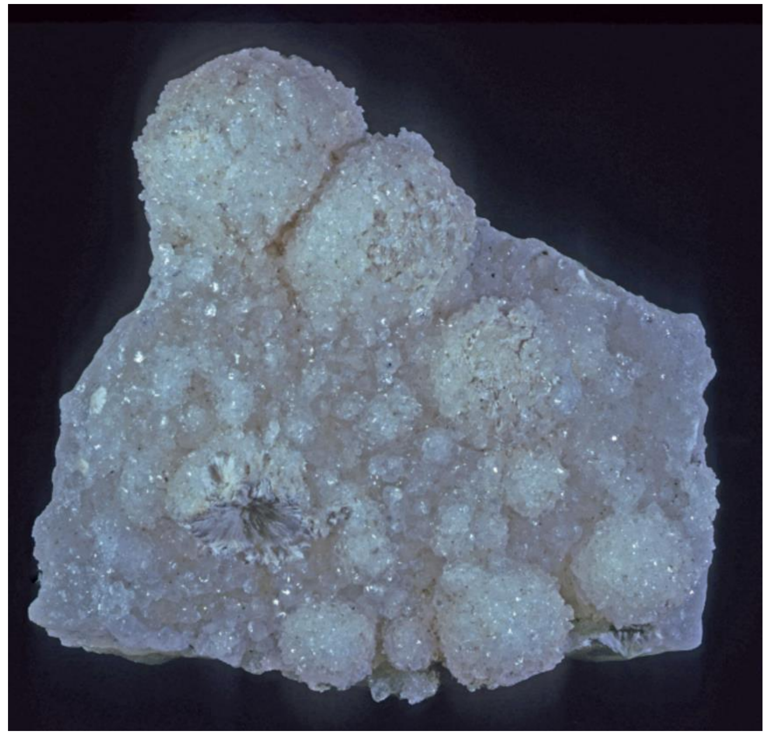
Mindat shows that okenite is reported from the Centerville Quarry but not from Manassas.

Washington state produced a few sizable okenite specimens in the 1970s during construction of the Skookumchuck Dam. (Skookumchuck is an indigenous Chinook term roughly meaning whitewater or rapids.) Amygdules in basalt hosted the rare okenite specimens. Okenite from this locality forms larger crystals than okenite from other localities. Crystals from the Skookumchuck Dam radiate from a central core, as do okenite crystals from other localities. The crystals are chalky white and stubby, and they are usually covered by colorless calcite crystals. Photos on Mindat show specimens up to 7 centimeters (2.8 in) in size, with individual balls of okenite up to 2 centimeters (0.8 in) in size.

Denmark administers the semiautonomous Faroe Islands and Greenland. Both places host okenite, though neither locality produced many specimens. Okenite from the Stroud Quarry in the Faroes can be lovely, with radiating, acicular crystals up to 2 centimeters (0.8 in) in size. The quarry is now used for salmon farming.

The Zeilberg Quarry in Bavaria, Germany, produced a few okenite specimens, mostly low-quality specimens extracted in the 1970s-80s. Romania surprised me as a source of okenite. As in many other places, the okenite was found with zeolites in an aggregate quarry. Spherules of okenite came from Crişcior. One Mindat photo of a specimen 7 centimeters (0.25 in) long shows okenite balls on matrix with gyrolite, stilbite, and calcite. (The specimen shown looks larger than the photo image.)

Okenite, Zeilberg Quarry, Maroldsweisach, Bavaria, Germany. Source: Mindat; photo: Peter Neschen.



Okenite balls covered by small white apophyllite crystals, Skookumchuck Dam, Bucoda, Thurston County, Washington. Source: Mindat; photo: Rock Currier.

The regional basalt flows known as the Siberian Traps are similar to the okenite-hosting Deccan Traps on the Indian subcontinent and the Washington state flows. Yet only one okenite specimen is known from Russia. It was collected in about 1999 near Noril'sk on the Taimyr Peninsula.

The Deccan Traps are a series of vast basalt flows in central and western India that covered the region in the late Cretaceous Period about 60 to 70 million years ago. The word "trap" comes from a Swedish word for stairs, referring to the stepwise rises caused by layers of lava flows; "Deccan" refers to the region. The eruptive events produced more than 1 million cubic kilometers (200,000 mi^3) of basalt. Interestingly for an eruptive volcanic rock, fossils as well as minerals have been found in the Deccan Traps.

Many quarries in India crush the basalt. Quarries near Malad, Mumbai Suburban District, Maharashtra are probably the most famous sources of lovely spherulites (spheres of radiating acicular crystals) of okenite. The quarries are a source of vesicular basalt used for construction. Some unusually attractive specimens look like puffy okenite balls within basalt

Okenite, Mumbai Suburban District, Maharashtra, India. Source: Mindat; photo: Rob Lavinsky.

amygdules, resembling pearls in a dark "oyster" shell. The best specimens exhibit okenite tufts (spherules) with acicular needlelike, transparent crystals that appear opaque white at the core of the tuft, where the individual crystals merge. Some specimens offer a pleasing contrast between white okenite and purple quartz (amethyst). Along with quartz, okenite is found with calcite, gyrolite, prehnite, laumontite, and other minerals.

Another, similar okenite locality is the Nashik Quarry in the Nashik District, also in India's Maharashtra state. Nashik hasn't been as prolific in producing fine okenite specimens, though the Nasik ones are equally attractive. Nashik is also in the Deccan Trap basalts (the same geologic environment).

