THE NORTHERN VIRGINIA MINERAL CLUB INC

Crystals are the flowers of the Mineral Kingdom

Meeting: January 27 Time: 7:45–9:00 p.m.

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

The Mineral Newsletter

Volume 55, No. 1
January 2014
You can explore our club Website at:
http://www.novamineralclub.org/

Geospatial Technologies

January 27 Meeting

Geospatial technologies underpin many of our daily activities, from using the Internet and your cell phone to making a withdrawal from your ATM.

In this discussion, we will take a quick look at geospatial technologies, including free and open-source software that you might find useful. We will also discuss limitations of that "map in your pocket"—GPS.

Dr. Michael Krimmer is Geospatial Studies Program Head and Assistant Professor at Northern Virginia Community College. He is on the U.S. Geospatial Intelligence Foundation Academic Advisory Board and the URISA Professional Practices Division Advisory Board. He is also active in K–12 geospatial education in Virginia. His special interest in using spatial reasoning as a decision tool.

Northern Virginia Mineral Club board members,

The club board will hold a meeting before the January club meeting. Board members will meet on January 27 at 6 p.m. at the Olive Garden.

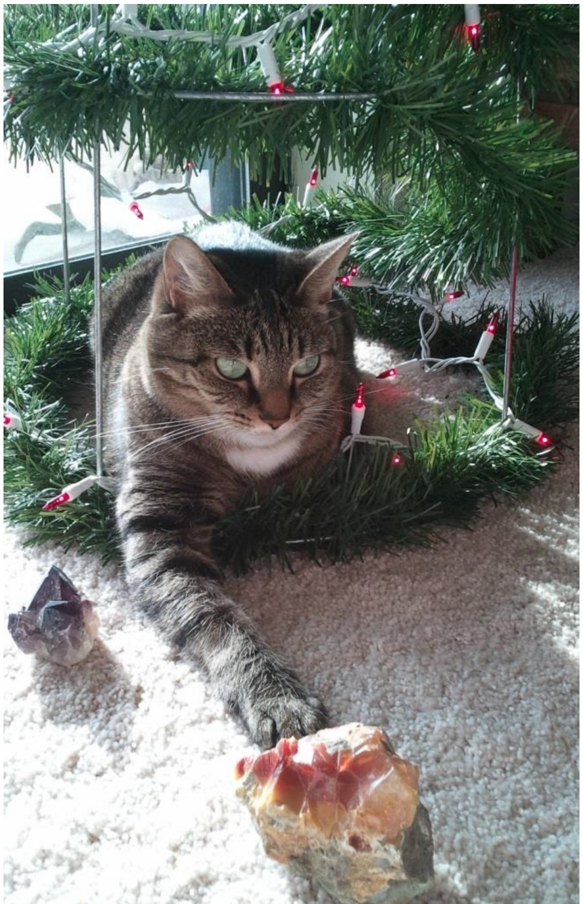
Olive Garden, Baileys Cross Roads (across from Skyline Towers), 3548 South Jefferson St. (intersecting Leesburg Pike), Falls Church, VA
Phone: (703) 671-7507

Reservations are under Kathy Hrechka, Vice President, NVMC. Please RSVP to my cell at (703) 407-5393 or kshrechka@msn.com.

Club Meeting and Holiday Party

December 16, 2013

President Rick Reiber called the meeting to order at 6:30 p.m. at the Long Branch Nature Center. The minutes from the November club meeting were



Rockhound Pet?
Pat Flavin's cat Cookie seems to be a budding rockhound—or rockcat? She is purrsuing an opal in the rough; the amethyst will have to wait.

approved as published in the December *Mineral Newsletter*.

Election of Officers for 2014

By motion made and seconded, the club members closed the nominations and elected the following officers:

- President: Vacant
- Vice President: Kathy Hrechka
- Secretary: Laurie Steiger and Ty Meredith
- Treasurer: Kenny Loveless and Rick Reiber

Rick asked for volunteers to accept nomination and election as president. No one volunteered.

Awards and Recognitions

Rick gave President's Awards to:

- Jim Kostka, for his active work in NVMC;
- Patricia Flavin, for her active work in NVMC and for her video of marine fossil hunting at Calvert Cliffs, MD; and
- Hutch Brown, for his active work as newsletter editor.

The following persons received certificates for their service at the 22–24 November 2013 club show at George Mason University:

Co-chairs: Jim Kostka and TomTaafe

Volunteers:

Scott Braley	Jennifer Casper
Bob Cook	Lois Dowell
Fran Ely	Phillip Fouts
Angela Goodheart	Michelle Harris
Roger Haskins	Mike Hass
Lew Holt	Kathy Hrechka
Pat Kaas	Darren Kimble
John Kress	Karen Lewis
Kenny Loveless	David MacLean
Sue Marcus	Victoria Martin
David Nanney	Diane Nesmeyer
Jeff Nesmeyer	Bill Oakley
Thomas Pierce	George Reimherr
Rob Robinson	Ken Rock
Talaya Ridgly	Sheryl Sims
Laurie Steiger	Wayne Sukow
Erika Suski	Susan Von Struensee
Judy Winkler	Rebecca Winkler
Brian Whiteley	Michaelle Wyatt

By motion made and seconded, the meeting adjourned for the December Christmas party.

Thanks to Sheryl Sims for sharing her wonderful holiday party photographs!

Thin Section Field Trip

by John Weidner

On Saturday, February 8, Northern Virginia Community College (NOVA) will open our geology lab to members of local mineral clubs, including NVMC. You will be able to use our polarizing microscopes to view thin sections.

Never seen a thin section before? We have a tutorial to get you started, a set of "must-see" thin sections, and live support from people who can help you get started.

