



The Mineral Newsletter

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

Long Branch Nature Center, 625 S. Carlin Springs Rd., Arlington, VA 22204



Bornite

on quartz

Dzhezkazgan Mine, Khazakhstan

Source: [Wikipedia](#). Photo: Rob Lavinsky.

Volume 59, No. 7

September 2018

Explore our [Website!](#)

September Meeting Program:

Fall Club Auction

(see page 3 for rules)

In this issue ...

Mineral of the month: Bornite	p. 2
Club auction details.....	p. 3
The Prez Sez.....	p. 4
June meeting minutes.....	p. 4
Field trip opportunities	p. 6
Cub Scout Camporall coming up!.....	p. 7
Bench tip: Mobile flexshaft stand	p. 7
AFMS: Rockhound of the Year	p. 8
EFMLS: Safety matters	p. 8
Fred Schaefermeyer scholarships	p. 9
Mineralogical reflections.....	p. 10
Humor.....	p. 11
Virginia's gold-pyrite belt, part 2.....	p. 12
Auction bid slips	p. 15
Auction summary sheet	p. 16
Upcoming events.....	p. 17

Deadline for Submissions

September 20

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



Mineral of the Month Bornite

by Sue Marcus

Most of us have heard of bornite (or “peacock ore”), although fewer have crystals of this mineral in our collections. Although oxidized bits and blebs of bornite are common, nicely crystallized specimens are much rarer. And glittering, iridescent hunks of “bornite” might actually be chalcopyrite that has been treated with acid to produce the attractive, salable tarnish.

Be thankful that mineralogists settled on the moniker given by Wilhelm Karl von Haidinger, who named the mineral after Ignaz von Born (whose original Hungarian name was Born Ignác). Previously, bornite had several multiword German names. “Bornite” was the name bestowed in 1845, although I like the 1791 name of *Buntkupfererz* (“multicolored copper ore”). Mindat provides the full location of the type (original) locality as Jáchymov (Sankt Joachimsthal), Jáchymov District (Sankt Joachimsthal), Krušné Hory Mts. (Erzgebirge), Karlovy Vary Region, Czech Republic. The area was part of largely German-speaking Bohemia at the time the material was initially found and described.

Bornite is usually emplaced by hydrothermal processes, when igneous or metamorphic events introduce ascending hot fluids into the newly forming rocks. Bornite occurs much less frequently in sedimentary rocks—typically in shales. Although isometric crystals form at high temperatures, they retrograde to orthorhombic forms.

Bornite is a primary copper ore, containing up to 63 percent copper, so most of it is ground up and fed into the crusher for processing. It is relatively common, massive, and uncommon as crystals. It weathers to chalcocite and other secondary minerals. Butte, MT, was a noted source of massive bornite and rare crystallized specimens when the mine there was active. Several Arizona copper mines produced massive specimens.

Well-formed crystals are noted from Dzhezkazgan, Kazakhstan, as well as Congo, Zaire, and Zimbabwe. Older crystallized specimens were extracted from the mines in Cornwall, England.

Because bornite is a heavy, brittle metal, it is not a gemstone. Wide wrapping or putting unworked pieces of tarnished “peacock ore” into jewelry is possible, but

Fall is coming!

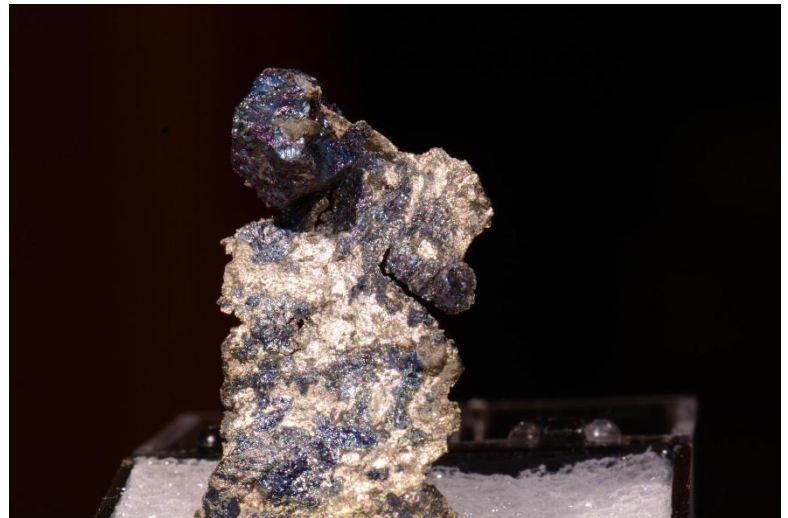


Northern Virginia Mineral Club members,

Please join your club officers for dinner at the Olive Garden on September 24 at 6 p.m.

Olive Garden, Baileys Cross Roads (across from Skyline Towers), 3548 South Jefferson St. (intersecting Leesburg Pike), Falls Church, VA
Phone: 703-671-7507

Reservations are under Ti Meredith, Vice-President, NVMC. Please RSVP to me at ti.meredith@aol.com.



Bornite on silver from Zacatecas, Mexico. Photo: Bob Cooke.

the copper content can leave green stains on garments and the people wearing them.

Technical details:

Chemical formula..... Cu_5FeS_4

Crystal form Orthorhombic

Hardness 3–3.5

Density 4.9–5.3 (avg. 5.09? sources vary)

Color Fresh surfaces: reddish (copper) brown; exposed surfaces: iridescent, degrading to black with length of exposure
 Streak Dark gray-black
 Cleavage None
 Fracture Conchoidal; none (sources vary)
 Luster Metallic ➤

Sources

Geology.com. 2018. [Bornite](#).
 Handbook of Mineralogy. 2001–05. [Bornite](#).
 Mindat. N.d. [Bornite](#).
 Minerals.net. 2018. [The mineral bornite](#).
 Webmineral. N.d. [Bornite mineral data](#).
 Wikipedia. 2018. [Bornite](#).