Micromount-size okenite was found at the Aranga Quarry on New Zealand's North Island. Based on Mindat photos, the specimens would be of most interest to locality collectors because the okenite appears to be poorly crystalized. Okenite is also reported, from the following localities: Rio Putagan, Chile; the Noche Buena Mine, Zacatecas, Mexico; County Antrim, Ireland; Bulla Island, Azerbaijan; and as microcrystals at the Jeffrey mine, Quebec, Canada.

Okenite, Nashik Quarry, Maharashtra, India.
Source: Mindat; photo: Rolf Luetke.

Okenite, Nashik Quarry, Maharashtra, India. Source: Mindat; photo: Rob Lavinsky.

Mindat shows single okenite specimens from Hungary and Costa Rica. The Costa Rican specimen is an attractive piece with okenite spherules up to 2 millimeters (0.007 in) in size. The late Rudy Tschernich, a zeolite expert and micromount collector, collected it from a roadside boulder in 1993.

Okenite is reported from Scotland, though it may have been mistaken for mesolite, which looks similar and occurs in similar geologic environments. Okenite was also reported from the Crestmore Quarry in Riverside, CA. This locality has a geologic environment that is unlikely for okenite; however, gyrolite (with which okenite is often associated) was found there in one specimen.

Okenite has no economic value, other than as a collectable mineral. Moreover, okenite (from what I've found) has not been cut, polished, or used as a gemstone. Because okenite is fragile, with hairlike crystals, it is never likely to be suitable for lapidary work or jewelry, from what has been found to date. Perhaps future discoveries will unearth gem-quality okenite. Should that happen, I hope some of those specimens remain in their natural, beautiful forms.

As of April 16, 2023, individual okenite balls were available online for as little as about $17. A 10.8-kilogram (23.9-lb) specimen 36.6 centimeters (14.8 in) in size was offered for about $750.

Mindat offers an odd warning, informing potential collectors that okenite has been treated with bright colors of dye, with the resulting specimens passed off as natural. Brightly colored okenite is not natural. I have not seen these fakes, but Peeps candy comes to mind.

Technical Details

Chemical formula ......$Ca_{10}Si_{18}O_{46}\cdot 18H_2O$ (IMA & Mindat); $CaSi_2O_5\cdot 2H_2O$ (Wikipedia)
Crystal form ....Triclinic
Hardness 4.5-5
Specific gravity..........2.3
Color ....Colorless, white, yellow-white, blue-white
Streak ....White
Cleavage ....1 perfect
Fracture ....Conchoidal to uneven
Luster ....Vitreous to pearly

Sources

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Kobell, F. von. 1828. Ueber den Ockenit, eine neue Mineralspecies. In: Kastner, K.W.G. (ed.). Archiv für die gesammte Naturlehre. Vol. 14. Nuremberg, Germany: Johann Leonhard Schrag: 334-337.

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Merlino, S. 1983. Okenite, $Ca_{10}Si_{18}O_{46}\cdot 18H_2O$: the first example of a chain and sheet silicate. American Mineralogist 68(5-6): 614–622.

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Wikipedia. N.d. Okenite.

Dr. Caitlin Ahrens

Rockhounding on Mars

May 1 Program

Dr. Caitlin Ahrens, who works for the National Space and Aeronautics Administration (NASA), will describe how NASA's rovers on Mars are collecting rock samples and analyzing them for their mineral and chemical content. The rovers use a Chemistry and Mineralogy instrument, or CheMin for short, to collect and analyze the samples. Minerals found on Mars so far include olivine, pyroxenes, hematite, magnetite, gypsum, and phyllosilicates.

Minerals are indicative of environmental conditions that existed when they formed. For example, olivine and pyroxene, two primary minerals in basalt, form when lava solidifies. Jarosite, found in sedimentary rocks by both the Curiosity and Opportunity rovers on Mars, precipitates out of water.

Dr. Ahrens received her B.S. in physics/astrophysics and geology from West Virginia University in 2015 and a Ph.D. in space and planetary science at the University of Arkansas in 2020. She is currently a NASA Postdoctoral Program Fellow at the Goddard Space Flight Center in Greenbelt, MD. Her research involves remote sensing of icy surfaces and volatile interactions, including permanently shadowed craters at the lunar poles, focusing on the composition and thermodynamics of ices. Dr. Ahrens also works on a number of planetary volcanism projects, including lava flow morphology, caldera formation, and rheology on Mars, Ceres, Titan, and Pluto.

President's Collected Thoughts

by Jason Zeibel

I hope that everyone is enjoying some wonderful spring weather as April turns to May. Here in our household, we are in the midst of a flurry of activities as soccer, Scouts, and school hurdle rapidly towards summer break. When rushing by the display case, though, we try to take some time out of our routine every now and then to stop and look at some of the favorite minerals in our collection. We enjoy remembering how we came across them, where or whom we got them from, and who we were with at the time.

In April, we had a wonderful presentation via Zoom about the history and mineralogy of the Pugh Mine in northwestern Ohio. As is often the case, it seems like the heyday might be past for collectors to get into a mine or quarry and find crystal pockets. It seems like insurance premiums and litigation have ruined the appetite of many mine and quarry owners for opening their doors to rockhounds. Nevertheless, for those that have Pugh Mine specimens in their collections, this was a wonderful opportunity to learn about the history of this collecting locality. The club is appreciative of Jamison Brizendine for sharing the results of his research, and we look forward to his next research topic!

For our next meeting, we will be back in person at the Dunn Loring Fire Station on Monday, May 1. We will start with a brief discussion about potential upcoming rock collecting localities for the club. In preparation, if you have ideas for sites that you think the club could go to, please send an email to Roger Haskins (treasurer@novamineral.club). Roger has graciously agreed to tabulate the results and do a little advance legwork to start the discussion.