Itching to look at thin sections again? Come browse our collection of over 1,000 thin sections!

Want to know how thin sections are made? We'll have a demo/exhibit set up!

Like to hang out with folks who are really nice—and who share your own interests? NOVA staff will be there, along with club members from NVMC, MSCA, and MSDC. 'Nuff said?

By the way, ask about our growing collection of thin sections of local rocks!

We will be open from 1 p.m. until … well, you decide! Just come to the NOVA Geology Department on the Annandale Campus, CS Building, Room 217.

Finding us is easy!

NOVA is located a mile or so outside the Beltway at 8333 Little River Turnpike, Annandale, VA 22003-3796.

However, you do ***not*** want to take the entrance on Little River Turnpike (see map).

If you are coming from the Beltway on Little River Turnpike, you will see the entrance to NOVA on the left. Drive past it and go left at the next light onto Wakefield Chapel Road. Go left at the third entrance (at the bottom of the hill). Then go left again into the bottom level of the parking garage.

Don't worry about the signs that say "Cash Parking." Just take a ticket; we have vouchers to pay for the parking.

In the garage, drive up as far as possible, park, and walk out to the north. North is back toward Little River Turnpike; it is uphill.

If the garage is closed, then they will not be enforcing parking restrictions. Park in the lot in front of the parking garage and come uphill past the parking garage.

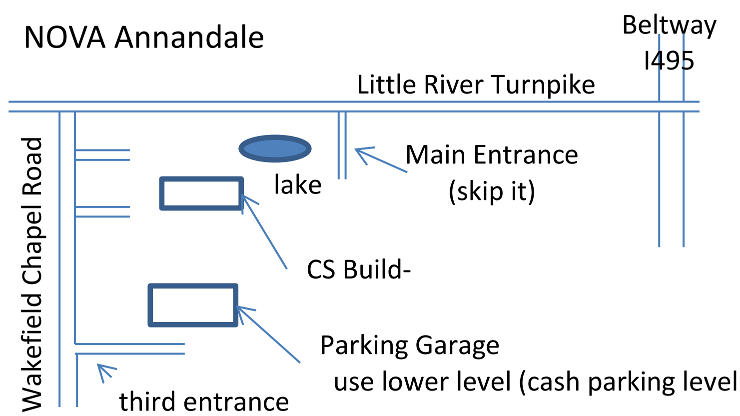
The CS building is the only building truly north of the parking garage. It looks like a one-story building, but that's because you will be entering on the second level, which is where the geology lab is located.

If you stop someone to ask, ask for the CS Building or the Science Building.

Need handicap parking? Go west on Little River Turnpike and left onto Wakefield Chapel Road, same as above. Turn left at the SECOND entrance and drive in essentially straight until you see the handicap parking. No college sticker is required for the handicap parking, only a standard handicap plate or hang-tag.

We will be set up in CS 217, which is in the northeast corner of the CS building. Follow the sounds of the happy mineralogists.

Problems? Call John Weidner at 571-241-6459.



NVMC members:

If you have not yet paid your annual dues, now is the time! See p. 16 for directions!

Smithsonian Q?rius—New Education Center is Amazing!

by Kathy Hrechka, Vice President

On December 12, 2013, the Smithsonian's National Museum of Natural History opened an interactive educational zone for teens called Q?rius (pronounced "curious").

Q?rius is a new way of connecting everyday teen experience with science. It contains about 6,000 natural history objects for teens to handle and observe. It consists of scientific labs, collection vaults, instructional studios, and a hangout loft to inspire teen visitors.

Students can create their own digital field books, inspired by scientist notebooks. Used in the collection zone and throughout various activities, the field books collect data about objects and scientists in the museum. Field book data is retrievable on the Internet after students return home.

Geologist Adam Blackenbecker in the museum's education department is credited with designing most of the activities. Dr. Michael Wise in the Department of Mineralogy assisted in choosing various minerals of interest to teens in the collection zone.

This newly created educational zone is located on the ground floor near the museum's Constitution Avenue entrance. Q?rius is open to the public during designated hours. ⛏

Casts of human skulls to touch and explore in Q?rius, the Smithsonian Natural History Museum's new interactive educational zone for teens.

Adam Blackenbecker with a display of beach sand microminerals for view under microscopes.

Q?rius volunteer Kathy Hrechka, on her first day on the job, discovers aragonite in the mineral collection.

Dr. Michael Wise checking out a sulphur specimen.

Eocene Mosquito’s Last Supper
A Mineral Sciences/Paleobiology Collaboration

Editor’s note: The article is adapted from NMNH Geoscience *(newsletter of the Department of Mineral Science, Smithsonian National Museum of Natural History), Fall 2013, p. 1.*

There is a buzz in the scientific community about a recent discovery in the Smithsonian’s Departments of Paleobiology and Mineral Sciences. The uproar is about a small fossilized female mosquito from the Middle Eocene (46 million years ago) found in shale from northwestern Montana.

This particular mosquito died after having had a recent meal. Dale Greenwalt, a retired biochemist who collects and analyzes insect fossils from Montana for the Smithsonian Institution, made the initial discovery.

Mr. Greenwalt wondered whether the abdomen of the fossilized mosquito was engorged by blood. With help from staff geologists Yulia Goreva and Tim Rose and post-doc fellow Sandra Siljeström of the Department of Mineral Sciences, the group sought to answer this Jurassic-Park-like mystery.

Utilizing a time-of-flight secondary ion mass spectrometer and scanning electron microscope, the group detected high levels of iron and evidence of heme-derived porphyrins, a blood protein, in the mosquito’s abdomen. From this evidence, Greenwalt and his team concluded that the Eocene mosquito did indeed have blood as its last meal.

