THE NORTHERN VIRGINIA MINERAL CLUB INC

The Mineral Newsletter

Meeting: January 25 Time: 7:45 p.m.

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

Smithsonian National Gem Collection. Photo: Chip Clark.

Volume 57, No. 1
January 2016
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January Meeting Program:

Valley and Ridge Geologic History

In this issue …

Chalcedony

Quartz (onyx) cameo from antiquity

Mineral of the Month: Chalcedony

by Hutch Brown

With my interest in structural geology, I like common rocks that show up in interesting ways and places. So I like quartz in all its variations.

One of them is chalcedony, which got its name from the ancient Greek town of Chalcedon in what is now Turkey. The Roman naturalist Pliny the Elder (23?–79 AD) mentioned chalcedony in his *Naturalis Historia*.

In the general sense of the term, chalcedony is cryptocrystalline quartz, meaning that it has microscopic crystals. By contrast, macrocrystalline quartz forms visible quartz crystals as well as massive quartz veins and lenses.

Most chalcedony is actually an intergrowth of tiny crystals of quartz and moganite, a polymorph of quartz that gradually degrades into quartz. Chalcedony contains 1–20 percent moganite. (It is all silicon dioxide)

Chalcedony has many varieties, including agate, chert, jasper, onyx, sard—even petrified wood. Among other occurrences, it appears as fossilizing material; as cement in sandstones; as layers and nodules in limestones and marls; and as veins and nodules in volcanic rock. For example, when silica-rich brines fill gaps in volcanic rock, the silica precipitates out, filling the gaps with chalcedonies (such as agate) containing trace amounts of water.

Chalcedony has a waxy luster and appears vitreous when polished. Like quartz, it belongs to the trigonal crystal system. With a hardness of 6.5 to 7, chalcedony comes in many colors, depending on the impurities it contains. Under short-wave ultraviolet light, chalcedony often turns green.

In the narrow sense of the term, chalcedony does not include banded colorful varieties such as agate. Instead, it is limited to botryoidal forms, meaning rounded masses, usually white to blue or gray. The cover shows an outstanding example, bluish gray in color. The engraver used the waxy, rounded form typical of this mineral to depict a side view of the human head in stunningly beautiful detail (on translucent onyx).

Sources: Wikipedia, Mindat, Gemdat.

Happy New Year!

Northern Virginia Mineral Club members,

Please join our January speaker, Professor Shelley Jaye, for dinner at the Olive Garden on January 25 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.

New Cover Design

Rockhounds like to see interesting mineral specimens. That's why *Rock & Gem Magazine* typically features a nice specimen on its cover. Makes sense to me, so I decided to try it for our newsletter, too.

–Hutch Brown, Editor

The Geologic History of the Valley and Ridge, as Recorded in the Rocks of Corridor H, WV

January 25 Program

Professor Shelley Jaye, who teaches mineralogy and geology at Northern Virginia Community College, will present a program based on a field trip she recently led.

Corridor H in West Virginia is an east/west route that starts at the Virginia border near the town of Wardensville, WV (on U.S. Rte. 48). It crosses the Valley and Ridge geologic province, featuring sedimentary rocks laid down in the early to middle Paleozoic Era (from about 500 million to 320 million years ago). The rocks were folded and faulted during the Alleghanian Orogeny, which began when proto-Africa slammed into proto-North America about 320 million years ago. After the great Alleghanian Mountain range weathered away, differential erosion rates in its sedimentary roots formed the geologic province known today as the Valley and Ridge.

Shelley began her exploration of the geosciences at a community college in suburban Detroit, MI. She attended Wayne State University in downtown Detroit, where she received both her BS and her MS degrees in geology. She conducted field research on early Paleozoic metasediments and metavolcanics on the island of Spitsbergen on the Svalbard archipelago, north of Norway.

After graduating, Shelley took a position with the federal government as a program manager in what is now the National Geospatial Intelligence Agency. That career was exciting and rewarding but also stressful and time consuming. In the late 1990s, with two small children to care for, she decided to change careers and begin teaching Earth science at Potomac Falls High School in Sterling, VA.

After moving to Virginia's Norfolk area, Shelley began teaching geology at Tidewater Community College. Back in the community college environment, she knew she had found the perfect second career. She is now at the Annandale campus of Northern Virginia Community College, where she teaches mineralogy as well as physical and historical geology. She is always trying to find great research opportunities for her students. ⚒

The Prez Sez

by Bob Cooke

It's bad enough that the Republican and Democratic primaries keep reminding us of regime change at the national level; but club members are now faced with regime change on a much more personal level—a new NVMC President and Vice-President. Thank goodness David MacLean and Rick Reiber agreed to continue on as Secretary and Treasurer to keep us on an even keel!

In my first couple of weeks in this new position, I have been impressed by the multitude of issues that are involved in running this club, things I never previously considered. It makes me particularly glad to have continuity in the positions of field trip chair, Webmaster, communications, editor, and show co-chairs, all of whom have been doing this work year after year without replacement.

As an example, I'd like to mention the work of our editor, Hutch Brown. Not only does Hutch assemble and publish our newsletter, he has also contributed scholarly multipage articles on geographic features in our area. I was pleased to see that the Eastern Federation of Mineralogical and Lapidary Societies *and* the American Federation of Mineralogical Societies both recognized him with a first-place award for an original educational article under the title, "Sugarloaf Mountain: A Maryland Mystery" (see *The Mineral Newsletter*, October 2014).

I also noted on the EFMLS Website that this year's schedule of classes (and registration forms) is posted for the Wildacres spring and fall sessions, May 9–15 and Sep 5–11 (see http://efmls-wildacres.org). You can find a summary of the spring session offerings on page 10 of this newsletter.

Ti Meredith has already lined up some very interesting programs for upcoming meetings. How she pulled all this together in such a short time is beyond me! If you'd like to share your mineral experiences at a future meeting or have a recommendation for a program, please let Ti know.

The coming year should prove to have many interesting activities for the NVMC. I look forward to enjoying them with you! ⚒

Bob Cooke

Deadline for Submissions

February 1

So we can send out the newsletter on time, please make your submission by the 1st of the month! Submissions received later might go into a later newsletter.

Club Meeting and Holiday Party

December 16, 2015

by David MacLean

President Wayne Sukow called the meeting to order at 7:45 p.m. at the Long Branch Nature Center in Arlington, VA.

The minutes of the November 16 meeting were approved as published in *The Mineral Newsletter*.

The president recognized guest Tim Lesage.

Committee Reports

By motion duly made and seconded, the members elected the following club officers for 2016:

President ....Bob Cooke

Vice-President........................Ti Meredith

Secretary ....David MacLean

Treasurer ....Rick Reiber

Congratulations to you all! And *thank you*!

Awards and Recognitions

Newsletter editor Hutch Brown received the NVMC 2015 President's Award for his role in editing *The Mineral Newsletter*. The president encouraged Hutch to enter the newsletter in the annual EFMLS contest for newsletters and articles. He did, along with an array of superb articles by club members.

Kathy Hrechka received a plaque as second-place winner in the annual EFMLS contest for her outstanding editorship of *The Mineral Mite*, newsletter of the Micromineralogists of the National Capital Area.

The president recognized Karen Lewis as a member of NVMC since 1985.

The president also recognized Conrad Smith, Eagle Scout, rockhound, and student at the New Mexico Institute of Mining and Technology, whose accomplishments were recognized in a 2015 issue of *Rock & Gem* magazine.

Presentations

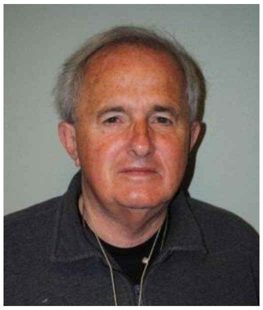
Alec Brenner, a student at the California Institute of Technology, gave a talk on his research with mentor George R. Rossman, a professor of mineralogy at Caltech. His research is on spectroscopic quantification of structurally bound water in pyroxenes and olivine, with application to meteorites. His paper on the subject will be published in a refereed journal.

Conrad Smith, who is majoring in mineral engineering at New Mexico Tech, gave a talk on his observations of several mines in New Mexico.

Holiday Party

By motion duly made and seconded, the members adjourned the meeting to enjoy the joint NVMC/MNCA holiday party. ⛏

Thanks to Sheryl Sims for the photos!