After that, we will have a program by Dr. Caitlin Ahrens titled "Rockhounding on Mars." NASA has done an amazing job with the Perseverance Rover, drilling into bedrock and depositing sample tubes of rocks and dust in neat piles ready for collecting and returning to Earth. We just need to figure out how to do that. Since my daughter Celia wants to be an astrogeologist someday, I can guarantee that we'll get there!

Finally, here are some upcoming activity dates to be aware of. Tentatively plan for Sunday afternoon, August 6, for our summer picnic at the Zeibel house in Clifton, VA. We will have grilled proteins of various types and ask participants to bring sides, desserts, and (of course) rocks and fossils for swapping (details to follow). Our fall auction will be at the Dunn Loring Fire Department on Monday, September 11. And, of course, don't forget the annual club show on November 17-19.

Jason

The Story of Silver in America

Editor's note: *The article is adapted from a mining industry website via Matthew Wood, the instructor of a geology study program for kids at Learning Haven in San Francisco, CA. Thanks to student Penny for the reference!*

Humans have held silver dear since antiquity. In the ancient world, silver held a cultural and religious value that rivaled the value of gold and precious jewels. The Greeks worshipped silver as sacred to the goddess Artemis, the Egyptians used it in their temples, and the Chinese valued it over gold.

In the ancient world, silver served numerous purposes. It was the base for jewelry and amulets, served as the primary metal for coins and silverware, and was worshipped for its healing properties. Its usefulness led to a booming trade between such great empires as the Phoenicians, Romans, and Persians.

The demand for silver remains steady in today's world, though its uses have changed. The modern silver industry fills demands for everything from solar panels and automobile parts to medicine and jewelry.

Early Discoveries

When the Spanish conquistador Hernán Cortés landed in Mexico, he found the empire of the Aztecs overflowing with gold and silver. His arrival marked the end for the Aztecs and the start of a massive silver industry for Spain.

Spain was not new to mining for silver. The country had stood as the pinnacle of silver production in Europe since the days of the Roman Empire in 300 B.C.E. In the 16th century, Spain remained a powerhouse of silver mining, but its power only grew with control over silver deposits in the New World.

Spain's efforts to mine the precious metals of the New World resulted in over 300 tons of silver being sent to Spain annually in the 16th century. So rich were the silver deposits in the Mexican and South American regions that Spain all but controlled the European silver trade from the 16th to the early 19th century.

Spain controlled most of the New World's known silver deposits, but other European colonies found silver on their land. For example, New York and Massachusetts colonists found veins of silver mixed with iron ore in the 18th century, though the deposits were not as pure as those in the Spanish colonies.

As Spain continued to exploit the riches of its New World conquests, its demand for silver led to the growth of a more sinister industry—the African slave trade. By the 1550s, many enslaved people arriving in the Americas would find themselves forced to mine for gold and silver. The demand for enslaved people in mining would continue until the end of slavery in the United States as white landowners brought slaves with them on prospecting journeys in the West.

In 1821, Spain lost the Mexican War for Independence, and by 1826, most of its territories in the Americas had also won their independence from Spain. In the power vacuum that followed, the United States began to get into the game of mining silver deposits.

The Silver Rush

Before the Silver Rush began, the Gold Rush had prospectors heading west for a slim chance at a better future. California had only just become a U.S. territory in the aftermath of the Mexican-American War, but after James W. Marshall found gold in Coloma, CA, that all changed. By 1855, California had grown, entering the Union and becoming home to cultured cities like San Francisco, thanks to massive population growth during the Gold Rush.

Few prospectors ever found gold, but some found silver. The Silver Rush in the United States began in 1858 with the accidental discovery of the Comstock Lode, a massive silver deposit in Nevada. Following the discovery of Comstock, a renewed army of frenzied prospectors headed west.

Nevada and Colorado were the capitals of the 19th-century Silver Rush, with mines producing millions of ounces of silver each year. By 1859, Colorado's largest mine in Leadville produced over $2.5 million worth of silver, valued at about $57 million today. Both Nevada and Colorado remained massive influences on the Silver Rush until it died in the 20th century. However, even as new mines popped up in both states, other parts of the United States began to discover deposits of silver.

Silver Mining in the Late 19th and Early 20th Centuries

With the advent of the Industrial Revolution, silver remained hotly in demand, but above-ground silver sources were rare. So silver mining began to go underground to dig into veins of silver buried in rock.

New silver lodes in Colorado and Nevada continued to draw prospectors, but other states began to discover pockets of silver and join in the mining trade. In Butte, MT, a massive quantity of silver veins led to the development of a thriving mining town by 1882. In Utah, the transcontinental railroad transported prospectors who founded the Park City and Flagstaff mines.

Silver was booming. Its abundance in the United States gave the young country economic power, allowing the United States to rise above the European powers that once dominated global trade. The production of the precious metal remained integral to the U.S. mint, which plated coins in silver until 1965, while also supporting technological advancements in the Industrial Era.

Silver became a crucial component in the medicinal field; doctors used silver in sutures, bandages, and eye drops to fend off infections. And the new technology of photography relied on silver in its film materials. By 1888, the first solar panel patents called for the use of silver in the devices.

As the 20th century loomed, silver grew in importance. NASA used silver to purify water on its International Space Station in the 1990s. In addition, computers and electronics drove high demand for the metal used in computer chips.

But the power of silver in the U.S. economy would not last forever. Eventually, demand for mining silver in the U.S. began to fade.