The results of the study are published in the Proceedings of the National Academy of Sciences, volume 110, pages 18496–18500. If you subscribe to the journal, you can access the paper at http://www.pnas.org/content/early/2013/10/08/1310885110.full.pdf+html.

You can also hear an audio piece on the fossil done by National Public Radio at http://www.npr.org/2013/10/14/232048774/trapped-in-a-fossil-remnants-of-a-46-million-year-old-meal.

A blood-engorged female mosquito from the Middle Eocene Kishenehn Formation in northwestern Montana. Note the distended and opaque dark abdomen. Photo: Dale Greenwalt.

How to Get to Mars

For actual footage of a Mars rover taking off from Earth and traveling to the Red Planet, click on the URL below. Very cool!

http://www.youtube.com/embed/XRCIzZHpFtY?rel=0

Lapidary Services Wanted

Rex Looney, who lives in Reston, VA, is looking for someone to do some stone cutting and bead making from a 5-gallon bucket of flint from Flint Ridge, OH (shown below is a sample). Rex would like to arrange to obtain 30 to 35 large-hole rough beads and perhaps a couple of flat one-quarter-by-one-half-inch pendants. If you are interested in doing the work, please contact Rex Looney by e-mail at: rexographer1@yahoo.com

The A.E. Seaman Mineral Museum

by Michael Pabst

Editor's note: The article is adapted from Mineral Minutes *(newsletter of the Mineralogical Society of the District of Columbia), November 2013, p. 7.*

Last July, friends from Pittsburgh invited us to test out their new car by driving around Lake Michigan.

We started by visiting Sleeping Bear Dunes National Seashore (with incredible 450-foot dunes), Mackinac Island and Bridge, and Michigan Technological University in Houghton. Then we drove to Green Bay and Manitowoc in Wisconsin and used the S.S. Badger Car Ferry to cross the lake to Ludington, MI.

Finally, we drove to Holland in Michigan to absorb some Dutch culture and some brews from the New Holland Brewery (Dragon's Milk on tap is wonderful!). We all thoroughly enjoyed the trip.

I did have a brief doubt about dragging my wife and friends a few hours' drive out of the way to Houghton, which is on Lake Superior, just to see another museum. But in the end, I figured I could get away with it, especially if a museum visit were linked to a tour of a copper mine. And I had read in various places that the museum was first-rate.

Well, the A.E. Seaman Mineral Museum at Michigan Technological University is awesome! Everyone loved it. Inspired by what they saw in the exhibits, my friends bought a set of massive native copper bookends from the well-stocked museum store.

I took many photos with my little pocket camera. The lighting and the labeling were outstanding, so I was able to get a number of good photos from the world-class specimens on display, even shooting freehand through glass.

The Picasso-like copper is from the Central Mine in Upper Michigan's Keweenaw County, and the dendritic copper specimen is probably also from Keweenaw County. The local native copper and silver specimens are unique, but there are also wonderful specimens from all over the world.

I hope these few photos will inspire you to make the journey to see the A.E. Seaman Mineral Museum.

Salotti Earth Science Education Award

Editor's note: The award announcement by the A.E. Seaman Mineral Museum honors one of our own club members, Wayne Sukow.

The A.E. Seaman Mineral Museum is delighted to announce Dr. Wayne W. Sukow of Fairfax,VA, as the winner of the 2013 Dr. Charles A. Salotti Earth Science Education Award. The award recognizes excellence in Earth science education.

This marks the 15th annual presentation of the award, sponsored in honor of Dr. Charles A. Salotti by the Salotti family, the Edith Dunn and E.W. Heinrich Trust, the A.E. Seaman Mineral Museum Society, and the A.E. Seaman Mineral Museum.

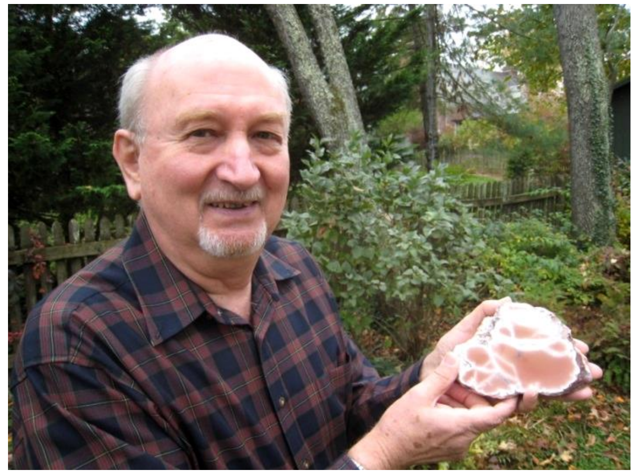
Holding degrees in physics, biology, and nuclear physics and a Ph.D. in chemical physics, Dr. Sukow spent much of his early career (1973–1984) as a physics professor and department chairman at the University of Wisconsin–River Falls.

He then served as executive director of the West Central Wisconsin Consortium (at the University of Wisconsin) and eventually devoted himself to a new career as program director and section head at the National Science Foundation's Division of Elementary, Secondary, and Informal Education (1992–2004).

Dr. Sukow's has shown leadership at all levels of education, which has permeated his career. He has served in numerous capacities—as a school board member, consultant, advisory board member, and invited speaker.

Dr. Sukow's service, leadership, and teaching of the Earth sciences have been equally extensive. He has served in various capacities, from speaker, to bulletin editor, to officer in local gem and mineral clubs.

In 2003, he became the Assistant Director and later Director of the Eastern Federation of Mineral and Lapidary Societies (EFMLS) for the EFMLS's Wildacres program. In 2006, he took a year-long leave of absence to serve as EFMLS President.



Dr. Wayne W. Sukow, longstanding member of the NVMC, is the 2013 winner of the Dr. Charles A. Salotti Earth Science Education Award.