Jim Kostka: If It Clicks, I Collect It

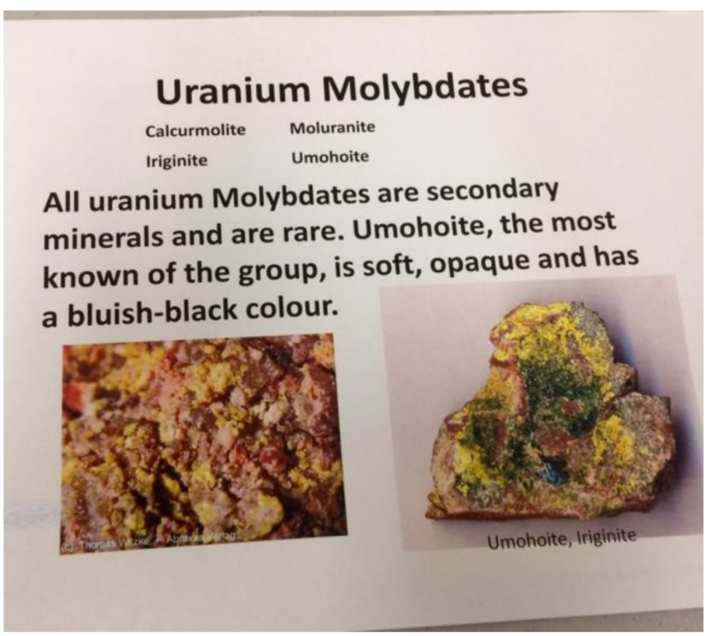
by David MacLean

Editor's note: *The article summarizes a presentation by Jim Kostka at the NVMC meeting on June 22, 2015, called "Radioactive Minerals, Part 2."*

As the saying goes, "Born in a star, but when it is lead it is dead." Uranium (U), thorium (Th), and other elements heavier than iron were born in the collapse and explosion of a supernova perhaps 6.6 billion years ago (bya).

Uranium isotopes U238, U235, Th232, and actinium 233 decay stepwise up and down the periodic table into daughter products and eventually into stable isotopes of lead such as Pb206 and Pb210. Some of the daughter decay products are, for example, radium (Ra226), radon (Rn), and polonium (Po).

The decay process includes emission of alpha particles, helium nuclei, beta particles, electrons, and gamma rays—high-energy electromagnetic radiation from the nuclei. The half-life (t1/2) is the time required for half the nuclei to decay. Half-lives of radioactive elements range from femtoseconds (a femtosecond is one millionth of one billionth of a second) to billions of years.



Jim illustrated his presentation with photos and rock samples laid out on display tables for club members to view during breaks.

Jim Kostka demonstrating his Geiger counter.
All photos: Sheryl Sims.

Half-lives of radioactive elements include 4.5 billion years for U238, 704 million years for U235, and 14.8 billion years for Th232. The shorter the half-life, the more intense the radioactivity.

The isotopic composition for uranium is 99.3 percent U238, 0.72 percent U235, and 0.005 percent U234 (or 50 parts per million). Only U235, U233, and an isotope of plutonium (made from uranium) are fissionable.

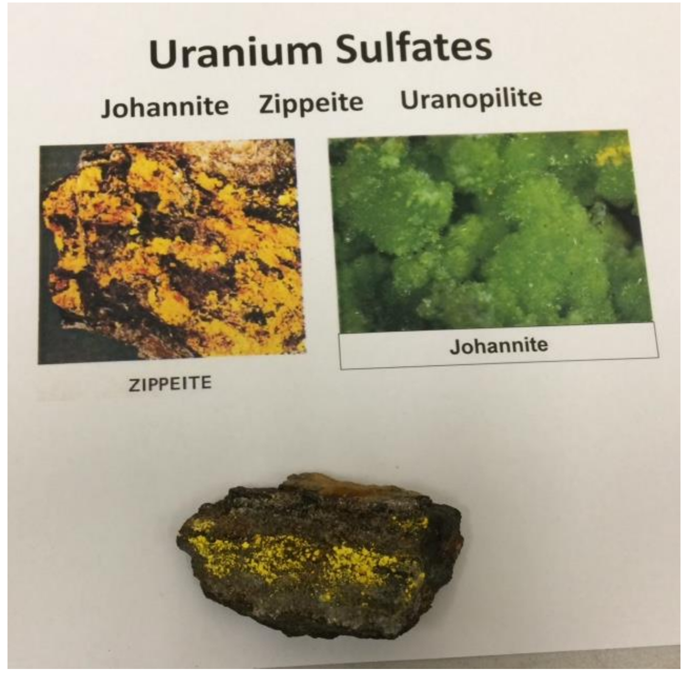
The average concentration of uranium in soil and intrusive and extrusive rocks is about 2.4 parts per million. Uranium in granites is leached out by acid and oxidation from U^{4+} to U^{6+} and then concentrated in alkaline environments and reduced by organic matter.

Primary uranium minerals are oxides (such as uraninite) and silicates (such as coffinite), which are often too expensive to mine and extract. Carbon dioxide, sulfide oxidation, and water alter uranium into uranyl ion (UO_2), which can then be precipitated and concentrated as a variety of minerals containing $(UO_2)^{2+}$. These secondary uranium minerals are found on the Colorado Plateau in Colorado, Utah, and elsewhere. The world-class large uranium deposit in southern Virginia is coffinite in a rift zone.

Some typical sedimentary uranium minerals are carnotite and tyuyamunite as uranyl vanadates, autunite and torbenite as uranyl phosphates, and zeunerite as uranyl arsenate. Uranium also occurs more rarely in mineral classes including uranyl molybdate, tellurites, niobates, tantalates, and selenides.

Uranium and thorium occur in some lanthanide (rare earth) minerals such as samarskite. Uranium and thorium often occur in atomic substitutions in the zircon crystal structure. Zircon is hard, inert, leach resistant, and durable, so uranium or thorium and their decay products remain bound in the zircon for long periods of time.

By measuring the ratio of lead isotopes to the uranium or thorium, one can accurately estimate the age of the zircon crystal. In Australia, a sandstone formation that is 3.3 billion years old contains zircon that was determined to be 4.4 billion years old. That is only 267 million years younger than Earth itself. ⚒



A Little Iron Goes a Long Way

Editor's note: *The article is adapted and abridged from* Gem Cutters News *(newsletter of the Gem Cutters Guild of Baltimore, Inc., Baltimore, MD), November 2015, p. 8. It originally appeared in* The Roadrunner, *August 2006.*

People are always seeking ways to counteract rust. But it was not always that way. Ancient peoples often used iron rust (ocher) in their decorations.

Rust is common in nature. Iron oxide (FeO_2)—or sometimes just iron itself—is often responsible for the coloration of gemstones.

Some minerals used for jewelry have iron as a principle constituent. Hematite is 70 percent and pyrite (marcasite) 40 percent iron. Most agate and jasper with yellow, brown, and red hues owe their coloring to iron.

In some gemstones, very small traces of iron can dramatically change the color. A few tenths of a percent of iron within a crystal can turn an ordinary mineral into a beautiful gem that has both aesthetic and monetary value.

A few tenths of a percent of iron in quartz produces both citrine and amethyst. Beryl is another gemstone in which traces of iron can influence color. In aquamarine, a few percent of iron causes both green and blue, depending upon where the iron atoms are located within the crystal lattice. The color of golden beryl is also caused by a small percentage of iron atoms.

When one-tenth to three-tenths of a percent of the mineral corundum comprises iron atoms, a gemstone called yellow sapphire results. If a like amount of the metal titanium is also present, we have the more desirable and better known blue sapphire.

Many other gemstones and minerals owe their coloration to traces of iron, sometimes by itself and sometimes in combination with other elements. ⚒

Iron brings out shades of green and blue in aquamarine (beryl). Source: Smithsonian National Gem Collection. Photo: Chip Clark.

Story of Geology

Letter to the Editor

Editor's note: *I am pleased that a club member has submitted a letter to the editor inspired by the series of articles in our newsletter called* Story of Geology *(June–December 2015). The letter reprinted here responds to the article "Genesis Inscribed in the Rocks?" (*The Mineral Newsletter*, June 2015, pp. 11–12). The author of this letter is solely responsible for the views expressed here, which do not necessarily reflect those of other NVMC members. If you would like to comment or contribute to our newsletter, please contact me at hutchbrown41@gmail.com.*

Dear Hutch Brown, Sue Marcus, et al.:

I have enjoyed your recent articles struggling with the issues of Genesis, Geology, the exact time of creation, etc. I have formulated a theory to explain all this and eliminate any conflict between creation and evolution. Between science and religion, etc. For a working title we may call it the Lew Holt theory of time, the universe, and everything. As we further develop and refine my theory, we may want to change or add to the title which will be okay. Now here goes.