A Fading Industry

Silver mines are not extinct in the United States, but their power and preeminence have faded. Only a handful of mines continue to operate, the largest of which is the Red Dog Mine in Alaska. Factors such as the importation of silver and the decreasing demand for the precious metal have spelled the demise of silver mining in the United States.

Red Dog Mine in Alaska. The open-pit mine produces zinc, lead, and silver. Photo: U.S. Geological Survey.

The decline of silver truly began when the United States adopted the Coinage Act of 1873. The act effectively demoted silver bullion as the production of silver dollars ceased although gold dollars were still produced. The act upended the silver mining industry, and critics would call it "The Crime of 73."

The attack on silver's use in the U.S. economy would continue. By 1935, no silver coins were minted in the United States due to the high demand for the metal. Then, in 1965, President Johnson signed another Coinage Act into law, which removed silver from already minted coins in the United States.

But it was not the Coinage Acts of 1873 and 1965 that spelled the decline of U.S.-based silver mining. Like many industries, silver mining suffered under the effects of exporting labor and importing silver from cheaper sources. By the early 21st century, the United States imported more silver than it produced. Less than 20 percent of U.S. silver consumption came from silver mined in the United States, with Canada, Mexico, and a few South American countries supplying the rest.

The fall of U.S. silver mining has shifted priorities in the mining industry. Only a handful of U.S. mines produce silver as a primary product, including the Lucky Friday Mine in Idaho and the Alaskan Greens Creek and Red Dog Mines. Most U.S. mines now produce silver as a byproduct of copper mining.

The changing tides in the silver business aren't new to the industry: mining towns in the 19th century disappeared when the silver veins ran dry. Modern mines have to shift their focus to other resources to stay open.

The Legacy of Silver

All that glitters is not gold, especially when it comes to U.S. history. Like the ancient empires of old, the United States benefited from the discovery of silver in its territories. The silver trade allowed states like Montana and Colorado to thrive in their early years and drove population growth in the territories of the West.

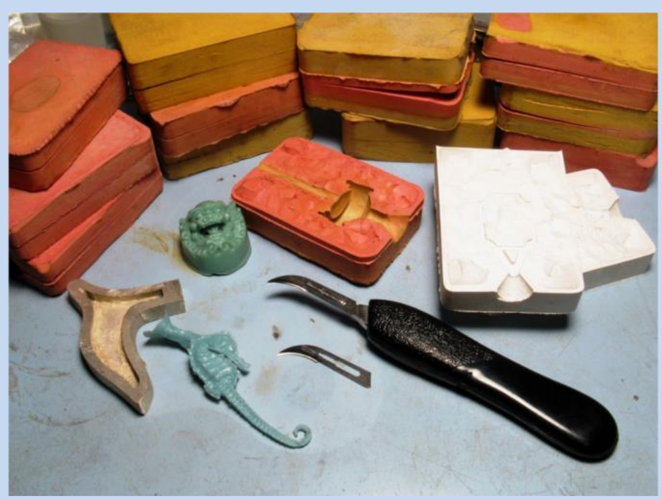
Ultimately, silver mining in the United States played a crucial role in the nation's technological advances during the Industrial Revolution and thereafter. Today, the legacy of silver in the United States underpins the modern era. The cars, solar panels, and electrical grids that rely on silver might not exist today were it not for the 1858 silver rush that launched an industry in the United States.

Bench Tip: Cutting Molds

Brad Smith

Cutting molds is easier and more precise with a sharp blade. A new Xacto blade is sufficient for cutting RTV molds but is usually not sharp enough for vulcanized rubber molds. For that, it's best to use scalpel blades available from most jewelry supply companies. The #11 blade is triangle shaped, and the #12 is hawksbill shaped. I find the hawksbill particularly nice for cutting the registration keys of the mold.

Smart Solutions for Your Jewelry Making Problems
amazon.com/author/bradfordsmith



Lithium Ore Deposit Discovered in Maine

by David Abel

Editor's note: *The article is abridged from the* Boston Globe, *1 April 2023. Thanks to Sue Marcus for the reference!*

Five years ago, after much of their land had been logged in western Maine, Gary Freeman and a colleague were bushwhacking through a thicket, searching for a treasure they suspected could be buried beneath the mud and moss carpeting the sloped ground.

Following coordinates cited in a decades-old geological survey of the area, the veteran gem hunters began clearing the bramble and digging. Soon after, they hit something solid. They used hoes to scrape away the dirt and were astonished by their discovery: enormous, flaky white crystals the size of telephone poles.

What they unearthed here on the north side of Plumbago Mountain was the ore (spodumene) of a highly sought metal: lithium, a vital ingredient of a carbon-free future, essential for running electric cars and storing solar energy. By some estimates, the deposits near Newry, ME, might be the largest in the country—with the potential to become a critical domestic supply for automakers and so valuable that it could provide a needed boost to Maine's economy.

But none of the ore here is being mined. The state has refused to allow it, citing Maine's strict environmental laws. A wave of competing bills is making its way through the legislature—some that would allow mining to proceed, others that would ban it—fueling a debate that has pitted a clean energy future against unknown environmental impacts.

"If we want a clean energy transition, we're going to need a lot of lithium, and mining is going to have to happen somewhere," said Ian Lange, director of the mineral and energy economics program at the Colorado School of Mines, who has been monitoring the developments in Maine. "If we don't make electric vehicles, we make more internal combustion engines. Blocking these mines is Big Oil's best friend."