According to one of Dr. Sukow's many supportive testimonials, "Wayne exemplifies the principles of the Dr. Charles A. Salotti Earth Science Education Award through his long service to Earth science education as well as his activities to inspire and encourage people, particularly young people, to understand and appreciate the Earth's geological heritage and mineralogical treasures."

Dr. Sukow has authored numerous popular articles in the Lapidary Journal, Rock & Gem Magazine, and Deposits Magazine on topics related to his mineralogical and lapidary interests, especially datolite and agates from the Lake Superior region. He has also helped to educate untold numbers of people of all ages through his lectures and exhibits at clubs, shows, and museums and through his award-winning American Federation of Mineralogical Societies program competition entries.

To top it all off, he regularly volunteers as a visiting science teacher in Washington metropolitan area middle and high schools.

Congratulations to Dr. Sukow!

Lake Superior agates are one of Dr. Sukow's many areas of expertise. Photo: Wikipedia.

Old Rag, Part 2: How Did It Get There?

by Hutch Brown, Editor

Author's note: In the December 2013 newsletter, I described some of the features of Old Rag Mountain. In this followup story, I tell how Old Rag and the rest of Virginia's Blue Ridge Mountains came to be.

Old Rag is one of the best known sites in Virginia's Blue Ridge Mountains. Named for the raggedy appearance of its ridgeline, Old Rag has spectacular views from an elevation of more than 3,200 feet. It also has enormous jumbles of granite boulders, with rocks more than a billion years old.

So is Old Rag more than a billion years old?

No. Even the tallest mountains erode to sea level in less than 100 million years (estimates vary). Nor is Old Rag an eroding remnant of an enormous mountain chain that formed when proto-Africa collided with proto-North America about 320 million years ago; those mountains, too, are long since gone.

So how did Old Rag get there? And why is it made up of such ancient rocks?

Grenville Orogeny

Old Rag is part of the Blue Ridge geologic province, which includes a scrap of continental basement rock elsewhere buried under much younger rocks. The Blue Ridge forms a series of long ridgelines trending northeast to southwest across much of the mid-Atlantic region, including Virginia. As a series of landforms, the Blue Ridge Province begins the parallel ridges and valleys that extend westward to the Allegheny Plateau. But its geology differs from that of the ridges to the west.

The granitic rocks of the Blue Ridge were formed during a mountain-building event about 1.2 to 1.0 billion years ago, the so-called Grenville orogeny. The continents that would become Africa and North America collided, building mountains that were likely as high as the Himalayas (Mt. Everest is nearly 30,000 feet high). Deep beneath them, the basement rocks formed

View from the top of Old Rag. Photo: Hutch Brown.

as granite and related igneous rocks, which still underlie much of Virginia and are uniquely exposed in the Blue Ridge (fig. 1).

The Grenville orogeny contributed to the formation of a supercontinent known as Rodinia, with what is now Virginia in the middle. The mountains eroded away, and a long period of tectonic calm ensued. As far as we know, the region was a flat plain; it was also barren, without plants and animals (which had yet to evolve).

About 700 million years ago, the continental crust began to stretch and break, exposing the basement rocks to erosion. Sediments formed—shales, sandstones, and conglomerates, later metamorphosed into phyllite, gneiss, and mica schist. Known as the Lynchburg formation, the rocks are exposed today on the eastern side of the Blue Ridge Province (fig. 1).

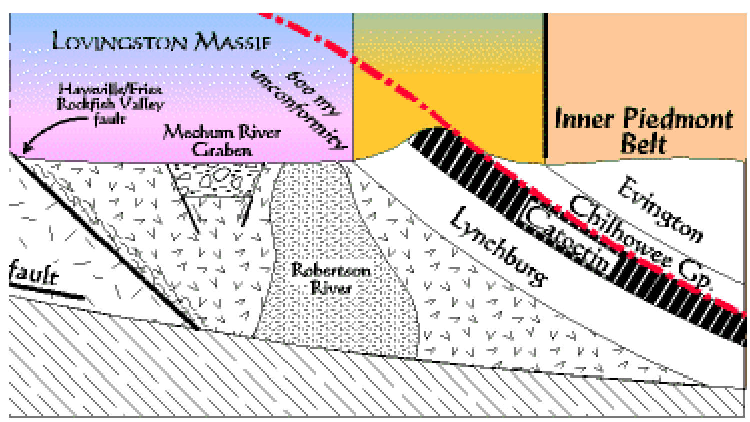


Figure 1—*Basement and associated rocks, eastern Blue Ridge Province. The granitic basement rocks of the Lovingston massif are more than a billion years old. The Lynchburg formation and Robertson River intrusive suite date to continental stretching about 700 million years ago. The overlying Catoctin greenstone dates to continental rifting about 570 million years ago. Source: Fichter and Baedke (1999).*

Plutons also intruded into the stretched overlying rock, and volcanic activity occurred. The evidence comes from the Robertson River suite of rocks in the eastern part of the Blue Ridge Province (fig. 1), including igneous granite and volcanic rhyolite.

The basement rock and the overlying Lynchburg formation both have metamorphosed gabbro, an intrusive rock similar to basalt. The gabbro intrusion came from rising magma that rapidly cooled near the Earth's surface, forming crystals too small to see without a magnifying lens.

In plate tectonics, crustal stretching and doming commonly lead to rifting as a continent breaks apart—but not in this case. The Rodinia supercontinent did not actually break up for another 100 million years or more.

Continental Rifting

About 570 million years ago, rifting began along what is now the eastern edge of the Blue Ridge Province (fig. 2). Hot spots of magma heated the overlying rock and pulled it apart. Entire blocks of rock slipped downward along fracture lines in the brittle overlying rock, forming a parallel series of steep cliffs (horsts, from the German word for eyrie). Each horst towered over a deep trench (graben, from the German word for pit).