God created the universe for sure, for there is great order in the universe, which we are only beginning to be able to apprehend. Every day we discover more and more stuff which always fits into this great order in some way. It just cain't be no accident. No random big bang. It's an orderly creation of a mind so big we can't figure it all out.

The time it took all this to be created is much more than six days and nights. Substitute Eons for days and it becomes more understandable. Whoever wrote the six days story {Moses?} has simply been mistranslated. He meant Eons.

As for the method of creation, He could have done it any way He wanted. He is all powerful, after all. He could have sat down on the evening of October 22, 4004 BC, in a black robe and pointy hat and waved a wand. Said abracadabra, I hereby create the heavens and the earth.

But that's too simple for a God of all power. What's he going to do for the rest of time? He needs something more complicated to keep his mind occupied. He designs and puts in place all these systems of Gravity, Relativity, Conservation of motion, etc. String theory! There's a good one. And of course good old evolution. The birth, life, and death of

John Martin, The Deluge *(1834). Oil on canvas. Source: Wikipedia.*

whole universes, not to mention species such as ours, which has evolved according to his designs.

He told all this to Moses in a sort of divine revelation so Moses could write the book. Genesis! What a great book. Moses was good, but not that good. Evidently he left enough loopholes so that later generations could come up with that date.

October 22, 4004 BC. Supposedly the date of creation? Sorry, that won't work. We got fossils that are older than that. The timeline is perplexing for sure.

Old Albert Einstein did a lot of good work on Time and his Unified Field Theory, which is supposed to tie all these other theories together. He was still working on it when he died. Said if he could work it out he would know what God was thinking. What a guy! The world's leading scientist said he believed in God.

Today's working scientists mostly believe in God. Why do so many of the self-styled faithful refuse to believe in science? There should be no conflict. It's simply a matter of time. WHEN did God create everything? How can we understand God's time? God's time is infinite. His moment of creation is infinite. His systems of evolution, the expansion of the universe, etc., are still going on.

And now we discover that we are living in the moment of creation. It's still going on! What a Guy! Praise Him!!!

Lew Holt

July 29, 2015

Shocked Quartz and the K–T Boundary

by Sheryl E. Sims

While waiting to leave for work one morning, I channel-surfed to my local PBS station. There I saw a geologist chipping away at a layer of earth and talking about something called the K–T boundary. It was a thin layer of sedimentary material of a different color along a pretty large expanse of a cliff.

The geologist said the layer was evidence of something both interesting and frightening that happened about 65 million years ago. During the event, more than three-fourths of all plant and animal species living on Earth went extinct. The catastrophic event is known as the K–T mass extinction because it occurred at the boundary between the Cretaceous (K) and Tertiary (T) Periods.

What was the best known group of animals to perish? That's right! It was the dinosaurs! Above the K–T layer, fossils have been found of alligators, turtles, and various mammals. Below the boundary are numerous dinosaur fossils. The fact that none were discovered above the layer indicates that the dinosaurs no longer existed during the Tertiary Period.

The K–T boundary was first discovered in 1980 by Nobel Prize-winning physicist Luis Alvarez; his son, geologist Walter Alvarez; and chemists Frank Asaro and Helen Michel. Together, they found that the same sedimentary layer around the world contained high levels of iridium, which is very rare in the Earth's crust. Iridium tends to bond with iron, and it sank along with most iron into the core of the Earth during what is called planetary differentiation. However, iridium remained in large quantities in many asteroids and comets. Alvarez and his team believed that a large asteroid hit the Earth at the end of the Cretaceous Period, forming the K–T boundary.

One result of the extreme pressure and heat caused by the collision was shocked quartz. Shocked quartz, a form of quartz, has a microscopic structure different from typical quartz. Intense pressure changes the crystalline structure of quartz along planes and inside the crystal. If you view these planes under a microscope, you see lines or planar deformation features, sometimes called shock lamellae.

The K–T boundary in a cliff at Trinidad Lake State Park, CO. Source: Smith (2013); photo: Cindy Smith.

Shocked quartz was first discovered after underground nuclear bomb testing. Eugene Shoemaker showed that shocked quartz is also found inside craters created by meteor impact, such as the Barringer Crater and the Chicxulub Crater. Shocked quartz is found worldwide in the thin Cretaceous–Paleogene boundary layer.

Sources

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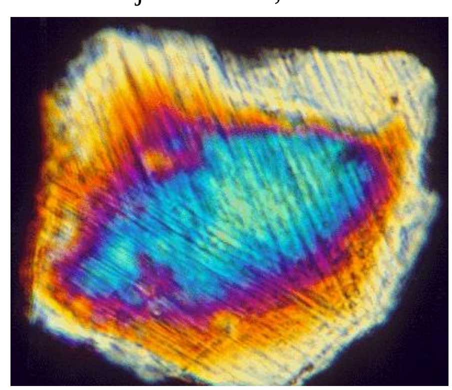


Shocked quartz sand grain (0.13 mm in diameter) from the bolide impact crater at the mouth of the Chesapeake Bay. The collision occurred during the Eocene Epoch (about 58 million to 37 million years ago). Source: USGS (2000); photo: Glen A. Izett.

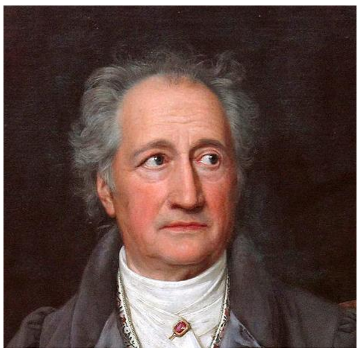
AFMS News

Safety Matters—Goethe

by Ellery Borow, AFMS Safety Chair

Editor's note: *The article is adapted from the* A.F.M.S. Newsletter *(October 2015), p. 5.*

Advice from the German poet, novelist, and playwright Johann Wolfgang von Goethe (1749–1832): Treat people as if they were what they should be and you help them become what they might be.



Johann Wolfgang von Goethe (detail from a painting by Josef Karl Stieler in 1828). Source: Wikipedia.

That applies to rockhound safety as well. Indeed, time and again I have witnessed situations where a person expects the best of another person and is rewarded by seeing the development of a better person. As club safety chairpersons, what we want people to be is safe. We want to encourage folks to act safely, keep safety in mind, and be aware of safety issues in activities transpiring around them. We also encourage folks to promote, encourage, and expect safe behavior by others around them.

Treating people as if they were what they ought to be—how does one accomplish that lofty goal? Some suggestions and considerations:

1. People are intelligent; treat them as such. Explain not just the how-to's of being safe, but the why's as well. Some safety matters might not be obvious, even to the very thoughtful among us.
2. People care about one another. Build on that concern for the safety of others by describing how acting safely and creating a safe work environment for yourself helps keep others safe as well.
3. People want to be safe. Describe easy ways for them to be safe, and they will take it from there.
4. People can set a good example for others. Kids in particular always need great examples to emulate. Help folks be aware of how our brains work—how people often mirror one another's behavior (even unconsciously), including good safety habits.
5. People often actively seek to better themselves. Make it easy for them to do so by deed, by word, and by treating folks as if they are indeed already noticeably better in this business of safety.

Human nature is wonderful and remarkable. I make it a habit to expect the best from folks, and I am usually pleasantly rewarded by seeing folks respond by human nature to my positive outlook. Indeed, if expecting the best elicits the best and expecting the worst elicits the worst, why not expect the best? In matters of safety, we should all aspire to seek the best in one another.

We can do this. We are, after all, rockhounds!

Each One Teach … One?

by Betsy Oberheim, EFMLS Each One Teach One Committee Chair

Editor's note: *The article is adapted from* EFMLS News *(November 2015), p. 5.*

I was thinking about this "Each One Teach One" award and wondered if it isn't impossible!

But as I walk around our rock club meetings, rock shows, even flea markets, I hear people asking questions about rocks and minerals. As someone explains the answer, other people gather to hear. You may start out teaching one, but its like dropping a pebble in a still pond; the ripples spread and affect many others.

Dealers are natural teachers; they delight in telling customers and others how the minerals formed, where colors came from, how old a specimen could be, etc. Unfortunately, they do not always belong to a rock club, so that a member can nominate them.

But I am sure you have a fellow club member who is a natural teacher and enjoys an audience among the public. It's only a few minutes of your time to nominate that person and see how proudly they accept a certificate or plaque acknowledging their contribution to furthering our hobby. For more information, contact me at Aoberheim3@comcast.net.