Environmental advocates and some local residents have noted that previous mining projects have led to substantial pollution and the creation of Superfund sites in Maine. They worry that extracting spodumene (lithium aluminum silicate, $LiAl(SiO_3)_2$),

Spodumene, Walnut Hill Pegmatite Prospect, Hampshire County, MA. Source: Wikipedia; photo: Rob Lavinsky.

a multicolored crystal that contains the lithium, could contaminate drinking water, lead to increased air pollution, and radically transform this small town of 400 full-time residents that's home to the Sunday River Ski Resort.

And if the valuable spodumene crystals were processed in the area to extract lithium, they worry that the tailings could react with the air and water to create sulfuric acid, doing lasting damage to the water supply and the entire local ecosystem. Experts have differing opinions about the possible impact.

The area's geological history, as a collision point of ancient continents, made it prime gem country. And an old Maine Geological Survey suggested that lands around Newry could have large, valuable spodumene crystals.

Kunzite (a gem variety of spodumene), Konar Valley, Nuristan, Afghanistan. Source: Wikipedia; photo: Didier Descouens.

A number of environmental advocates in the state have suggested that the lithium discovery may be more hype than reality. They've also pointed to research suggesting that lithium can be extracted in less harmful ways, such as from salt-flat brines, without open-pit mines or controversial evaporation ponds. They have urged more recycling of lithium-ion batteries as a way of reducing the need for more mining.

However, the United Nations estimates that just 20 percent of more than 50 million tons of so-called e-waste gets recycled properly every year. It's unlikely that recycling would be enough to make up for the growing demand for lithium. The International Energy Agency estimates that, by the end of the decade, existing mines and those under construction will supply only about half the lithium needed to meet global demand.

The rising demand for lithium has also inflated the price by as much as nine times since 2020, though it has fallen in recent months. The price is expected to continue to surge over the coming years as hundreds of millions of new electric cars are likely to be produced.

John Slack, a retired geologist with the U.S. Geological Survey who coauthored a paper last year on the lithium deposits in Maine, called the risk of pollution from mining the spodumene in Maine "very low." He

Hiddenite (a gem variety of spodumene), Adams Hiddenite and Emerald Mine, Alexander County, NC. Source: Mindat; photo: Rob Lavinsky.

urged state lawmakers to update their mining laws to allow for the extraction of lithium, saying the area's spodumene lacks the sulfide minerals that can cause pollution. Moreover, he noted, the processing of the ore into lithium would likely take place at a new plant being built in Tennessee, which received a $142 million federal grant in 2022 to process lithium from other mines in the United States.

In nearby Andover, where the population has plummeted since the furniture maker Ethan Allen shut its mills more than a decade ago, residents had mixed feelings about the proposed mining. Trucks carrying the large rocks would likely come and go through town on their way to the proposed mine.

At Mills Market on Main Street, where the whoopie pies are made with maple syrup, co-owner Joe Martin was all for it. But one of his customers, Kimberly Peare, ticked off her concerns: contaminated groundwater, disturbed wildlife, and impeded waterflows, among other unknowns.

The Rocks Beneath Our Feet

Quartz Outcrops in Northern Virginia

by Hutch Brown

Ever climbed a ridge in our area and noticed large chunks of white quartz lying around—or quartz boulders half-buried in the ground?

I have, most recently when I climbed the biggest hill in Roundtree Park, a public park just off Annandale Road in Falls Church, VA.

Quartz is common in our local creeks because it's so erosion resistant. But the massive quartz in our area's bedrock is mostly limited to relatively thin veins.

So why do some hills in our area have large outcrops of milky quartz?

Prominent Quartz Outcrops

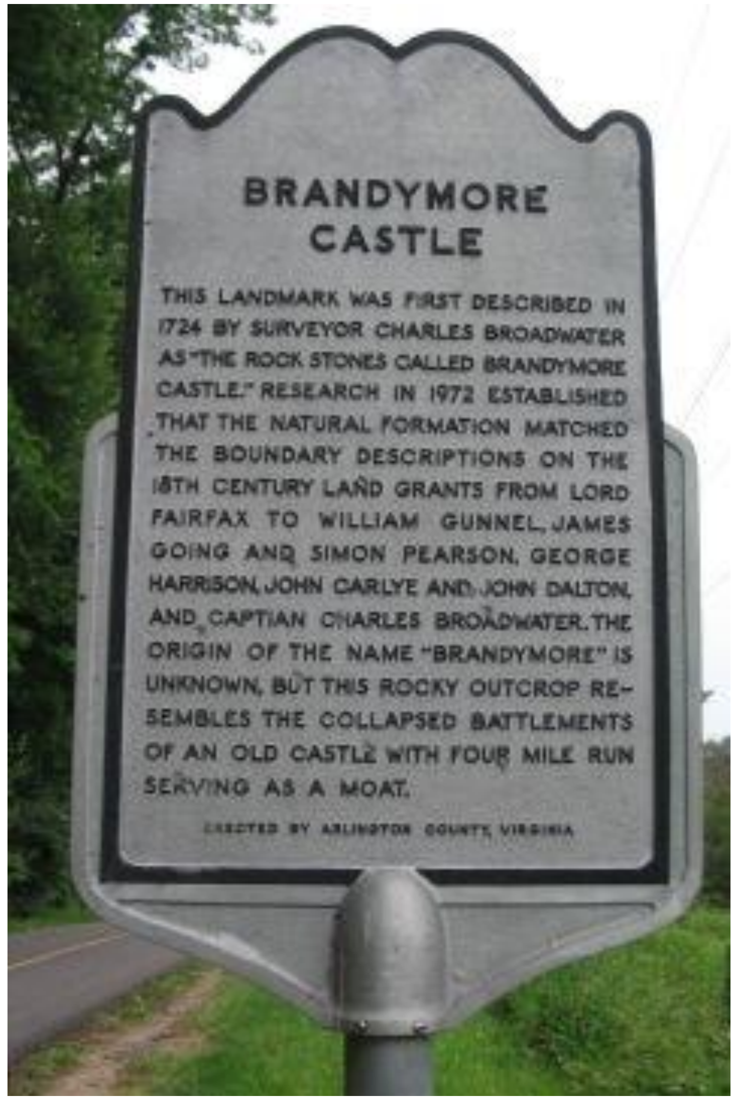
The best known quartz outcrop in our area is Brandymore Castle in Arlington. It even has its own historical marker on the paved W&OD Trail.