Gradually, the axial (main) rift graben widened and deepened enough to fill with seawater, the beginning of the Iapetus Ocean, precursor of today's Atlantic. By about 550 million years ago, the continental margin was forming; a jagged coastline emerged, roughly conforming to the eastern edge of today's Blue Ridge Province.

Parallel to the main graben were half-graben, formed by uplift, doming, and fracturing of the overlying brittle rock, much like in East Africa's Great Rift Valley today. The half-graben trapped rainwater runoff , depositing river and lake sediments. Where magma reached the surface, lava poured across the landscape, helping to fill the graben and forming the basalts that later metamorphosed into Catoctin greenstone (fig. 1).

As the continents pulled apart, the thinned basement rocks sank and were covered with sediments and seawater (fig. 3). Layers of clastic rock—sedimentary rocks such as shale and sandstone, made from eroded bits of pre-existing rock—formed in the multiple graben.

The graben, now underwater, were covered with coastal runoff sediments such as mud and sand, forming additional layers of clastic rock. The clastic rocks, in turn, were covered by carbonate sediments from decomposing sea life, forming layers of carbonate rock, particularly limestone. The various layers of sedimentary rock buried the Grenville granite along the continental margin, together with the original rift graben (fig. 3).

Island Arc Orogenies

Another long period of tectonic quiet followed. Carbonate rock layers continued to accumulate along the continental margin, but not much sediment came from land. Our area was again a flat and featureless plain, although terrestrial plants and animals were now evolving.

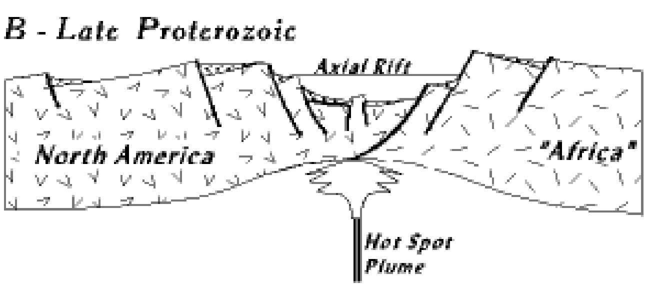


Figure 2—*Early Iapetan rifting about 570 million years ago (in the late Proterozoic era). A plume of magma at a weak spot under the Rodinia supercontinent thinned the basement rocks, causing faults and slippage in the brittle surface rocks. The resulting rift valleys filled with sediments from eroding cliffs. The main axial rift formed a sea, like the Red Sea today, as the Iapetus Ocean began to form. Source: Fichter and Baedke (1999).*

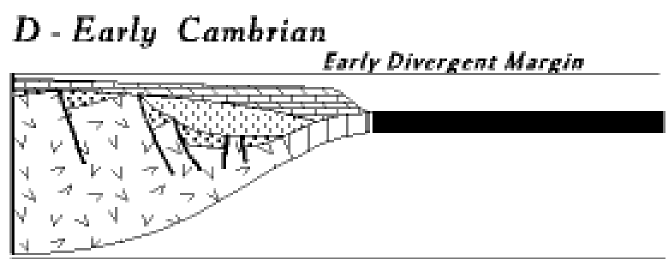


Figure 3—*The continental margin about 530 million years ago (early Cambrian period). Proto-Africa and proto-North America were diverging, forming the Iapetus Ocean. Black bar = basalt (ocean crust); black lines = faults, with multiple parallel graben; V = igneous rock; bricks = carbonate rock; dots = clastic rock. Source: Fichter and Baedke (1999).*

However, an island arc was approaching from the ocean. An island arc is a chain of volcanic islands, usually shaped like an arc, that forms where one tectonic plate in the ocean subducts under another. From about 450 to about 350 million years ago, two island arcs collided with proto-North America in a consecutive pair of mountain-building events, with a long period of tectonic calm in between (fig. 4).

As the ocean crust subducted under each approaching island arc, it acted as a ramp; each arc—first the Taconic, then the Avalon—rode up over the continental margin, attaching itself to proto-North America. The added land masses are known as terranes, fragments of crustal material broken off from one tectonic plate and sutured onto another. The immense weight of each terrane forced down the continental margin, forming basins ahead of the rising mountains.

The mountain-building events changed the orientation of continental drainage from eastward to mainly westward. As the towering coastal ranges eroded, rivers carried sediments into the foreland basins and ultimately into the inland seas beyond. Seas frequently covered much of the mid-Atlantic interior from the pre-Cambrian through the Mississippian periods (from about 570 to about 320 million years ago).

Following each mountain-building episode, the last rocks to erode were typically rich in the most weather-resistant material: quartz. All else being equal, near-shore sedimentary sequences following an orogenic event typically begin with shale followed by sandstone, then limestone. For example, the Tuscarora sandstone exposed at Seneca Rocks, WV, originally overlaid the Juniata formation of siltstones, shales, and other finer grained rocks. The Tuscarora sandstone marks the end of the mountain chain formed by the Taconian orogeny.

Although clastic sedimentation slowed as the mountains eroded away, carbonate rocks continued to form offshore, and limestone is now widely exposed throughout the Valley and Ridge Province. The Shenandoah Valley, part of the Great Valley that reaches from northeast to southwest across much of the mid-Atlantic region, owes its fabled fertility to the carbonate rocks laid down during long periods of tectonic calm between mountain-building events.