Wildacres Registration Now Open!

by Steve Weinberger, Wildacres Committee Chair

Editor's note: *The article is abridged from* EFMLS News *(December 2015), pp. 1, 8.*

Wildacres is a fantastic retreat located on Pompeys Knob just off the Blue Ridge Parkway about an hour north of Asheville, NC. Signing up for the May 9–15 session will give you the opportunity to take one or two classes, hear excellent talks from our guest speaker, join a field trip, explore the area, and participate in a variety of other activities.

You can find a registration form in the EFMLS newsletter—or go to the Wildacres Website for more information. Some classes fill quickly, so we ask you to include four options. You can choose from the workshops listed below.

Coming to Wildacres in May 2016 …

Beading—Kumihimo with magmata beads (*Mia Schulman*): Learn a new kumi technique to complete a lovely necklace.. No experience needed. 2-day class, 1st semester.

Beading—Russian spiral necklace (*Mia Schulman*): Use two sizes of seed beads for a lovely spiral pattern. Your necklace can be worn alone or with a pendant (instead of using a chain.) No experience needed. 2-day class, 2nd semester.

Cabochons—Basics (*Bernie Emery*): Transform rock into a shiny, well-formed cabochon. Learn the trim saw as well as grinding, sanding, and polishing. Slabs are provided or use your own with instructor approval. Bring an apron and safety glasses. No experience needed. 2-day class, 1st semester.

Cabochons—Intermediate (*Bernie Emery*): Learn techniques for cutting different shapes. Slabs are provided or use your own with instructor approval. Bring an apron and safety glasses. Prerequisite: Prior experience with cabbing and trim saw. 2-day class, 2nd semester.

Faceting (*Larry Heath*): Learn to cut and polish a 57-facet round brilliant gemstone, to identify well-cut stones, and to select rough material. Bring an optivisor (#7 or #9) and an apron. No prior experience needed. 4-day class.

Flint Knapping (*Michael Miller*): Learn the basics, including finishing and design. With the "tricks of the trade," you can create your unique portfolio of beads, jewelry components, focal cabochons, and more. No experience needed. 4-day class.

Geology I (*Rob Robinson*): Learn how geologists interpret rocks to tell geologic history (rock formation and deformation and the sequence and timing of events). A field trip to local rock exposures will illustrate local rock types, deformation types, and how a geologist maps and interprets structures (limited walking is required). Bring a loupe, sturdy shoes, outdoor clothes, a geologic hammer, and safety glasses. No experience needed. 2-day class, 1st semester.

Geology II (*Rob Robinson*): Learn about plate tectonics and the geologic history of the Blue Ridge region and its minerals. Discover the geologic environments hosting mineral and gem collecting sites, including your own collecting localities. Two field trips will show local rocks and geology, including a 1-mile walk over gentle trails. Same clothing and equipment as for Geology I. Basic knowledge of geology preferred. 2-day class, 2nd semester

Pewter Fabrication (*Bruce Gaber*): Learn to make functional and decorative objects. Pewter is easy to work, and finishes range from glossy to matte. Learn to emboss and add an etch or patina. Modern pewter contains no lead. No experience needed, 4-day class.

Basics of Scrimshaw (*Sandra Brady*): Learn to engrave ivory and similar materials. Use a hand scribe to learn attractive shading techniques. Learn basic composition and tool sharpening. An optivisor or other magnification is recommended. No experience needed. 2-day class, 1st semester.

Scrimshaw—Color Basics (*Sandra Brady*): Building on the basics, use modern scrimshaw methods to explore the beauty of color; preserve your own art work. Bring an optivisor. 2-day class, 2nd semester. Prerequisite: Basics of Scrimshaw.

Soapstone Carving (*Sandy Cline*): Develop a working knowledge of the material, tools, and methods used to complete a carving. Produce a simple piece and progress to making a more advanced sculpture, developing your own personal style. No experience needed. 2-day class, both semesters.

The Rocks Beneath Our Feet

A Cross-Section of the Coastal Plain

by Hutch Brown

The Long Branch Nature Center, where our club meets, has a remarkable location. Step outside and you will see the basic geological structure of the entire mid-Atlantic Coastal Plain right before your eyes.

The land rises in stages: First comes the creek bed itself; then come low platforms of ground on either side of the creek, including the one that our nature center sits on; finally come hilltops on both sides of the greenway, platforms for the surrounding neighborhoods.

Why this tripartite lay of the land? Where did each part come from?

When I first moved to Arlington, VA, I thought the answer was clear: dumptrucks and bulldozers. Both have played a role in redistributing soils, building roads and structures, and laying down lines of boulders (what engineers call riprap) along creeks to prevent streambank erosion.

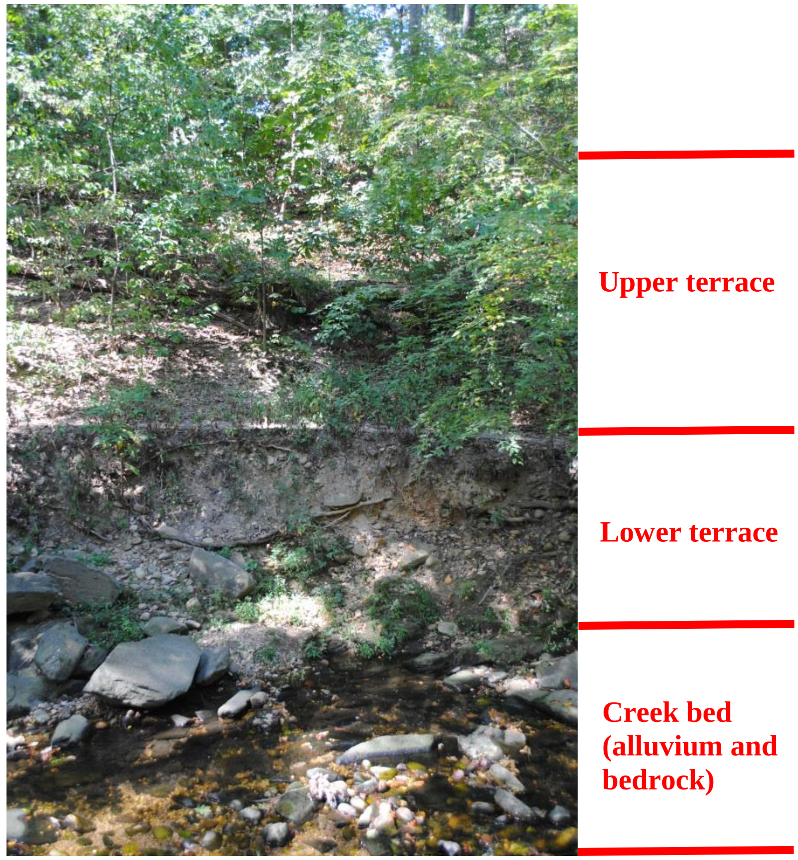
But the bedrock itself and the overlying terraces are entirely natural. A geologic map of Arlington County (fig. 1) tells a story of geological processes over hundreds of millions of years that dwarf anything people have done to the land in our area; brown areas of extensive artificial fill (**af**) are few and small (fig. 1).

Metamorphic Bedrock

Long Branch creek has cut down to the crystalline bedrock known as Indian Run sedimentary melange, the first chapter in our story. Ranging from medium gray to brown in color, the rock initially formed from sediments laid down in an ancient ocean trench during or before the Cambrian Period (about 545 million to 505 million years ago); hence it appears on geologic maps as **CZi** (fig. 1)("C" for Cambrian; "Z" for late Proterozoic, reflecting the uncertainty; and "i" for Indian Run, where it was first described).

So where was the ancient ocean trench? How did the sedimentary rock form there? And how did it get to where it is today—and change into metamorphic rock along the way?

Beginning about 320 million years ago, the proto-African continent, driven by tectonic forces, slammed



Hill overlooking Lubber Run, not far from the Long Branch Nature Center, showing the tripartite lay of the land. Photo: Hutch Brown.