Club Member Rocks and Minerals Auction Coming Up! September 24 Program

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

The meeting will start promptly at 7:30 p.m. (*note*: this is 15 minutes earlier than usual). We will quickly move through the business part of the meeting so we can get to the fun!

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

- item number (your initials or other unique code followed by a sequence number);
- description;
- from (locality); and
- starting bid amount (the lowest bid you will accept for sale—if not stated, minimum bid is \$1).

Also, use the summary sheet on at the end of this issue to list all of your items for sale so that the Treasurer can record the final sales price and give you your money after the auction.

Labeling Specimens

by Sue Marcus

Did you know that Webmineral.com has a specimen label that you can customize and print to use for your own collection? Enter <http://webmineral.com/> into a search engine (I use Firefox), then use the search box on the Webmineral.com website (upper right) and type in the name of your mineral. Click on [mineral name] Data, then scroll to the bottom. Click on “Print this label.”

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

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

Bring small bills, bid early and often, and help us move on to the next item. We need to be out of our meeting room by about 10 p.m.

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

- Any member may offer up to 20 specimens or up to 4 flats for auction.
- Each flat is one auctionable item.
- The club gets 15 percent of the purchase price; the remainder goes to the seller.
- Anyone may donate items to the auction to fully benefit the club (no money goes back to the donor).
- The minimum bid is \$1 on any item. The minimum increase is also \$1. Bids higher than \$20 increase by \$5.
- We start with a silent auction to assess interest in each item for sale. So look carefully and start bidding. Items with multiple bids during the silent auction will be brought sooner to the actual (vocal) auction.

Winning bidders must pay for the item promptly, with cash or check. ➤



The Prez Sez

by Bob Cooke, President

It's that time again: the NVMC fall auction is coming up. It's a great opportunity to recycle those minerals that have lost their luster, to acquire new minerals with lots of luster, and to support the Fred

Schaefermeyer Scholarship Fund at the same time.

Auction rules are spelled out above. For those bringing items to be auctioned, please complete the forms for the item bid slips and the summary sheet before coming to the auction—both are in this newsletter—just follow the instructions above. The auction setup is always hectic and time will be limited, so please plan accordingly.

Our Annual Gem, Fossil and Mineral Show is in November and will be upon us sooner than we think. Volunteer signups for the past few years have been underwhelming at best. Volunteers show up on the day of the event and we somehow make things happen, but there is no warm fuzzy feeling beforehand. Several vendors at the show have marveled that we are able to conduct the Mineral Show at all given the limited number of volunteers!

Please be prepared to support this year's show with everything you can give it! ➤

Bob

Meeting Minutes

June 25, 2018

by Bob Cooke (filling in for
Secretary David MacLean)

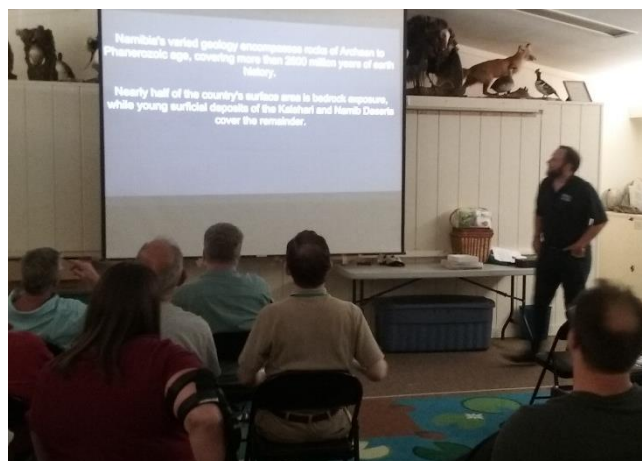
Vice-president Ti Meredith conducted a drawing for door prizes. The lucky recipients were Anuolu Balong, Carolyn Cooke, Robert Groves, Elijah Kim (twice, thanks to his Dad's ticket), John Kress, Amanda Parker, Jeff Guerber, Bill Oakley, Ken Reynolds,

Casper Voogt, shown at right (photo by Ti Meredith), was the guest speaker and the highlight of our meeting. Casper presented pictures and running commentary of his recent trip to Namibia in search of exotic animals and even more exotic minerals. His anecdotes gave in-

teresting insights into the quirks of renting cars in Namibia, buying minerals both from commercial businesses and directly from miners, checking shoes for scorpions before putting them on, and walking absent-mindedly only to suddenly find yourself in very close proximity to an ostrich's backside. He also photographed the countryside, people, animals, and the night sky; you can find some of his striking photos at <http://bit.ly/2Mwk9KB>.

At 9:20 p.m., President Bob Cooke called the NVMC business meeting to order.

- Bob recognized past presidents Barry Remer and Rick Reiber and welcomed guests, including new members Anuolu Baldgun and Lauren Silverton.
- The minutes of the May meeting were approved as written in the newsletter.
- An email from Alec Brenner was read to the members describing Alec's pursuit of a Ph.D. in Harvard University's Earth and Planetary Sciences Department. Members reaffirmed their desire to continue scholarship support at \$400 per year to both Alec Brenner and Conrad Smith.
- Mineral books from the library of Gerry Cox were available for purchase.
- The new NVMC nametags have been received and made available for pickup. A signup sheet was provided for requesting additional nametags.
- Steve Parker agreed to serve as the new Field Trip Chair. He will be the NVMC point of contact for coordinating field trips with other clubs and will send out future emails to NVMC members who have expressed interest in field trips. Steve distributed bottles of dilute hydrochloric acid for field testing of calcite.