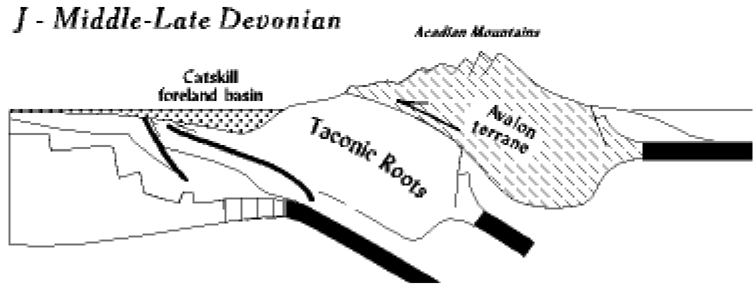
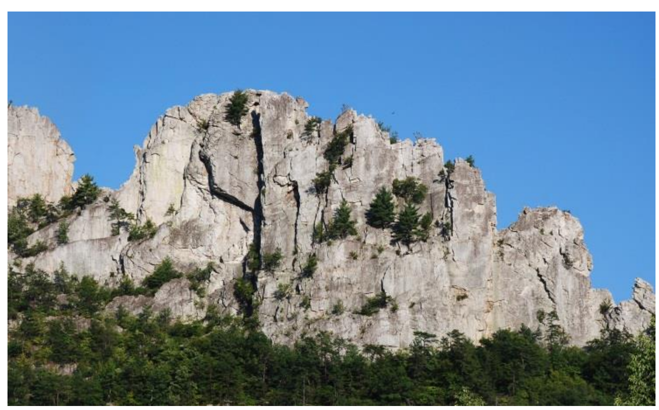


Figure 4—*The Acadian orogeny, about 380 million years ago (during the middle to late Devonian period). The old Taconic terrane was mostly eroded away, and sediments from the new Avalon terrane were filling the Catskill foreland basin, forming clastic rock. Black bar = basalt (ocean crust and extinct subduction zones); black lines = faults; dots = clastic rock. Source: Fichter and Baedke (1999)*

Alleghanian Orogeny

From the end of the Iapetan rifting event (about 570 million years ago) to the end of the Mississippian period of tectonic calm (about 320 million years ago), the ancient Grenville rocks were buried under mounting layers of clastic and carbonate rock. The sedimentary rock layers that covered the western part of our area were flat; the Taconian and Acadian orogenies added sediments through erosion but probably lacked enough tectonic force to alter the sedimentary layers to the west through the heat and pressure that cause folding, faulting, and metamorphosis.

But the Iapetus Ocean was closing, and the next mountain-building episode would change all that.



Tuscarora sandstone spine at Seneca Rocks, WV. Source: Wikipedia.

About 320 million years ago, the last orogenic event in the mid-Atlantic region began as proto-Africa (then part of a larger continent called Gondwana) collided again with proto-North America (fig. 5), contributing to the formation of the supercontinent Pangaea. As with the earlier terranes, the east-dipping subduction zone acted as a ramp, allowing proto-Africa to slide up over the edge of proto-North America. No one knows how far inland it went, but possibly as far as the Allegheny Front, where the impacts abruptly end.

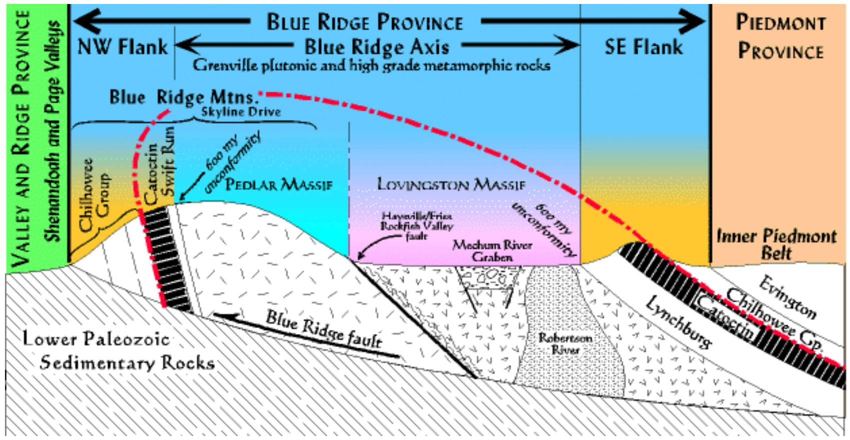


Figure 6—*Blue Ridge thrust fault and overturned anticline. The Blue Ridge Province, with the Grenville rocks at its core, includes a suite of associated rocks, such as Catoctin greenstone, Weverton quartzite (part of the Chilhowee group), and other rocks with origins in continental stretching about 700 million years ago and Iapetus rifting about 570 million years ago. Source: Fichter and Baedke (1999).*

The overlying mountains have long since eroded away, leaving no trace of proto-Africa but exposing its tremendous impacts on the underlying rocks. The enormous weight of Gondwana and the tremendous heat and stress generated by its collision with proto-North America did more than just deform the underlying rocks. The force of the collision actually displaced many native rocks, moving them long distances and forming all or part of three geologic provinces.

Old sutures associated with the terranes and old faults along the ancient continental edge caused large sheets of rock to detach and slide westward along great, nearly horizontal thrust faults (fig. 5). Parts of both the Taconic and the Avalon terranes detached and moved inland, forming the belts of metamorphic rock that now make up the Piedmont Province.

The thinned and stretched Grenville basement rocks at the old continental margin also broke free. Together with immediately overlying rocks such as Catoctin greenstone and Weverton quartzite, they moved inland along a great thrust fault. They ultimately came to rest over younger rocks, forming an anticline (fig. 6). In an anticline, the middle of a rock sequence arches up and the ends point down. The Blue Ridge anticline is thrust toward the west, overturning onto much younger sedimentary rocks.