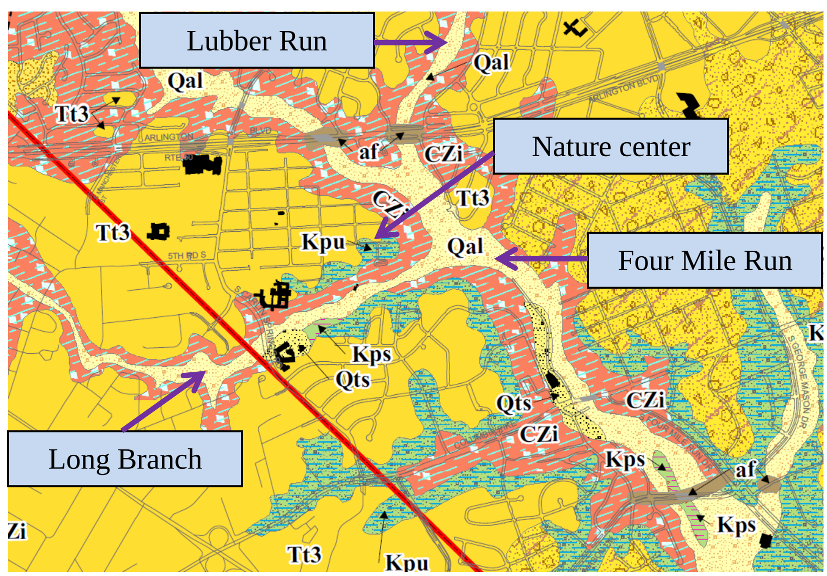


Figure 1—*Map showing the geology near the Long Branch Nature Center in Arlington, VA. Pink = bedrock (Indian Run sedimentary melange,* **CZi***); green = overlying sediments (Potomac Formation,* **Kpu/Kps***); yellow = top layer of sediments (terrace deposits,* **Tt3***). (Buff/olive = alluvium in the creek beds,* **Qal/Qts***; brown = artificial fill,* **af***; black = structures.) Source: Frost and Ernest (1999).*

The bedrock along Four Mile Run near the Long Branch Nature Center is a metamorphic rock called Indian Run sedimentary melange. The bedrock here shows a thick white quartz vein. Photo: Hutch Brown

into proto-North America in a mountain-building event called the Alleghanian Orogeny. Lasting about 40 million years, the Alleghanian Orogeny shaped much of the geology of the mid-Atlantic region.

But the Alleghanian Orogeny was not the first mountain-building event to affect our area. As the proto-Atlantic Ocean slowly closed, smaller land masses preceded proto-Africa on its collision course with proto-North America.

Two of them collided together in the proto-Atlantic Ocean before even reaching what is now North America (fig. 2). A microcontinent called Arvonia crashed into an island arc called Chopawamsic.

An island arc is a line of volcanic islands, usually in the shape of an arc, that forms where one oceanic plate subducts under another (fig. 3). The colliding plates cause friction that melts the lithosphere, sending magma rising toward the surface and erupting in volcanoes.

The subduction zone forms an ocean trench where one plate dives under another (figs. 2, 3). Rock bits scraped from the grinding plates accumulate in the trench, along with eroded material from land. Earthquakes and underwater debris slides are common in the subduction zone, and the trench gradually fills with sediments that harden into rock.

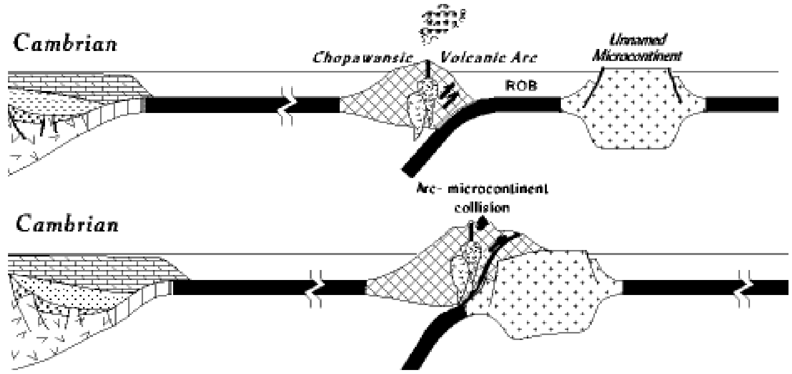


Figure 2—*As the proto-Atlantic Ocean closes, the Chopawamsic volcanic arc and the Arvonian microcontinent approach proto-North America (top). After colliding in a mountain-building event (bottom), they continue to approach proto-North America (at left). Black bar = basalt (ocean crust and subduction zones); black lines = faults. Source: Fichter and Baedke (1999).*

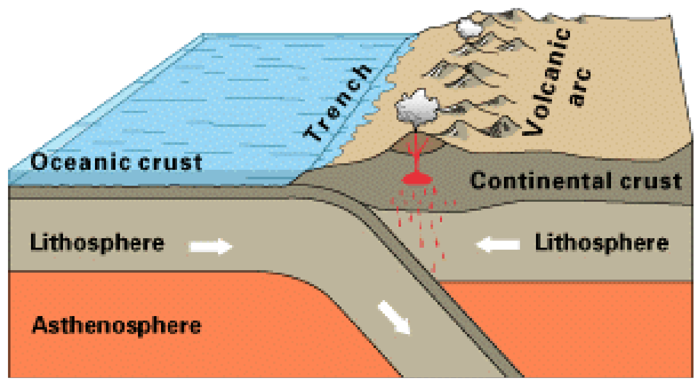


Figure 3—*Where plates converge, heat from friction drives magma toward the surface, forming volcanoes over the subducting plate. The plunging plate forms an ocean trench in the subduction zone. Source: Kious and Tilling (1996).*

When the land masses finally collide, sedimentary rock in the ocean trench, crushed between the colliding masses, is pushed up onto dry land as part of the mountain-building process. In the process, the corresponding heat and pressure can transform the sedimentary rock into metamorphic rock.

The Indian Run sedimentary melange and adjacent metamorphic bedrock in our area, such as Accotink schist and Lake Barcroft metasandstone, appear to have formed in this manner. Deepening sediments in an ocean trench hardened into rock. The sedimentary rock then surfaced from the sea, probably during the mountain-building event when Arvonia collided with the Chopawamsic volcanic arc. In the process, the sedimentary rock might have transformed into metamorphic rock.

But probably not. Uplift alone does not cause metamorphism. Although transported and folded during the Alleghanian Orogeny, for example, the shale, sandstone, and other sedimentary rocks that make up the Valley and Ridge Province to the west of the Blue Ridge did not undergo metamorphism. A more likely explanation for the metamorphism characteristic of our area's bedrock is what happened next.

About 320 million years ago, when the proto-Atlantic Ocean finally closed, proto-Africa rode up over the proto-North American continent, peeling off underlying layers of rock and pushing them to the west (fig. 4). The huge Alleghanian Mountain range—the size of the Himalayas today—was centered squarely over what is now the Piedmont. The tremendous heat and pressure transformed the underlying sedimentary rock layers into metamorphic rock, and the great rock train of the Alleghanian Orogeny placed them where they are today in the Piedmont and Coastal Plain.

So the bedrock next to the Long Branch Nature Center—the Indian Run sedimentary melange—originated in an ocean trench more than 500 million years ago. Uplifted onto dry land, it was sutured onto proto-North America more than 440 million years ago during the Taconic Orogeny (when the Arvonia/Chopawamsic land mass finally slammed into proto-North America). Then the Alleghanian Orogeny pushed the Taconic bedrock into its present location more than 280 million years ago while transforming it into metamorphic rock.

Riverine Sediments

The second part of our story concerns the sediments on top of the metamorphic bedrock. They are densely packed and difficult to pick apart, even with a shovel, but they are not solid rock (fig. 5). Known as the Potomac Formation, the sediments were laid down dur-

Figure 5—*Exposure of the Potomac Formation near the Long Branch Nature Center in Arlington, VA. The formation, exposed by erosion, includes unconsolidated sediments ranging from cobble to clay. Photo: Hutch Brown.*

ing the Cretaceous Period (which lasted from about 144 million to 66 million years ago).

The sediments range from clay to rounded cobble, usually randomly intermixed, although in some places sand predominates. On the Arlington geologic map, the Potomac Formation appears as **Kps** or **Kpu** (fig. 1)("K" for Cretaceous; "p" for Potomac; "s" for sand; and "u" for undivided, meaning a random mixture of sediments of all sizes, as shown in figure 5).

So where did the sediments come from?

After the Alleghanian Orogeny ended about 280 million years ago, the great mountain range it created started to weather away. Within a few tens of millions of years, it was gone. Nothing remained but a vast continental plain draining to the west.

The collision of proto-Africa with proto-North America was part of a global joining of the Earth's continents into a supercontinent called Pangaea. But fault lines remained in the great suture zones.