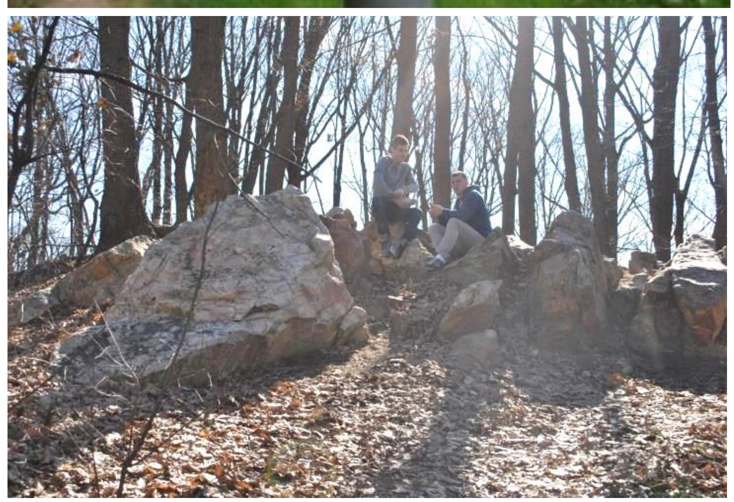
The outcrop is a jumble of white quartz boulders maybe 50 feet across and no more than 5 feet in height. The boulders cap a forested hill on county parkland; the hill was originally surrounded on three sides by a bend in Four Mile Run, Arlington's largest stream. The rock jumble marked 18th-century property lines for wealthy local landowners, who had the land cleared for crops and pasture, so the outcrop was an important landmark visible for miles around.

The origin of the name is unknown, but the "Castle" part might have derived from someone's fanciful notion that the rock jumble resembled castle ruins within a moat formed by Four Mile Run. The "Brandymore" part—who knows?

Brandymore Castle isn't the only quartz outcrop in our area. I grew up in the 1960s in a brand-new subdivision in Annandale, VA. Most of the surrounding countryside was still abandoned farmlands and woodlands waiting for developers to build more subdivisions like mine.

My friends and I roamed the local woods, and we discovered a huge jumble of quartz boulders on a ridge overlooking the local creek, a tributary of Accotink Creek called Long Branch. The quartz outcrop covered an area the size of a small suburban park, with boulders more than a dozen feet high, so we kids dubbed it Rock Fort.





Brandymore Castle, a jumble of white quartz boulders on county parkland in Arlington County, VA. Photo: Hutch Brown.

Part of Rock Fort, a huge quartz outcrop on a ridge over-looking a creek in Annandale, VA (not far from Northern Virginia Community College's main campus). Photo: Hutch Brown.

The developer must have been annoyed by the size of the outcrop, which occupies prime land bordering a street in a neighborhood called Canterbury Woods. Though defaced by graffiti and apparently ignored by the local community, it's an impressive geologic feature in our area. I still enjoy going there. (See Brown (2014) in the sources below for directions.)

Roundtree Park

I recently discovered another quartz jumble in a public park overlooking Holmes Run in Falls Church, VA. My wife and I have been exploring parks in our area, and we happened on Roundtree Park because my stepdaughter and her husband live nearby. We spent a few hours hiking almost every trail in the park (which isn't large), including one that leads up the only sizable hill.

Quartz outcrop capping a hill in Roundtree Park off Annandale Road in Falls Church, VA. The quartz boulders have been defaced with gray paint. Photos: Hutch Brown.

Towards the top, we started seeing big pieces of milky quartz—and I thought, aha! Sure enough, we found an outcrop of white quartz boulders at the top. The outcrop is reminiscent of Brandymore Castle, though much smaller in area (about 20 feet across) but with boulders just as large (about 5 feet high).

Like Rock Fort, the quartz formation is nameless and unmarked on any map; some of the boulders are similarly defaced, mostly painted over in battleship gray. At Brandymore Castle, a prominent boulder was also painted over by vandals in 2001 but then restored by the county. Apparently, no one has thought to restore the vandalized quartz at either Rock Fort or Roundtree Park.

County records show that the quartz near Brandymore Castle was quarried by a former landowner, presumably for crushed rock. One part of the hill at

Roundtree Park is similarly scooped out, suggesting possible quarrying there as well. Eroded—or maybe blasted—chunks and boulders of milky quartz extend downhill from the Roundtree outcrop onto the Holmes Run floodplain, reflecting a sizable intrusion of quartz in the local bedrock.

How did the quartz intrusion get there?

Quartz Lens

The Roundtree quartz is embedded in a granitic bedrock called tonalite (fig. 1). Tonalite (TUN-uh-lite) is similar in composition to granite, equally rich in quartz but with much more plagioclase feldspar and much less alkali feldspar. Other than quartz, I found no bedrock outcrops in Roundtree Park, so I never saw rock that was clearly tonalite. The loose stones I found on the Holmes Run floodplain were part of the weathered alluvium (fig. 1), possibly washed downstream from bedrock sources other than tonalite.