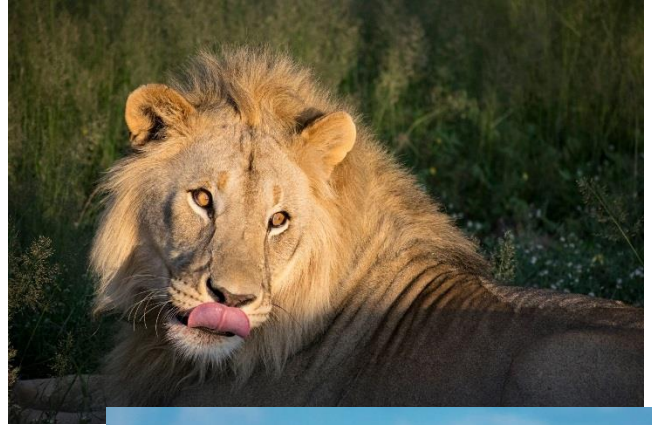


- Amanda Parker agreed to serve as the club photographer.
- Tom Taaffe, the club's Show Chairman, was not available for a show update. He was on the road returning from the Gilsum, NH, rock swap. In his absence, Carolyn Cooke distributed announcement cards for the upcoming NVMC show at George Mason University in November.
- Bob announced that the next NVMC meeting will be the September club member rocks and minerals auction.

The meeting adjourned at 9:45 p.m. ↗.

**A sampling of Casper's stunning photos
from Namibia ...**

... for more, go to <http://bit.ly/2Mwk9KB>.



Save the dates! **Field Trip Opportunities**

A number of field trip opportunities are coming up, including the annual trip to the Willis Mountain Kyanite Mine.

Willis Mountain Kyanite Mine

September 29, 9 a.m.–1 p.m.

Please arrive at 8:30 a.m. for the safety briefing. If you're planning on coming, contact Field Trip Chair Steve Parker as soon as possible at stevenlparker@gmail.com to get added to the field trip list. Steve can give you more information, such as directions to the quarry.

Safety tips: Stay clear of the highwalls, which can collapse without warning—technically, keep the same distance away from base of the highwall as its height. Don't park your vehicle there, either, and set your parking brakes.

Follow and obey all posted signs in the quarry. Drive on left side, and yield to all quarry vehicles. Stay clear of all quarry equipment. Set your parking brakes.

Carry a first aid kit, at least bandaids. Don't climb or cross the berms around the edges/along the quarry roads.

Wear all required personal safety gear all the time inside quarry—a hardhat (less than 5 years old), steel-toed boots with ankle support, gloves, long pants, and eye protection. Use tools as intended. Don't use a cheap carpenter's hammer to break rocks.

Don't throw rocks. Warn others around you when you move a big rock or begin to hammer with a sledge or the like. Don't work directly above another person. Keep alert for hazards such as loose rock above.

Watch out for dangerous wildlife such as poisonous snakes, bees, rabid animals, and ticks (think Lyme disease). Check the weather and plan accordingly, with rain gear, sunscreen, and so on. Keep clear of all water-filled areas.

Northern Virginia Community College Geology Field Trips

NOVA's Annandale campus offers 1-day weekend courses—essentially, field trips—related to our hobby. You can get more information on each of the field trips



*Kyanite crystals (7 centimeters long).
Source: Wikipedia; photo: Aelwyn.*

listed below at the [Field Studies in Geology—GOL 135 Website](#).

Miocene Geology of Calvert Cliffs, MD

September 10, 9 a.m.–6:00 p.m. Learn how the Miocene seas spread across Chesapeake Bay region about 10 to 20 million years ago. We will visit the Calvert Marine Museum collections and study ancient sediments, stratigraphy, and paleoenvironments preserved in world-famous Calvert Cliffs, MD, collecting fossils along the way.

Geology of Washington, DC, and Monument Stone

September 23, 8 a.m.–5 p.m. This walking tour will focus on the geology of our capital and its effect on city design as well as building stone choice and structure. Also covered will be the origin of the diverse rock types used in building, monument, and memorial construction.



Geology of Holmes Run Gorge

September 29, 9 a.m.–5:30 p.m. Holmes Run Gorge is a canyonlike area less than 2 miles from NOVA in Alexandria. Our instructional day will consist of a 3.5-hour class at the college, followed by a 5-hour geologic tour of the gorge. After the face-to-face activities, you will have 2 weeks to complete a related online assignment. ↗

Cub Scout Camporall Coming Up! Saturday, September 29

by Kathy Hrechka

Members of the NVMC, the Cub Scouts need your help!

Please consider sharing our hobby with the Cub Scouts during their camping weekend at Camp Snyder in Haymarket, VA, on Saturday, September 29.

The Scouts need donations of low-cost small gems or pieces of quartz, mica, calcite, limestone, and other minerals. The items will be buried in a “Big Dig” sand-pile. The Cubs find rooting around in the sand for treasures to be loads of fun. You can bring rocks and minerals to donate for the Scouts at our September 24 meeting and give them to Mike Kaas.

Please also consider volunteering your time, which means simply showing up. I have already prepared teaching stations, such as “Earth Rocks,” mineral study boxes, Mohs hardness study boxes, and a geologic state map.

The Scouts can earn badges, so we need a geologist onsite for the boys to complete the “Earth Rocks” requirement of a visit with a geologist. Please call me if you can help at 703-407-5393.

People are already pitching in. As a dealer, Tom Taaffe is coordinating with Scout leadership in purchasing fossils for the boys. Dave Hennessey donated a 5-gallon bucket of amazonite, quartz, mica, and other minerals. Mike Kaas picked up bags of basalt, marble, and granite from garden centers. Limestone and sandstone are still needed!