Rifting began during the Triassic Period about 230 million years ago as Pangaea started to break up. Upwelling magma found old fault lines between proto-Africa and proto-North America and reactivated them. As the crust thinned and stretched, great blocks of rock sank along

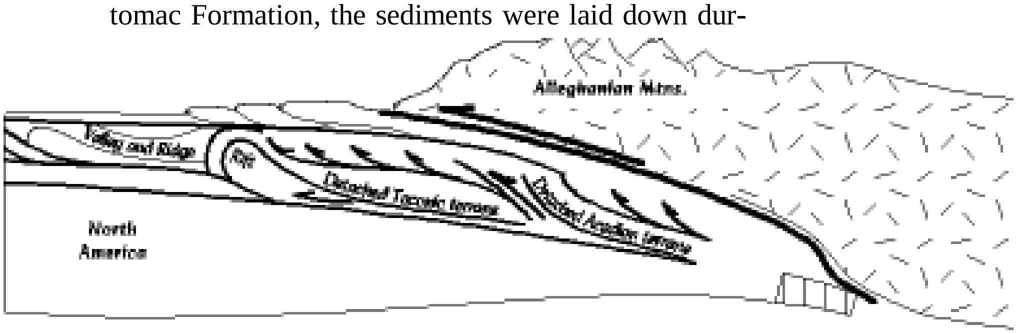


Figure 4—*The Alleghanian Orogeny, about 320–280 million years ago. As proto-Africa rides up over proto-North America, massive thrust faulting pushes the underlying bedrock westward while folding the flat sedimentary rocks beyond. Source: Fichter and Baedke (1999).*

old fault lines. Most formed basins that later filled with sediments, such as the Culpeper Basin in Virginia and the Gettysburg Basin to the north in Maryland and Pennsylvania (fig. 6).

At what geologists call the axial rift, the continents actually pulled apart, forming a widening sea. The axial rift is now buried at the edge of the continental shelf (fig. 6). By about 175 million years ago, rifting was complete and the Atlantic Ocean was taking shape.

Triassic rifting changed the orientation of our area. Instead of flowing to the west, rivers now drained to the east into the Atlantic Ocean (with the notable exception of the New River in southwestern Virginia, which maintained its westerly course).

Forerunners of the Potomac River and its tributaries began to drain the interior of our area, washing sediments downstream. Where the dip of the underlying basement rock steepened, the rivers and streams cut rapids and falls through the rock in a process that geologists call headward erosion: As streams wear away their channels, they gradually lower their elevations, working back toward their headwaters.

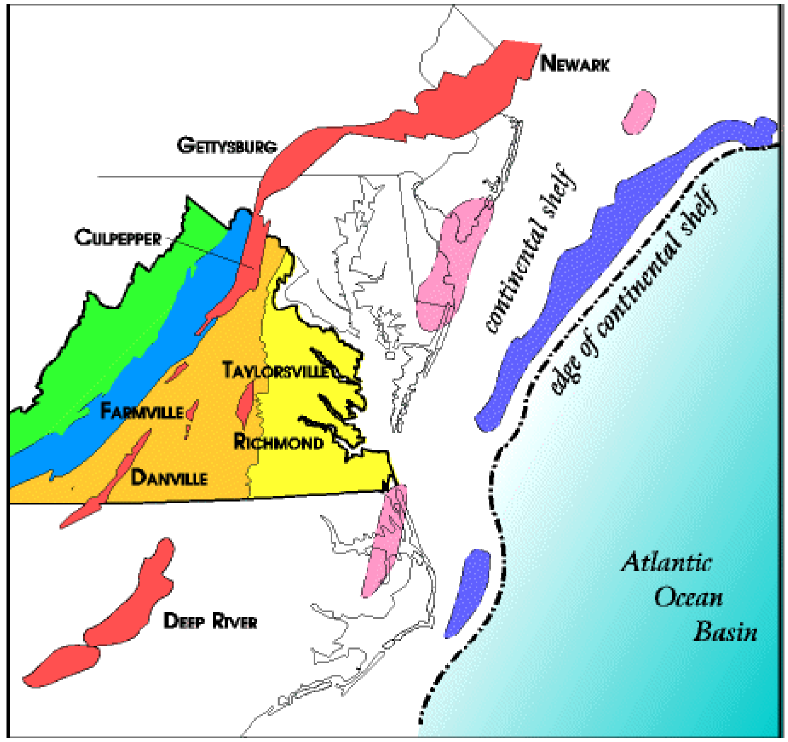


Figure 6—*The Triassic rift basins in our area. Red = basins exposed as bedrock; pink = basins buried under sediments; dark blue = axial rift basin . Source: Fichter and Baedke (1999).*

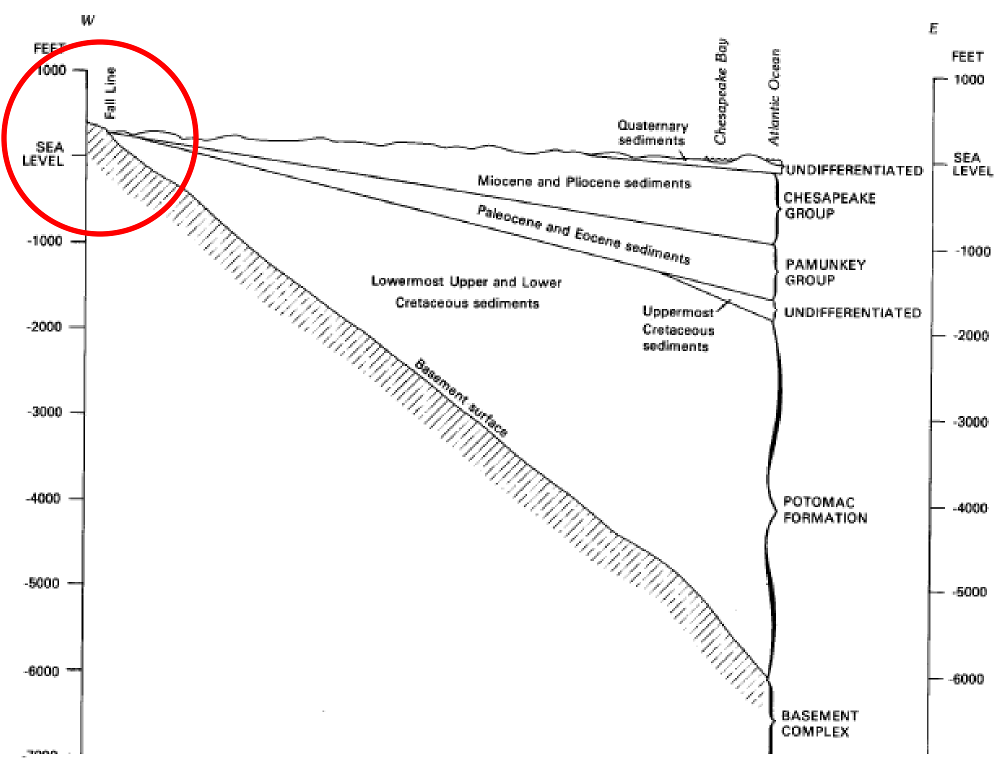


Figure 7—*The mid-Atlantic Coastal Plain, showing the Cambrian basement rock and the overlying wedges of sediments that thicken toward the ocean: the Cretaceous Potomac Formation and the overlying Tertiary sediments (the Pamunkey and Chesapeake Groups). The Fall Line, close to sea level, is circled. Source: GMU (2013).*

In the process, the rivers and streams in our area created what geologists call the Fall Line (fig. 7). The "line" is actually a zone; for the Potomac River, for example, it reaches from Great Falls all the way to Theodore Roosevelt Island, a distance of some 20 miles. That is where the last large outcrops of metamorphic basement rock occur.

The Fall Line is not far above sea level (fig. 7). After crossing the line, the rivers and streams slowed down and deposited their sediments. Roosevelt Island exists precisely for that reason: After reaching the tidal zone, the Potomac River widened and slowed enough for sediments to accumulate around the rocky core of the island.

From about 140 million to 100 million years ago—during the early Cretaceous Period—shifting river systems across our area delivered huge quantities of sediment from the Piedmont and beyond, depositing them on the Coastal

Huffman's Falls, part of the Fall Line zone for Four Mile Run, downstream from its confluence with Long Branch creek. Note the water-worn formations of metamorphic bedrock (Indian Run sedimentary melange). Photo: Hutch Brown.

Plain. The sediments covered the basement rock with a wedge of material that gradually thickened toward the ocean, reaching about 4,000 feet in depth (fig. 7).

The results are fascinating. Along Long Branch creek outside the nature center where our club meets, you can find rocks from across the interior of Virginia, including sedimentary rocks from the Triassic basins and metamorphic rocks from the Blue Ridge beyond. Some contain ancient fossils.