West of the Blue Ridge, the sedimentary rocks were also thrust-faulted and folded, ending at the Allegheny Front. There, a final overturned anticline capped by Tuscarora sandstone has been breeched by erosion to form Germany Valley in West Virginia, drained by a branch of the Potomac River (fig. 7). The sandstone wall just west of the river marks the beginning of the Allegheny Plateau, where the sedimentary rock layers, though deeply incised by streams, remain rela-

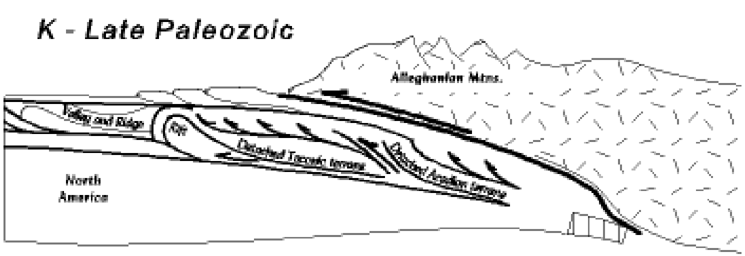


Figure 5—*The Alleghanian orogeny, about 320 million years ago (during the late Paleozoic era). As proto-Africa rides up over proto-North America, massive thrust faulting pushes both the Taconic and Avalon terranes and some of the Grenville basement rocks westward while folding the flat sedimentary rocks beyond. Source: Fichter and Baedke (1999).*

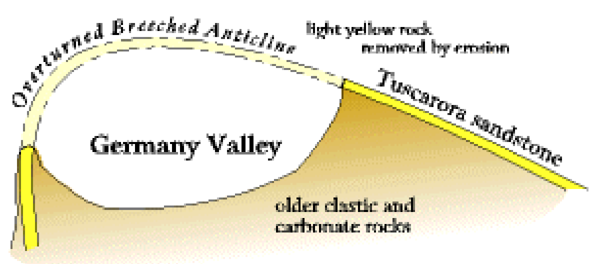


Figure 7—*Folding of sedimentary rock at the Allegheny Front (the sandstone wall), which marks the farthest extent of the Alleghanian orogeny. Source: Fichter and Baedke (1999).*

tively flat, unaffected by the Alleghanian orogeny.

Rejuvenation

In the 250 million years since the Alleghanian orogeny, little has happened to alter the Blue Ridge geology, although the topography has seen tremendous change. The great Alleghanian mountain range has long since eroded away; its sediments, largely poured off to the west, helped to permanently fill the inland seas. Rifting began about 230 million years ago, opening the Atlantic Ocean and leaving rift graben in the Piedmont Province. The graben have long since filled with basalt and sedimentary rock, widely exposed in such places as Culpeper, VA.

Virginia is in a prolonged period of tectonic calm, yet beyond the Coastal Plain the state is hardly as flat and featureless as one might expect. Parallel ridges in the west rise thousands of feet high. They are all about the same height, and they are cut by water gaps that allow drainage to the Atlantic.

One possible explanation is that all of Virginia was a flat plain in the relatively recent past. The landscape probably featured slow, meandering rivers that drained mostly to the west.

Within the past 45 million years, however, gradual uplift across the interior mid-Atlantic region has tipped the land toward the ocean again, reversing the main course of Virginia's drainage from west to east. As the land rose, the rivers and streams cut valleys into the least resistant bedrock. They also cut through ridges of harder material, creating gaps for water to spill through to the Atlantic (such as at Harpers Ferry, WV).

The ridges are formed from the most erosion-resistant rock, such as Tuscarora sandstone, Old Rag granite, and Weverton quartzite. By contrast, the valleys are underlain by shale and limestone. The ridges and valleys are parallel due to the parallel processes of folding and faulting during the Alleghanian orogeny (fig. 8).

The relatively recent gentle uplift, called rejuvenation, includes the Allegheny Plateau. Its cause is uncertain; one hypothesis is continental arching due to mantle migration away from an ocean floor that is increasingly loaded with continental sediments.

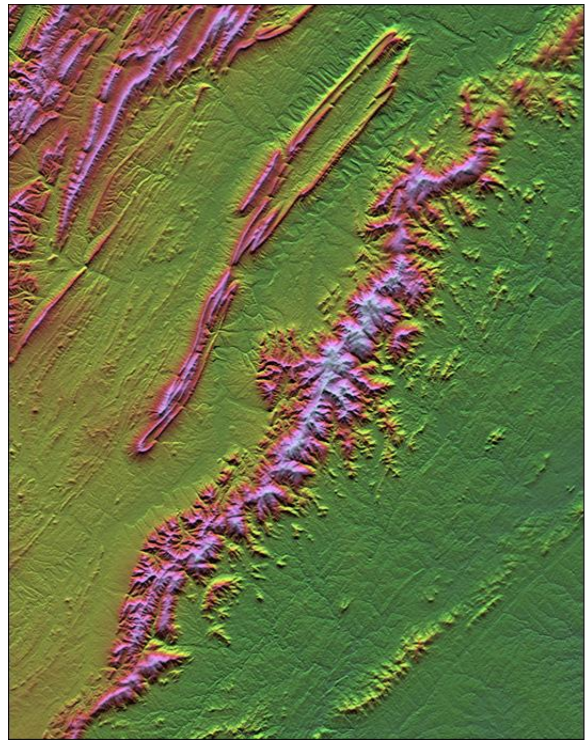


Figure 8—*Landforms in the Blue Ridge (lower right) and Valley and Ridge (upper left) are parallel due to faulting and folding during the Alleghanian orogeny. Source: Schruben (1999).*

Different rates of erosion have also contributed to growing topographic relief. Rates of erosion in the western Blue Ridge Province—except for Harpers phyllite, the westernmost member of the Chilhowee group of rocks (fig. 6)—are higher in valleys than on ridges. When valleys erode faster than ridges, mountains appear to be rising—and, for all practical purposes, they are.