Eagle Scout Conrad Smith will be at camp all day to teach the Scouts about geology, including “Minerals in my Smartphone.”

The Smithsonian’s Udvar Hazy will also be setting up 10 simulators and workstations for the boys. Camp Snyder has a fort, and geology will be taught upstairs in full sun.

The annual Cub Scout Camporall doesn’t always have opportunities like this to engage kids in our hobby. Dave Carlson, Scouting volunteer, reached out to me this year because former NVMC member Jim Kostka and I had previously taught geology to the Scouts at Camp Snyder. This year, Dave is expecting over a thousand Scouts! ↗



Materials used for Cub Scout teaching stations about geology. Photo: Kathy Hrechka.

Bench Tip **Local Metals Source**

Brad Smith

Local companies that use sheet metal typically have barrels of scrap copper, brass, and aluminum sheet that they save for recycling. The shop owner/manager will usually let you go through it to select the shapes and thicknesses you want. Prices vary but will generally be close to the wholesale per-pound scrap value. For me at this time, that’s \$3 per pound of copper.

I’ve found it much cheaper to buy metal this way than ordering from a catalog. There are no shipping charges, and you’ll be supporting a local small business in your community.

Remember to bring your work gloves if you try this. Also useful is a thickness gauge. When I asked if they had any 14 gauge, they didn’t know. Turns out they measure the thickness of copper by its weight per square foot.

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



A Round of Applause

by Judi Allison, AFMS Rockhound of the Year Chair

Editor's note: The article is adapted from AFMS Newsletter (June/July 2018), p. 2.

Let's give a round of applause to those hard-working yet quiet folks who have gone out of their way to do something above and beyond for their club this year. It can be done so simply—just by submitting a short writeup of the person's special contribution to your Regional Rockhound of the Year Chairperson.

Note the key word "short." This is not meant to be a life biography. It is a paragraph or so honoring the person for a special contribution during the year.

An example might be giving credit to "Joe," who attends every monthly meeting, shows up to quietly help in all aspects of the club show, graciously passes on his door prize when he wins one (usually to a child or new attendee), and brings ice cream as an extra treat for the potluck. With his quiet demeanor, Joe doesn't want to be an officer, but without his contributions the club would be lacking something special.

I am sure that every club has people who have given a great deal of themselves, whether serving as officers or chairs or leading other activities—or being someone like "Joe." You get to decide whom you honor.

Just remember: like a round of applause, it is a short accolade for your chosen club member. ➤

Does your club show involve exhibit cases; table setup; electrical wiring; demonstrations; children's activities; or carrying, carrying, and more carrying? If so, please note that any or all of these activities and the myriad other show-related activities may involve matters of safety.

For example, exhibit case setup usually involves handling large panels containing glass and pinch points. Are folks mindful of these safety concerns as cases are assembled? Does someone check the case lights and switches for electrical code requirements and general electrical safety? Are light sockets damaged? Are wires loose or insulation frayed?

During table setup, does someone verify that table legs are locked and that there are no unsafe metal edges or protruding screws? Are table coverings fire retardant? Some halls require such fire-retardant material.

Electrical wiring for show requirements such as signage, dealer table lights, demonstration area power, and audiovisuals should all be checked for safety. Indeed, electrical safety could have volumes written about it. It is wise to have all electrical safety matters checked by folks with electrical expertise. Standard electrical safety checks include verification that temporary show wiring meets local and National Electrical Code requirements. Wires run along floors should have all tripping hazards mitigated.

Have all temporary electrical outlets for show tables, activities, and programs been tested/checked? Are all temporary wires sized for the electrical load? Do show workers know where emergency shutoffs are located? Are fire extinguishers available for electrical fires?

All these matters should be addressed.

Do show demonstrations offer suitable protection for the demonstrator and the public? Is the sound volume of audiovisual programs kept to reasonable levels? Are safe lifting and hoisting recommendations followed for all the carrying, carrying, and more carrying? Do kids' demonstrations have multiple reviews for safe operation?

Rock and mineral club shows often involve many facets of interest and should address all of the usual safety concerns for the many and varied activities. A show is not the time to let down your guard but rather to put your best foot forward in representing the hobby. It serves the club and the public well to make our shows as safe as possible.



Safety Matters Show Safety

by Ellery Borow, EFMLS Safety Chair

Editor's note: The article is adapted from EFMLS Newsletter (February 2012), p. 3.



Gem and mineral shows do not often call to mind visions of bandages, scraped knees, strained backs, and safety glasses. Most shows, however, would be well served if they included safety preparations in their planning and execution.

Here are a few general guide lines for general show safety:

- Have in a club's possession and be sure to utilize the AFMS Safety Manual, EFMLS Recommended Guide for Club Show Chairmen, and EFMLS Safety Tips for Rockhounds.
- Consider appointing a safety overseer specifically for show-related safety matters.
- Coordinate with the facilities manager for specific site-related safety issues in the hall (including egress, electrical power requirements, lighting, handicap access, and fire extinguisher access and placement).
- Make sure that first aid coordination and supplies are available at the show and on any field trips.
- Ensure that all club volunteers have a part to play in show safety—it is, after all, the whole club's show.
- Keep everyone informed and on top of safety matters.

This single article cannot possibly bring to light every possible show safety issue. Be alert and stay on your toes for any and every potential safety issue.

In the show season to come, may every club show be a safe show! Thank you, and please remember: your safety matters! ▲

Fred Schaefermeyer Scholarships

This year, our club awarded \$400 scholarships to Alec Brenner and Conrad Smith, two young members of our club who are pursuing higher education in fields related to our hobby.

Alec sent the following letter of thanks (lightly edited by Editor Hutch Brown).