Tertiary Terraces

Near the Long Branch Nature Center, the Potomac Formation terraces rise by up to about 20 feet. Looming over them are hills on both sides of the creek. Dozens of feet high and relatively flat on top, the hills form a second level of terraces. They contain deposits from the Tertiary Period, which began in the aftermath of the cataclysmic meteor strike that doomed the dinosaurs about 66 million years ago. The Tertiary terraces, the final part of our story, directly overlie the Cretaceous deposits of the Potomac Formation.

Near the ocean, the Tertiary deposits are marine. Over the past 100 million years, average global temperatures have been generally higher than today. Accordingly, sea levels have often been higher. In the late Cretaceous and Tertiary Periods, the Coastal Plain in our area was often partly underwater—in effect, an extension of the continental shelf.

The seawaters covering the Coastal Plain came and went over millions of years in what geologists call marine transgressions and regressions. The rising seas sometimes reached the Fall Line (fig. 8). The so-called Salisbury Embayment shows the extent of the Tertiary marine transgressions in our area, and it borders on the Fall Line in Maryland and northern Virginia.

Yet the marine transgressions were limited. They usually covered only parts of the Salisbury Embayment at a time, leaving other parts dry. Moreover, they were punctuated by marine regressions. During most of the Oligocene Epoch (from about 37 million to 24 million years ago), for example, the Coastal Plain was above sea level, just like today.

Nevertheless, seawater reached all the way to the Fall Line multiple times during the early Eocene Epoch (from about 58 million to 50 million years ago) and during the early to middle Miocene Epoch (from about 24 million to 10 million years ago). The Miocene transgressions laid down the sediments of Maryland's Calvert Cliffs, famous source of ancient marine fossils in our area.

But the area near the Fall Line was never underwater long enough for marine deposits to survive subsequent erosion. And whenever the Coastal Plain was above sea level, it was naturally drained by meandering river systems, just like today. Streams and rivers transported materials ranging from cobble to clay and deposited them below the Fall Line, leaving sediments much like the underlying Potomac Formation.

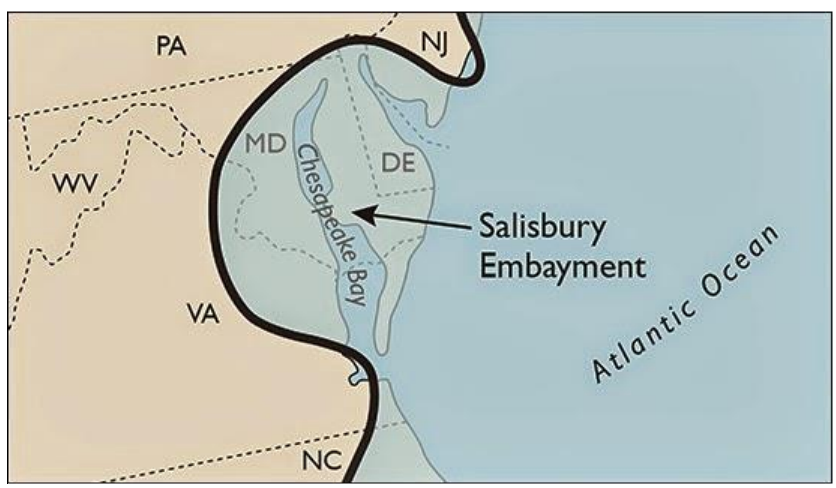


Figure 8—*In the Salisbury Embayment, Tertiary marine transgressions reached all the way to the Fall Line in Maryland and northern Virginia. Source: Share (2014).*

Accordingly, the Tertiary deposits near the Long Branch Nature Center range from cobble to clay (fig. 9). The sediments contain pebbles and cobbles of quartz, quartzite, sandstone, and other rocks from Virginia's interior, transported downstream by rivers and deposited on the Coastal Plain during the late Miocene Epoch (from about 10 million to 5 million years ago). On geologic maps, the terrace deposits near the nature center appear as **Tt3** (fig. 1)("T" for Tertiary; "t" for terrace; and "3" for the terrace layer, which possibly overlies older **Tt2** and **Tt1** sediments, although all three layers are similar in origin and composition).

Figure 9—*Exposure of sediments in a Tertiary terrace* (**Tt3**) *overlooking Lubber Run, a tributary of Four Mile Run not far from the Long Branch Nature Center. This erosion scar in a gully scoured by stormwater runoff shows cobble and pebbles in a matrix of silt and sand. The stones are rounded, betraying their riverine origins; the faded colors are due to heavy leaching (which has dissolved out the iron). Photo: Hutch Brown.*

Unconformities

That begs a question: Why are there such huge gaps in the geological record for our area? If Tertiary deposits no older than about 10 million years (fig. 1, **Tt3**) directly overlie Cretaceous deposits that ended about 100 million years ago (fig. 1, **Kpu/Kps**), then the geological record has a 90-million-year gap! What happened in between?

And the Alleghanian Orogeny ended about 280 million years ago. If Cretaceous sediments beginning about 140 million years ago (fig. 1, **Kpu/Kps**) directly overlie the metamorphic bedrock (fig. 1, **CZi**), then the geological record has a 140-million-year gap! Why *is* that?

Of course, it would have taken tens of millions of years for the ancient Alleghanian Mountains to wear away and expose their roots in the North American continental bedrock (the Blue Ridge, Piedmont, and Coastal Plain rocks). But that accounts for only part of the 140-million-year gap. What about the rest?

No one knows. Geologists call such gaps in the geological record unconformities. At best, they can make broad guesses (such as erosion keeping up with or exceeding deposition). I know of no other explanations for the unconformities in our area.

A Remarkable Place

So the Long Branch Nature Center is in a truly remarkable location. Just step outside and you will see all three of the Coastal Plain's structural components right before your eyes (figs. 1, 7): the metamorphic bedrock; the low terraces that mark the Potomac Formation; and the high terraces made up of Tertiary deposits. These three landforms tell a story of geology that begins more than half a billion years ago!

Worn away by the creek, the bedrock is plainly exposed and obvious for all to see, something you won't find downstream on the Coastal Plain. Erosion has left scars in the Potomac Formation that a stroll along the creek will readily reveal; again, these sediments are deeply buried downstream. The Tertiary terraces, higher up on the hillsides, have exposures that are harder to find. But if you walk far enough along the greenway trails, you will see some (fig. 9).

So we are lucky. The location of the nature center where our club meets gives us a cross-section of the Coastal Plain, a learning laboratory in structural geology. How appropriate! ⚒

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Rubies That Aren't

Mitch Portnoy

Editor's note: *The article is adapted from* Gem Cutters News *(newsletter of the Gem Cutters Guild of Baltimore, Inc., Baltimore, MD), November 2015, pp. 7–8. It originally appeared in the* Bulletin of the New York Mineralogical Club, *October 2014. All images are from the article as it appeared in* Gem Cutters News.

It is easy to understand how early miners, gem traders, jewelers, and royalty confused spinel with ruby and sapphire. Spinel occurs in the same bright red colors. (It also occurs in the alluring blue of traditional sapphire, but that is another story!)

Spinel forms in the same rock units and under the same geological conditions as ruby, and it is found in the same alluvial gravels. It is therefore not surprising that our ancestors, who knew nothing of atomic structure and mineral chemistry, thought that red spinels were rubies.

Multicolored spinel and corundum crystals as water-worn pebbles and gem fragments, typical of what might be recovered from alluvial deposits.

As a consequence, lots of spinels are now in important jewelry collections based on their incorrect identification as rubies. Indeed, several of the most spectacular spinels ever discovered were mounted in royal crowns and other "jewelry of significance" under the assumption that they were rubies.

In the late 1500s, gem traders in Southeast Asia were the first to recognize spinel as distinctly different from ruby. In Europe, spinel continued to be misidentified as ruby until the mid-1800s. Today, gemologists understand the significant differences between spinel and corundum (the mineral of ruby):

Corundum (ruby)	Spinel
Aluminum oxide	Magnesium aluminum oxide
Al_2O_3	$MgAl_2O_4$
Extremely hard: 9.0 Mohs	Very hard: 7.5–8.0 Mohs
Very dense: 4	Dense: 3.7
Hexagonal crystal system	Isometric crystal system
Doubly refractive	Singly refractive
Refractive index: 1.76–1.77	Refractive index: 1.712–1.736

The Black Prince's Ruby

The most famous example of a spinel misidentified as a ruby is a 170-carat bright-red spinel named the Black Prince's Ruby. The first known owner of this beautiful stone was Abu Sa'id, the Moorish Prince of Granada in the 14th century. The stone passed through several owners and eventually made its way into the Imperial State Crown of the United

Kingdom, where it is mounted immediately above the famous Cullinan II diamond.