A Complex Story

Old Rag granite has relatively low rates of erosion, so Old Rag stands out from the surrounding ridges, which are composed of other kinds of granitic rock. Old Rag has even been called a monadnock—an isolated mountain.

However, the Blue Ridge anticline as a whole is heavily eroded, especially on its eastern side. Why the eastern rocks should erode faster than the western ones is unclear, but it might have to do with uneven effects of the tremendous tectonic forces at work on the basement rocks over

View of Old Rag Mountain from Skyline Drive to the west, showing its relative isolation from the rest of the peaks and ridges nearby due to uneven weathering. Source: Wikipedia.

time. For example, the westward thrust of faulting and folding apparently raised the western side of the overturned anticline higher than the eastern side (fig. 6), so elevations in the Blue Ridge Province were probably always higher in the west than in the east.

Tremendous tectonic forces have been at work on Old Rag as well. According to one source (Frye 1986), the mountain-building processes crushed the grains of the granitic rocks throughout the Blue Ridge Province, making them more susceptible to erosion. Old Rag owes its very name to heavy weathering over the course of its relatively brief existence, which is due to gentle regional uplift in the last 45 million years or so.

Still, the story of Old Rag begins far before rejuvenation. Its location and composition are due to complex geological processes that go back more than a billion years. ⛏

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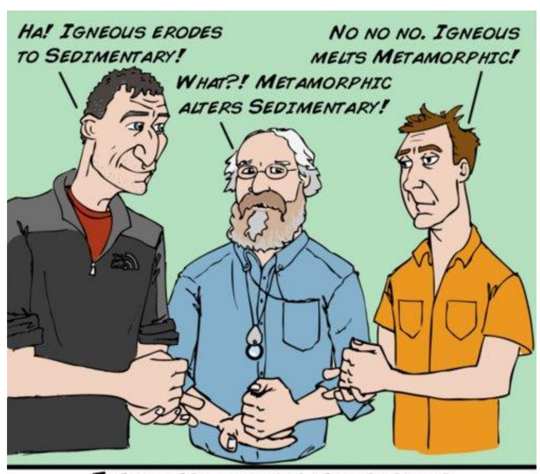

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Upcoming Events

(of interest in the mid-Atlantic region)

January 30–February 16
Tucson 22nd Street Show
Minerals, fossils, dinosaurs, meteorites, gems, and jewelry; 60,000 square feet of exhibitor space, 180 dealers
Corner of I–10 and 22nd Street, Tucson, AZ

February 15–16
21st Annual James Campbell Memorial Gem, Mineral, and Fossil Show and Sale
Capital District Mineral Club and the New York State Academy of Mineralogy, New York State Museum, Empire State Plaza on Madison Avenue, Albany, NY

March 1–2
51st Annual Gem, Mineral and Fossil Show
Delaware Mineralogical Society
Sat. 10–6, Sun. 11–5; admission: $6
Delaware Technical and Community College, 400 Stanton-Christiana Rd, Newark, DE (exit 4B off I–95)

March 8
24th Annual Mineral, Jewelry & Fossil Show
Sat. 10–5
The Show Place Arena, 14900 Pennsylvania Ave., Upper Marlboro, MD
http://www.smrmc.org

March 15–16
Annual Gem Mineral and Fossil Show
Gem Lapidary and Mineral Society of Montgomery County
Sat. 10–6, Sun. 11–5; adult admission: $6
Montgomery County Fairgrounds, 16 Chestnut St., Gaithersburg, MD
http://www.glmsmc.com

March 22–23
45nd Annual Gem & Mineral Show
Che-Hanna Rock and Mineral Club, Athens Twp. Vol. Fire Hall, 211 Herrick Ave., Sayre, PA; Contact: Bob Mcguire (570/928-9238)
http://www.chehannarocks.com

March 29–30
64th Annual EFMLS Convention and Show
Philadelphia Mineralogical Society and Delaware Valley Paleontological Society, LuLu Temple, Plymouth Meeting, PA

April 11–13
NY/NJ Mineral, Fossil, Gem, and Jewelry Show
350–400 exhibitor booths with minerals, fossils, dinosaurs, meteorites, gems, jewelry, gold, silver, turquoise; special exhibit: The Best of the Best of the Northeast
New Jersey Convention & Exposition Center, 97 Sunfield Avenue, Edison, NJ

April 18–19
Gem, Mineral, and Fossil Show
North Museum of Natural History and Science
Fri. 10–6, Sat. 10–5
Farm and Home Center, 1383 Arcadia Rd (off Manheim Pike) Lancaster, PA
Educational programs, door prizes, food
Contact: Alison Mallin (717-358-7188; amallin@northmuseum.org)

May
Date to be announced:
Ruhl Armory Show
Chesapeake Mineral Club, Baltimore, MD
http://www.chesapeakegemandmineral.org/

May 3–4
Treasures of the Earth: 11th Annual Show and Sale
The Mineralogical Society of Northeastern Pennsylvania, Oblates of St. Joseph, 1880 Highway 315, Pittston, PA

May 17–18
46th Annual World of Gems and Minerals: Gemstone, Jewelry, Bead, Mineral and Fossil Show
Berks Mineralogical Society, Leesport Farmer's Market, Route 61, Leesport, PA

June 7
62nd Semi-Annual Mineralfest
Pennsylvania Earth Sciences Association, Macungie Memorial Park, Poplar Street, Macungie, PA

August 15–17
Gem Miners Jubilee
Fri. 10–6, Sat. 10–6, Sun 10–4; admission: $6
Lebanon Expo Center, Lebanon, PA
http://www.gem-show.com

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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.*