Dear Northern Virginia Mineral Club,

This is the 11th year I've been an NVMC member. I joined as a seventh grader who loved rockhounding and fossil collecting, all the while dragging my parents around to meetings and on trips. Some members may remember me back then; I know that I remember the

club through the eyes of an enthusiastic middle schooler.

NVMC has been much more than any other extracurricular activity for me. Early on, members helped me learn mineral, rock, and fossil identification for my Science Olympiad competitions (and, of course, for fun), even going so far as to personally staff the competitions.

NVMC also helped me return the favor. I fondly remember all the years I manned the kid's booth at the club show, diplomatically telling scores of first graders, "It's not a diamond, it's calcite ... but that's a great guess!"

Most recently, throughout my college studies, NVMC has been there to support me through the Fred Schaefermeyer Scholarship Fund. I just received your most recent award of \$400, and it means a lot to me that NVMC is keen on supporting my studies and repeatedly so. I cannot appreciate your generosity more.

Beyond all else, the club is a place where it's cool to dig in the dirt for rocks and learn about them by sharing them with fellow rockhounds through articles, trips, talks, and shows. The real generosity I have to thank you for is that you've allowed me to share in all these, without which I wouldn't be a geology student today.

Thank you for all that you've done for me.

Sincerely,

Alec Brenner

GeoWord of the Day

(from the American Geoscience Institute)

stone intrusion

An irregular, bulbous, sometimes much distorted sandstone dike occurring within a coal seam or penetrating it (frequently from top to bottom), and always connected with a similar sandstone in the roof or in higher strata. The British usage of the term intrusion for such a mass of sedimentary rock in a coal seam is not recommended. Cf: *drop [coal]*. Syn: *stone eye*.

(from the [Glossary of Geology](#), 5th edition, revised)

Mineralogical Reflections

*Magnet Cove, AR–Memphis, TN–
Spruce Pine, NC–Franklin, NJ*

by George Loud

Karen and I had planned to attend gem and mineral shows in Spruce Pine, NC, at the beginning of August. Unfortunately, we had to cancel out at the last minute because of a health problem.

However, mere mention of Spruce Pine brings to mind a story that starts in Franklin, NJ.

Many years ago, in the process of going through offerings by outdoor vendors at the “Pond” in Franklin, I came across some strange-looking pyrite. The locality given for this strange “titaniferous pyrite” was Magnet Cove, AR. I had collected in Magnet Cove many times starting when I was a kid, but I had never seen such material before.

Because I regarded the material as unusual for the locality and because it was cheap, I purchased a piece. My inquiries of the vendor revealed only that he had purchased the material from another vendor at a show in Spruce Pine, NC.

Fast forward about 1 year to Memphis, TN, and one of my periodic trips there to visit my mother. As usual on such trips, I also visited my good friend Dr. Jim Cole in Memphis. Dr. Cole was one of the most enthusiastic rockhounds I have ever met. I collected with him in Magnet Cove on several occasions. He owned a cabin near Mount Ida, AR, and we used it as our base of operations.

Dr. Cole’s home in Memphis had a very large basement full of minerals. Likewise, his large backyard was full of crates and buckets of self-collected minerals. During this particular visit, I noticed a container full of pyrite that looked very similar to my specimen of “titaniferous pyrite.”

So I asked, “Jim, what is this stuff?”

“Oh, we found that if we soak pyrite from Cove Creek in bleach, it turns that color. I call it ‘titaniferous pyrite,’ but that is just a guess on my part.”

Knowing that Dr. Cole was a frequent vendor at the Spruce Pine shows, those comments put it all together for me.



Top: Pyrite and tetrahedrite on quartz, Sweet Home Mine, CO. Bottom: Apophyllite, Fengjiashan Mine, China. Source: Wikipedia (from Mindat).

I collect mainly minerals from classic U.S. localities and tend to jump at anything I see for sale that appears unusual for a locality. Lesson learned and frequently forgotten: if it appears to be unusual for the attributed location, (1) the label may be wrong, or (2) the specimen may be faked in some manner.

To illustrate the point, at the Tucson Show I once purchased an apophyllite specimen labeled “Centreville, Virginia” because it seemed to be an unusual habit of apophyllite for the locality. Upon returning home and unwrapping the specimen, I turned it over and, upon seeing the matrix, I knew immediately that it was from India. I should have turned it over to better see the matrix before I purchased it. Hate to admit that I was so stupid. ↗

Humor **Age-Activated Attention Deficit Disorder**

Anonymous email received by Lanny Thompson

Editor's note: *The story is adapted from Livermore Lithogram (newsletter of the Livermore Lithophiles, Livermore, CA), February 2008, p. 4.*

Recently, I was diagnosed with A.A.A.D.D.—Age-Activated Attention Deficit Disorder. This is how it manifests:

I decide to water my garden. As I turn on the hose in the driveway, I look over at my car and decide it needs washing.

As I start toward the garage, I notice mail on the porch table that I brought up from the mailbox earlier. I decide to go through the mail before I wash the car.

I lay my car keys on the table, put the junk mail in the garbage can under the table, and notice that the can is full. So I decide to put the bills back on the table and take out the garbage first.

But then I think, since I'm going to be near the mailbox when I take out the garbage, I may as well pay the bills first. I take my checkbook off the table and see that there is only one check left.

My extra checks are in my desk in the study, so I go inside the house to my desk where I find the can of Coke I'd been drinking. I'm going to look for my checks, but first I need to push the Coke aside so that I don't accidentally knock it over. The Coke is getting warm, and I decide to put it in the refrigerator to keep it cold.

As I head toward the kitchen with the Coke, a vase of flowers on the counter catches my eye—they need water. I put the Coke on the counter and discover my reading glasses that I've been searching for all morning.