[***Editor's note:*** The Black Prince was Edward of Woodstock (1330–76), eldest son of King Edward III of England. The Black Prince led English forces at the outset of the Hundred Years War, decisively defeating French armies at Crécy (1346) and Poitiers (1356). In 1367, Edward helped the Castilian ruler Don Pedro of Seville put down a rebellion fomented by the French, then claimed what came to be known as the Black Prince's Ruby in reward. Hence it came to England.]

The Timur Ruby

The Timur Ruby is a 352.5-carat bright-red spinel in a necklace that is part of the British Royal Collection. It was made for Queen Victoria in 1853. The stone was found in Afghanistan and is inscribed with the names and dates of owners going back to 1612 (mostly Mogul emperors).

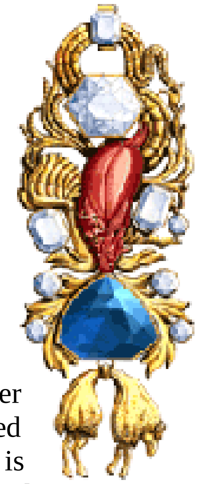
When the British annexed the Punjab in 1849, they confiscated the Timur Ruby (and the Koh-i-Noor Diamond) from Ranjit Singh. It was part of a group of spinels from the Lahore Treasure presented to Queen Victoria by the East India Company in 1849. This is the world's third largest spinel.

The Catherine the Great Ruby

The Catherine the Great Ruby is a 398.72-carat spinel mounted on top of the Great Imperial Crown of Russia. It was designed and constructed for the coronation of Catherine the Great in 1762. It is the world's second largest spinel.

The Great Imperial Crown was used by the czars of Russia until the monarchy's abolition in 1917. It survived the Russian Revolution, finding its way to Ireland. It is currently on display in the Moscow Kremlin Armoury State Diamond Fund.

The Côte de Bretagne Ruby



The 107.88-carat Côte de Bretagne Ruby was set in 1749 by France's King Louis XV into an ornament called The Order of the Golden Fleece. The ornament also used the French Blue Diamond (which was later recut into the Hope Diamond) and many other stones. It was considered to be the most lavish and expensive piece of jewelry in all of Europe.

The Golden Fleece was stolen, along with many of the French Crown Jewels, in September 1792 during the French Revolution. Recovered many years later, the Côte de Bretagne Ruby is carved into the form of a dolphin, a French royal symbol (often mistakenly identified as a dragon).

The Samarian Ruby

The Samarian Ruby (now called the Samarian Spinel) is the largest known spinel in the world. Part of the Iranian Crown Jewels, the Samarian spinel weighs about 500 carats. It bears an inscription dating to the mid-1600s attributing its ownership to Jahangir, the Mogul Emperor of India. It was taken from India in the early 1700s during the Afsharid Conquest.

King Henry VIII's Ruby Collar

England's King Henry VIII wore beautiful jewels during a proclamation of peace with France in St. Paul's Cathedral. He wore a "collar" (chain of office) thickly studded with the finest "carbuncles, as large as walnuts." These walnut-sized jewels are now known to be spinels, not rubies (called carbuncles at the time). This illustration of Henry, a miniature by Nicholas Hilliard from 1536, shows him wearing the "collar."

Upcoming Events
(of interest in the mid-Atlantic region)

January

16–17: Deland, FL—45th Annual Gem & Jewelry, Minerals & Fossils Show; Tomoka Gem & Mineral Society; Volusia County Fairgrounds, Tommy Lawrence Bldg, State Rte 44, (1 mile east of I-4, exit 118); Sat 10–6, Sun 10–5; adults $4, children free; info: Rosemary van Wandelen, 3051 Keyport St, Deltona, FL 32738, 386-479-1509, rrborzoi@yahoo.com; www.tomokagms.org.

23: Newton, MA—Annual Auction; Boston Mineral Club; American Legion Nonantum Post 440, 295 California St; Sat 9–5; free admission; info: Nathan Martin, 781-674-0017, rocknate@gmail.com, http://www.bostonmineralclub.org/annual_auction.

23–24: Panama City, FL—Annual Show; Panama City Gem & Mineral Society; Central Panhandle Fairgrounds, 2230 E. 15th St; Sat 8–5, Sun 9–4; free admission; info: Steven Shipton, 5113 E. 13th Ct, Panama City, FL 32404, 850-867-0586, shipton3@comcast.net.

January/February

30–13: Tucson, AZ—Wholesale and retail show; 400 dealers in three locations: InnSuites Hotel, Ramada Ltd., Mineral & Fossil Marketplace; 475 N Granada, 665 N Freeway, 1330 N Oracle; 10–6; free admission; info: Regina Aumente, PO Box 665, Bernalillo, NM 87004, 505-867-0425, mzexpos@gmail.com; Web site: www.mzexpos.com.

February

19–21: Indianapolis, IN—GeoFest: 14th Annual Indiana State Museum Fossil, Gem and Mineral Show; Fri/Sat 10–5, Sun 11–4; museum admission: adults $13, seniors $12, children $8.50; info: Peggy Fisherkeller, 650 West Washington Street, Indianapolis, IN 46204; 317-232-7172; pfisherkeller@indianamuseum.org; Website: www.indianamuseum.org.

March

5–6: Newark, DE—53rd Annual Earth Science Gem and Mineral Show; Delaware Mineralogical Society, Inc.; Delaware Technical and Community College, 400 Stanton-Christiana Road (I-95 Exit 4B); Sat 10–6, Sun 11–5; adults $6, seniors $5, kids 12–16 $4, 11 and under free; info: www.delminsociety.org or contact gene@fossilnut.com or call Wayne Urion at 302-998-0686.

11–13: Augusta, GA—28th annual Aiken-Augusta Gem, Mineral & Fossil Show; sponsors: Aiken Gem, Mineral and Fossil Society, Augusta Gem and Mineral Society; Fri/Sat 10–7, Sun 11–5; Julian Smith Casino, 2200 Broad Street, August, GA; adults $3/$5 weekend pass, children under 12 free with an adult; info: Chris Glass, 706-284-9239, www aikengmfs.org.

19–20: Sayre, PA—47th Annual Che-Hanna Rock & Mineral Club show; Athens Twp. Volunteer Fire Hall, 211 Herrick Ave; Sat 9–5, Sun 10–4;. info: Bob McGuire at 570-928-9238 or uvbob@epix.net.

April

1–3: Hickory, NC—46th Annual Show; Catawba Valley Gem & Mineral Club; Hickory Metro Convention Center; 1960 13th Ave Dr, Interstate 40-exit 125; Fri/Sat 9–6, Sun 10–5; adults/seniors $5, students/children free; info: Baxter Leonard, 2510 Rolling Ridge Dr, Hickory, NC 28602, 828-320-4028, gailandbaxter@aol.com.

1–3: Raleigh, NC—Annual show; Tar Heel Gem & Mineral Club; Kerr Scott Bldg, NC Fairgrounds, Blue Ridge Road; Fri 3–8, Sat 10–6, Sun 10–5; free admission; info: Cyndy Hummel, 919-779-6220, mchummel@mindspring.com; tarheelclub.org.

2–3: Orange, CT—43rd Annual Show 2016, Minerals, Gems, Jewelry & Fossils; New Haven Mineral Club; Amity Regional Middle School, Sheffield Rd (off Rt 34), Orange, CT; Sat 9:30–5, Sun 9:30–5; adults $5, children under 12 free when accompanied by an adult; info: newhavenmineralclub.org.

16: Severna Park, MD— Annual Jewelry Gem and Mineral Show; Patuxent Lapidary Guild, Inc., Earleigh Heights VFC, Rte. 2, Severna Park, MD; Sat 10–5; over 10 years old $2.00, under 10 free.

12–13: Clifton, NJ—27th Annual Show; North Jersey Mineralogical Society; Pope John II Center, 775 Valley Road; Sat 10–6, Sun. 10–4; adults $5, seniors $4; info: buckwood4@yahoo.com, www.nojms.webs.com.

Mineral of the Month: Chalcedony

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OR

Bring your dues to the next meeting.

Purpose: To promote and 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, http://www.amfed.org/efmls) and the American Federation of Mineralogical Societies (AFMS—at http://www. amfed. org).

Dues: Due by January 1 of each year; $15 individual, $20 family, $6 junior (under 16, sponsored by an adult member).

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.*