The Roundtree tonalite is part of the Falls Church Pluton, a rock formation underlying large parts of Falls Church and some parts of Annandale. The pluton resulted from magma that rose in a plume and cooled deep underground hundreds of millions of years ago; erosion has exposed it. Geologists describe the Falls Church tonalite as medium to coarse grained and light to medium gray in color; an outcrop I saw in a Falls Church yard resembled fine-grained granite.

The surrounding metamorphic bedrock includes Accotink schist and Lake Barcroft metasandstone (fig. 1)—rocks formed from sands and silts laid down by ocean currents in the Iapetan Ocean, forerunner of the Atlantic. Geologists believe that the Accotink and Lake Barcroft rocks are early Cambrian or late Proterozoic in origin, making them more than half a billion years old. They started as sedimentary rocks in a deep-sea trench bordering on an ancient volcanic island arc known as the Taconic Terrane. Counterparts today include the Mariana Islands and the Marianas Trench in the Pacific Ocean.

About 450 million years ago, the Taconic Terrane slammed into proto-North America in a mountain-building event known as the Taconic Orogeny. The collision lifted the sedimentary rocks in the ocean trench onto the continental plate. In the process, rising magma intruded the Accotink, Lake Barcroft, and other Taconic rocks, then cooled underground to form the Falls Church Pluton. The Taconian Mountains have long since eroded away, but the underlying terrane, including the Accotink and Lake Barcroft rocks along with the tonalite, is still sutured onto the continental plate.

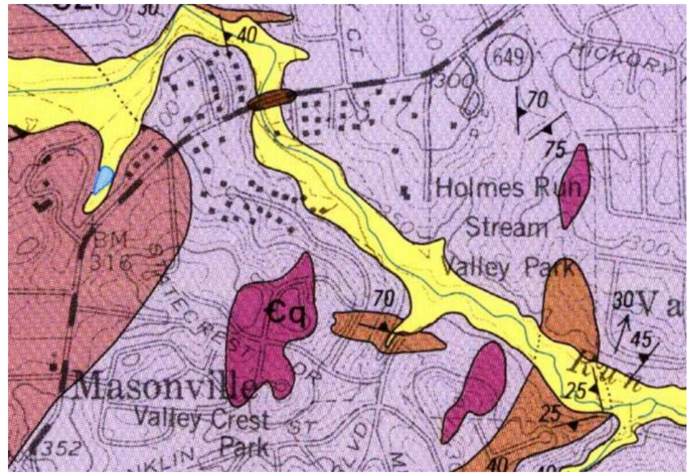


Figure 1—*Detail of a geologic map of the Annandale Quadrangle. The Roundtree quartz outcrop is in the largest of the three quartz lenses (***Cq***, burgundy). The lenses are embedded in Falls Church tonalite (lilac). Yellow is alluvium (sands and gravels) from Holmes Run; brown is Lake Barcroft metasandstone; and rose (left) is Accotink schist. Source: Drake and Froelich (1986).*

About 320 million years ago, in a huge mountain-building event known as the Alleghanian Orogeny, the proto-African continent closed the Iapetan Ocean, colliding with proto-North America and riding up over it to form a mountain chain as high as the Himalayas. The collision broke off entire sheets of underlying bedrock and transported them to the west on great thrust faults, folding and fracturing them and forming the Piedmont geologic province as we know it today. In the process—and perhaps already during the Taconic Orogeny—the bedrock underwent metamorphism, some of it becoming the Accotink schist and Lake Barcroft metasandstone. The Falls Church tonalite was also subjected to tremendous pressure.

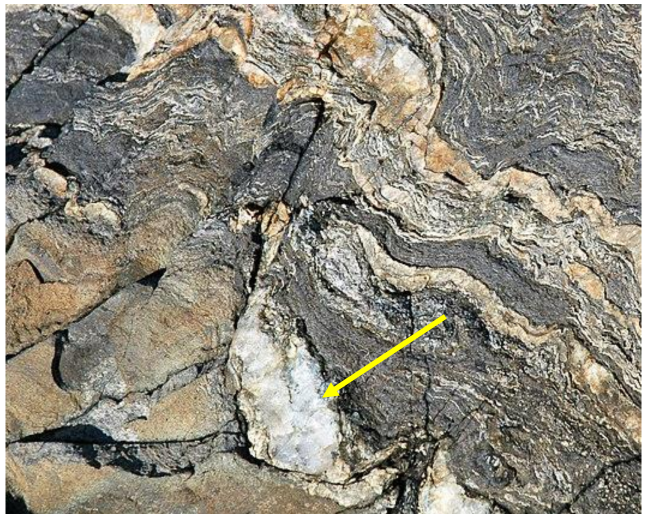
Lens Formation

So how did the Roundtree quartz form in the Falls Church tonalite? No one knows for sure, but one possibility is a quartz intrusion associated with hydrothermal processes during mountain building.

Surface water seeping through cracks in the rock percolates deep underground, and porous rock layers such as sandstone and siltstone can contain lots of groundwater. During mountain building, rising magma heats the water underground, saturating it with silica and other minerals. The cooling magma develops cracks and fissures—some of them huge—for the superheated water to fill. As the liquids cool, minerals precipitate out, including quartz-forming silica. The massive quartz deposits tend to be shaped like a lens—relatively long, thin, and bulging at the waist.

Another possibility is that the quartz lenses formed during mountain building due to tremendous pressures on the parent rock—in this case, the Falls Church tonalite. Under pressure, the quartz-rich granitic rock would have secreted silica to form thickening veins and lenses. Quartz lenses formed in this way, ranging from small to large, intrude multiple rock types. The process is called lateral secretion, and the result is known as segregation quartz.