I decide I better put them back on my desk, but first I'm going to water the flowers. I set the glasses back down on the counter, fill a container with water, and suddenly spot the TV remote. Someone left it on the kitchen table.

I realize that tonight when we go to watch TV, I'll be looking for the remote, but I won't remember that it's on the kitchen table, so I decide to put it back in the

den where it belongs, but first I'll attend to the flowers. I pour some water in the vase, but quite a bit of it spills on the floor.

So I set the remote back on the table, get some towels, and wipe up the spill. Then I head down the hall trying to remember what I was planning to do.

At the end of the day:

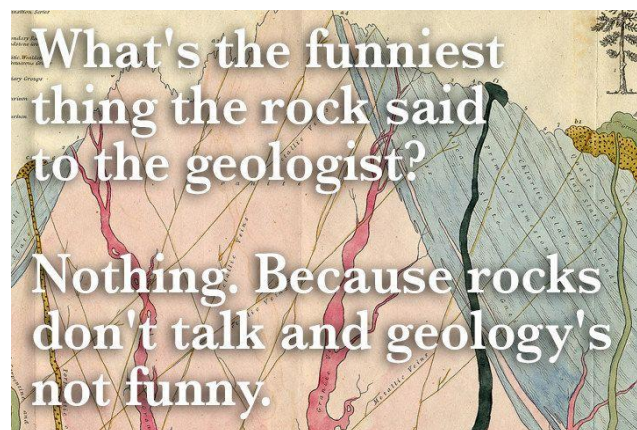
- the car isn't washed;
- the bills aren't paid;
- there is a warm can of Coke sitting on the counter;
- the flowers don't have enough water;
- there is still only one check in my checkbook;
- I can't find the remote;
- I can't find my glasses; and
- I don't remember what I did with the car keys.

Then, when I try to figure out why nothing got done all day, I'm really baffled because I know I was busy all the damn day and I'm really tired.

I realize this is a serious problem, and I'll try to get some help for it, but first I'll check my e-mail ...

Do me a favor. Forward this message to everyone you know, because I don't remember who the heck I've sent it to!

And don't laugh—if this isn't you yet, your day is coming! ♫





The Rocks Beneath Our Feet Virginia's Gold-Pyrite Belt: Tectonic Origins

by Hutch Brown

Editor's note: The article is the second in a four-part series on the geology of Virginia's gold-pyrite belt. The first part is in the June 2018 issue.

The southeastern United States is not known for its gold mines, yet they once existed by the hundreds from Maryland to Alabama. From 1804 to 1947, Virginia alone produced about 100,000 troy ounces of gold, worth about \$120 million at today's prices.

Virginia's gold mines were concentrated in a band of ores extending from Fairfax County southwest to Appomattox County (fig. 1). The concentrated area of gold-bearing rock is known as the gold-pyrite belt.

Most of the Earth's original gold accumulated about 4.5 billion years ago in the planet's solid metallic core, along with most iron and iron-affiliated metals, such as molybdenum, iridium, silver, platinum, and aluminum. The gold mined today comes from meteors and asteroids that bombarded the planet about 4.3 billion years ago. The meteor showers enriched the Earth's molten mantle with iron, nickel, cobalt, tungsten, and other "iron-loving" metals, including gold.

As molten rock circulated through the mantle, some of it cooled and solidified in the Earth's crust. Over billions of years, the Earth's mantle shaped and reshaped the planet's crust through tectonic processes, sometimes depositing gold and other precious metals.

So how did tectonic processes create Virginia's gold-pyrite belt?

Tectonic Plates

The solar system originated about 4.6 billion years ago. After the sun formed, the Earth and other planets aggregated from the remaining gases and rocky debris. By about 4.5 billion years ago, the Earth had consolidated into a molten mass of material covered by thin pieces of floating crust.

Today, the Earth has a solid metallic core surrounded by a viscous inner mantle and a liquid outer mantle. The mantle has a relatively thin solid crust, what geologists call the lithosphere. The lithosphere contains the rocks, minerals, gems, and fossils of interest in our hobby. Because the mantle forms the lithosphere, it

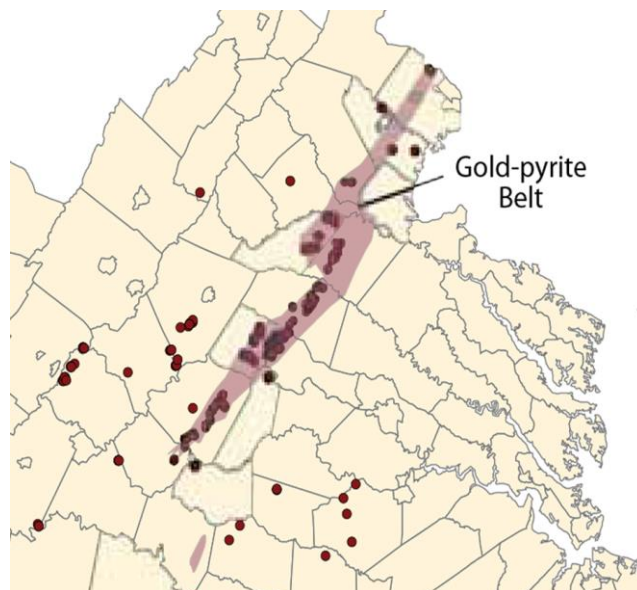


Figure 1—Top: The gold-pyrite belt in north-central Virginia (shaded area). Purple dots = gold mines and prospects. Source: Sweet (2007). **Right:** Gold nugget from Virginia's gold-pyrite belt, on display at the Smithsonian National Museum of Natural History. Source: N.a. (2014).



drives much of the story of geology, including the story of gold in Virginia.

Like the ocean, the Earth's liquid mantle is in constant flux (fig. 2). Convection currents mix the magma, forcing it to the Earth's surface in some places and carrying it back down in others. At the Earth's midocean ridges, the upwelling superheated magma forms new crust, pushing the older crust apart. The crust forms plates that are carried along by "slab pull" (fig. 2)—convection currents in the upper mantle, a zone of viscous magma that geologists call the asthenosphere.

Accordingly, the Earth's lithosphere is not entirely solid. It is much like a cracked egg, with pieces of shell floating on a liquid or viscous interior. The bits of shell are what geologists call tectonic plates; the word "tectonic" derives from Greek (*téktōn*) and Latin (*tectonicus*) words meaning "carpenter" and "related to building." The tectonic plates are, so to speak, the "building blocks" of geology.

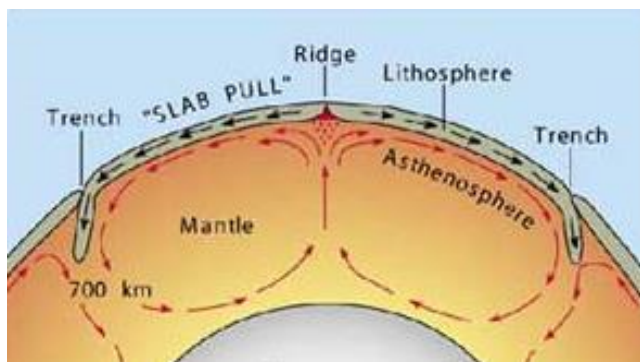


Figure 2—Convection currents circulate magma through the Earth's liquid mantle, forming new crust and carrying heavy old crust into the mantle to be recycled. Source: UCMP (2002).

At their outer edges, the tectonic plates collide with other plates (fig. 2). The plate that is cooler and heavier slides under the lighter plate, sinking into the asthenosphere and melting. The deeper the magma sinks into the Earth's liquid mantle, the hotter it gets, until it is superheated enough to circulate back to the Earth's surface in the mantle's convection currents (fig. 2).

The Taconic Terrane

Where one oceanic plate collides with another plate and dives under it, a deepsea trench results. An example is the Marianas Trench in the western Pacific Ocean (fig. 3). The advancing Pacific Plate dives under the lighter Philippine Plate, creating tremendous friction between the colliding plates. The heat melts the rock, sending plumes of magma rising to the surface. Accordingly, a line of volcanic islands in the shape of an arc has formed at the edge of the Philippine Plate.

Something similar happened half a billion years ago in the ocean that preceded the Atlantic (fig. 4). The oceanic plate advancing toward proto-North America was lighter than the continental plate, which dove under it, creating an offshore arc of volcanic islands (fig. 4, top). The diving continental plate formed a ramp in the subduction zone, and the island arc rode up over the continental margin (fig. 4, middle), attaching itself to proto-North America.

In plate tectonics, a small land mass that attaches itself to a continent is known as a terrane. Geologists have dubbed the island arc that collided with proto-North America about 450 million years ago the Taconic Terrane. The collision raised a chain of mountains (fig. 4, bottom), and the corresponding mountain-building event is known as the Taconic Orogeny.

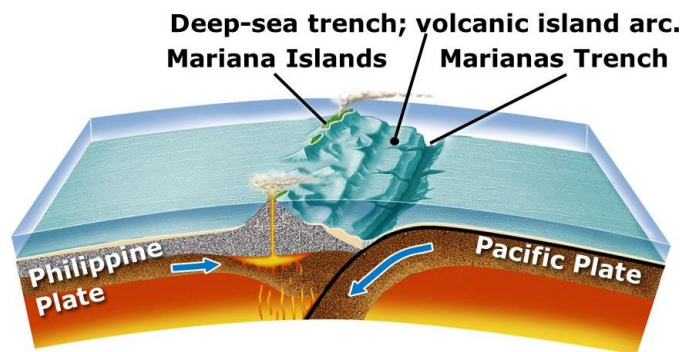


Figure 3—Where two oceanic plates collide, the heavier plate (right) subducts under the lighter plate (left), forming a deepsea trench. Rising magma from the colliding plates forms an arc of volcanic islands behind the trench. Source: Press and others (2006).