At Roundtree Park, Rock Fort, and Brandymore Castle, the quartz lenses are huge—dozens of feet thick, big enough to show up on geologic maps (fig. 1). Many geologic maps for our area show quartz lenses, usually in shades of purple and marked **Cq** (“C” for Cambrian and “q” for quartz).



Quartz lens (segregation quartz) in Cambrian gneiss on the coast of Maine. Source: Wikipedia; photo: James St. John.

Characteristics

The milky color of the rock in our local quartz intrusions is caused by minute inclusions of gas or liquid. In places, the quartz is in shades of pink, red, and orange due to trace amounts of iron or manganese in the rock. Black surfaces on the rock are from lichens growing on it.

Some quartz deposits contain minerals other than silica. The northern Virginia Piedmont is known for its gold-bearing quartz, and some quartz veins near the city of Fairfax, VA, have reportedly contained pyrite and black tourmaline. Such instances must be rare; I have never noticed anything but quartz in our area’s quartz outcrops (and I’ve looked).

Quartz in various hues at Rock Fort. (The black lines and flecks are lichens.) Photo: Hutch Brown.

The quartz crops out because it is not only one of the most common minerals on Earth but also one of the hardest—7 out of 10 on the Mohs hardness scale. The surrounding bedrock, whether igneous or metamorphic, is much more vulnerable to weathering. The bedrock forms a red clay subsoil around the outcrops, which owe their durability to the exceptional erosion resistance of quartz.

Quartz Confusion

Oddly enough, organizations like Friends of Brandymore Castle have mistaken the quartz at Brandymore Castle for limestone. One source even insists (in boldface) that “it is limestone, not quartz;” another claims that the “limestone outcrop has changed over the centuries as it has weathered almost 300 years since it was first seen by Charles Broadwater.”

The source of the confusion of quartz with limestone and the reasons for its persistence are unclear. The 18th-century surveyor Charles Broadwater, who used Brandymore Castle in mapping boundary lines for colonial land grants, referred to the outcrop only as “the rock stones called Brandymore Castle.” He was apparently interested in the “rock stones” as a landmark, not as a particular rock type—and he did not, to my knowledge, record it as limestone.

Anyway, many people who (like me) know little about minerals can readily identify quartz because it is so common and distinctive. A simplified geologic map of Arlington County shows no limestone anywhere in the county. Instead, it shows Brandymore Castle as a typical quartz lens marked **Cq**.

Moreover, the quartz outcrops in our area are highly durable. Because quartz (unlike limestone) is so resistant to weathering, we have no reason to suppose that the quartz outcrop at Brandymore Castle—or anywhere else in our area—has changed much in the last 300 years (vandalism notwithstanding).

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Quartz (not limestone) boulders at Brandymore Castle. Photo: Hutch Brown.

May 2023—Upcoming Events in Our Area/Region (see details below)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 **NVMC mtg**	2	3 MSDC mtg	4	5 **Cinco de Mayo**	6 Shows: Pittston, PA; Washington, PA
7 Shows: Pittston, PA; Washington, PA	8 GLMSMC mtg	9	10	11	12 Show: Marietta, GA	13 Show: Marietta, GA
14 **Mother's Day**; Show: Marietta, GA	15	16	17	18	19 Show: Franklin, NC	20 Show: Franklin, NC
21 Show: Franklin, NC	22	23	24 MNCA mtg	25	26 Show: Salem, VA	27 Show: Salem, VA
28 Show: Salem, VA	29 **Memorial Day**	30	31			

Event Details

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

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

6-7: Pittston, PA—Show and sale; Mineralogical Society of N.E. PA; Oblates of St Joseph, 1880 Hwy 315; Sat 10-5, Sun. 10-4; admission $3, preteens free with paid adult; info: George Walko, 570-200-5987, Anthracitecoin@gmail.com.

6-7: Washington, PA—Annual show; Mike's Minerals; Washington County Fairgrounds, 2151 North Main St; Sat 10-6; $5; info: Ray Garton, eraygarton@gmail.com.

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

12-14: Marietta, GA—Annual show; Georgia Mineral Society, Inc.; Cobb Civic Center, 548 South Marietta Pkwy SE; Fri. 10-6, Sat. 10-6, Sun. 12-5; free; info: Juergen Poppelreuter, Mayshow@gamineral.org; website: gamineral.org/showmain.html.

19-21: Franklin, NC—Retail show; Franklin Gem & Mineral Society; Robert C. Carpenter Community Bldg, 1288 Georgia Rd; Fri 10-6, Sat 10-6, Sun 10-4; adults $3; info: Chandra Fox, 706-982-0402, fgmshows@gmail.com; website: fgmm.org.

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

26-28: Salem, VA—Annual show; American Gem, Mineral and Jewelry Shows LLC; Salem Civic Center, 1001 Roanoke Blvd; Fri 10-6, Sat 10-6, Sun 11-4; adults $7, kids 11-17 $2, kids 10 and under free; info: Alan Koch agmjs3@gmail.com; website: www.americangemshow.com.

2023 Club Officers

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The Northern Virginia Mineral Club

Visitors are always welcome at our club meetings!

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

Please send your newsletter articles to:
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RENEW YOUR MEMBERSHIP!

SEND YOUR DUES TO:

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

OR

Bring your dues to the next meeting.

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

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

Meetings: At 7:30 p.m. on the first Monday of each month (except January and September).* (No meeting in July or August.)

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