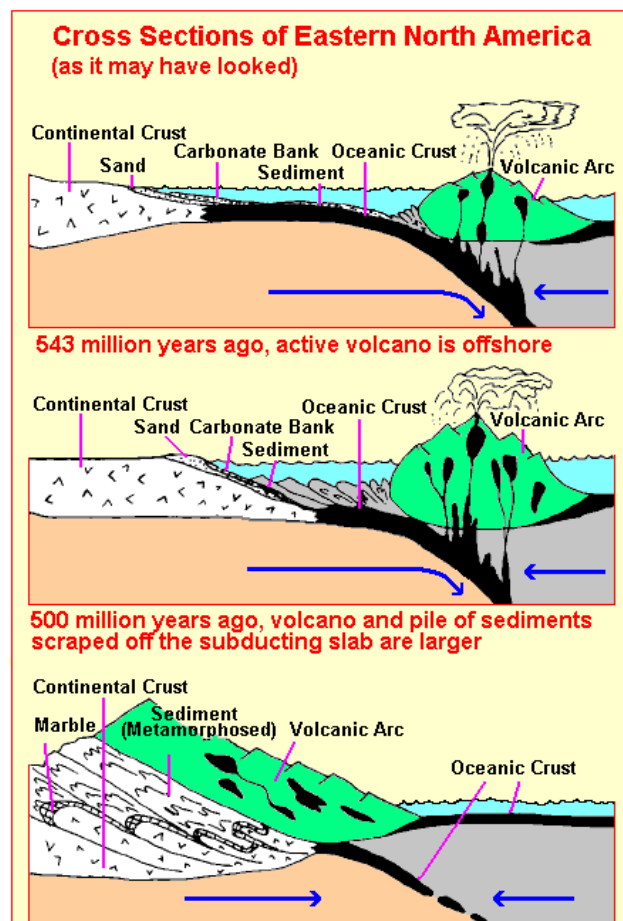


Figure 4—The collision of the Taconic Terrane with proto-North America. **Top:** An offshore volcanic arc approaches the continent, forming a deepsea trench in the subduction zone. **Middle:** The advancing terrane pushes trench sediments up onto the continental shelf. **Bottom:** The terrane rides up over the continental margin, raising the Taconic Mountains and burying the sediments. Note the igneous plutons (black splotches). Source: Topinka (2001).

The Taconic Orogeny lasted until about 435 million years ago. After the mountains weathered away, the Taconic roots formed the basis for today's Piedmont Province. By the end of the Taconic Orogeny, the gold–pyrite belt was in place in what is now the Virginia Piedmont.

Accordingly, much of the bedrock we see in the Piedmont today first formed in the proto-Atlantic Ocean at the edge of an advancing oceanic plate. Most dates to at least 485 million years ago (the Cambrian Period), and most is metamorphic. Metamorphism might have occurred at least twice: during the Taconic Orogeny itself and during the much greater Alleghanian Orogeny later on, when proto-Africa collided with proto-North America beginning about 320 million years ago.

Plumes of Magma

The gold–pyrite belt is not a mapped geologic entity. Instead, the gold and pyrite tended to form on or in veins, lenses, and nodules of quartz embedded in the Piedmont's metamorphic formations. Because the quartz intruded into the ancient Taconic bedrock, it must be younger in age. The gold-bearing quartz is usually classified as early Ordovician in age. It is thought to have formed about 470–485 million years ago, a period when the Taconic island arc was approaching or colliding with proto-North America.

So the gold–pyrite belt originated at a time of tremendous tectonic activity. It is closely associated with rising plumes of magma in the Taconic Terrane, probably during or just before the Taconic Orogeny.

But where exactly did the gold come from? And how did it get emplaced?

Next: How hydrothermal processes driven by tectonic activity deposited gold and pyrite in the metamorphic bedrock of the Virginia Piedmont.

Acknowledgments

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Lesson of Gold

... By and by, in the bed of a shallow rivulet, I found a deposit of shining yellow scales, and my breath almost forsook me! A gold mine ...! ... I set about scooping them out, and I turned homeward laden with wealth. ...

"Gentlemen," said I, "... tell me what you think of it!" and I tossed my treasure before them. ...

Then old Ballou said: "Think of it? I think it is nothing but a lot of granite rubbish and nasty glittering mica that isn't worth ten cents an acre!"

... So I learned then, once for all, that gold in its native state is but dull, unornamental stuff, and that only lowborn metals excite the admiration of the ignorant with an ostentatious glitter. However, like the rest of the world, I still go on underrating men of gold and glorifying men of mica.

—Mark Twain, *Roughing It*

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*Bidders: You need to bid on this item if you
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NAME/BID

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September 2018—Upcoming Events in Our Area/Region (see details below)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3 Labor Day	4	5 MSDC mtg, Washington, DC	6	7	8
9	10 GLMSMC mtg, Rock- ville, MD	11	12	13	14	15 NOVA field trip
16	17	18	19	20	21	22 Fall begins Show: W Friendship, MD
23 NOVA field trip ; Show: W Friend- ship, MD	24 NVMC mtg, Arlington, VA	25	26 MNCA mtg, Arlington, VA	27	28	29 Field trips

Event Details

5: Washington, DC—Monthly meeting; Mineralogical Society of the District of Columbia; 7:45–10; Smithsonian Natural History Museum, Constitution Avenue lobby.

10: Rockville, MD—Monthly meeting; Gem, Lapidary, and Mineral Society of Montgomery County; 7:30–10; Rockville Senior Ctr, 1150 Carnation Dr.

15: Calvert Cliffs—Geology field trip; 9–6; NOVA; info, reg: [GOL 135 Website](http://GOL135Website.com).

22–23: West Friendship, MD—53rd Annual Atlantic Coast Gem, Mineral, Jewelry & Fossil Show; Gem Cutters Guild of Baltimore; Howard Co. Fairgrounds; info: gemcuttersguild.com.

23: Washington, DC—Geology field trip; 8–5; NOVA; info, reg: [GOL 135 Website](http://GOL135Website.com).

25: Arlington, VA—Monthly meeting; Northern Virginia Mineral Club; 7:30–10; Long Branch Nature Center, 625 S Carlin Springs Rd.

27: Arlington, VA—Monthly meeting; Micromineralogists of the National Capital Area; 7:45–10; Long Branch Nature Center, 625 S Carlin Springs Rd.

23: Willis Mtn Kyanite Mine—Field trip; 9–1; info: Steve Parker, stevenparker@gmail.com.

29: Alexandria, VA—Geology field trip; 9–5:30; NOVA; info, reg: [GOL 135 Website](http://GOL135Website.com).

Hutch Brown, Editor
4814 N. 3rd Street
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**Mineral of
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President: Bob Cooke
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Treasurer: Roger Haskins
r1haskins@verizon.net
Communications: Vacant
Editor: Hutch Brown
hutchbrown41@gmail.com
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The Northern Virginia Mineral Club

Visitors are always welcome at our club meetings!

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RENEW YOUR MEMBERSHIP!

SEND YOUR DUES TO:

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;
\$15 individual, \$20 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. (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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