THE NORTHERN VIRGINIA MINERAL CLUB INC

The Mineral Newsletter

Meeting: May 21—*NOTE! One week earlier than usual!* Time: 7:45 p.m.

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

Topaz
Minas Gerais, Brazil

Smithsonian Mineral Gallery. Photo: Chip Clark.

Volume 59, No. 5
May 2018
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May Meeting Program:

African Gemstones

In this issue …

Mineral of the Month
Topaz

by Sue Marcus

Our segue from the April to the May Mineral of the Month comes through an isle in the Red Sea called Topasios Island. You might guess from that name alone that the May mineral is topaz.

And I hope you recall that the April mineral, olivine (or peridot), was found on an Egyptian island in the Rea Sea. Ancient lapidaries and naturalists apparently used the name "topaz" for peridot!

The island of Topasios (also known as St. John's or Zabargad Island) eventually gave its name to topaz, although the mineral topaz is not and has never been found there. Even earlier origins of the word "topaz" can be found in Sanskrit or Greek, depending on your preferred source.

The Color of Topaz

The topaz on the cover is a good representation of the mineral's natural orange color. Topaz can also be clear, light blue, or the color of champagne.

So what about those gorgeous vibrant blue gems we see in stores and at shows? *Caveat emptor*—buyer beware! Enjoy these beauties, but they are almost certainly irradiated and then probably heat-treated to produce that deep blue color.

Some members of our club enjoyed a recent presentation on blue minerals by Dr. Jeffrey Post at the Smithsonian National Museum of Natural History. Dr. Post informed us that topaz is irradiated to become the deeper (and more valuable) blue, then heated to remove brown shades that detract from the visual splendor. Many gemstones are treated onsite at the mine itself.

The Smithsonian's gem collection—notably its topaz specimens—provides valuable research materials because many specimens were acquired prior to the use of color-enhancing techniques. They provide a baseline of natural materials for comparison with more recently extracted, cut, or studied materials.

Pink and orange topaz are colored by traces of chromium in the crystal lattice. Brown topaz can be heat-treated to enhance the color, turning it into shades of pink, a process known as "pinking." Colorless or pale-hued topaz is also irradiated and heat-treated to enhance the value of the stones. Topaz also occurs in natural red or pale green shades, but only rarely.

Some special types (not true varieties) have acquired trade names to help market them. "Imperial topaz" is probably the best known of these special types. The definition of imperial topaz varies with the source and sometimes even within the source. Generally, imperial topaz is supposed to be, as one source described it, "the color of the setting sun"—yellow-gold with

Happy May Day!

Northern Virginia Mineral Club members,

Please join our May speaker, Logan Cutshall, for dinner at the Olive Garden on May 21 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.

A topaz thumbnail from the Erongo region of Namibia. Photo: Bob Cooke.

The Smithsonian gem hall has topaz crystals in various shapes and hues. The colors are all natural. Photo: Chip Clark.

hints of red, orange, or violet. Since imperial topaz commands a premium price, the definition has been broadened to include other colors in the yellow-to-pink spectrum (the more material available, the greater the profit).

"Mystic topaz" has been artificially treated to have rainbow hues on the surface. Some relatively bright-colored topaz may fade with exposure to daylight. Check your topaz under long-wave ultraviolet light because some specimens fluoresce yellow to orange.

Occurrence

Topaz has been known since antiquity to many cultures and occurs worldwide. It is usually found in igneous rocks that are high in silica, like granite and pegmatite (intrusive) and rhyolite (extrusive). Crystals form in vugs in granite or in rhyolite cavities left by gases. Thus, topaz forms later in the mineralization process than most of the minerals around it.

Brazilian pegmatites are the source of most topaz, particularly imperial topaz, although Russia is another imperial topaz source. To see immense Brazilian topaz crystals, including a natural blue topaz encrusted with lepidolite, visit the Smithsonian's Natural History Museum.

"Killiecrankie diamonds" was the term given to usually yellow, clear, or blue topaz—often waterworn—found around Flinders Island, Tasmania. Passed off as diamonds in Europe in the 1800s, some of them might still be there. Even earlier, a 1,680-carat topaz known as the Braganza was thought to be a diamond in the Portuguese crown.

Naturally pink topaz is most frequently found in Pakistan. The Erongo Mountains of Namibia are a more recent source of gemmy topaz crystals. Pyknite is a fine-grained form of topaz, with most Mindat photos from Germany and the Czech Republic, although some are from the McGuire Mine in Colorado.

In the United States, Utah's Thomas Range in Juab County is internationally known for beautiful, often perfect, "sherry-colored" (yellow to slightly pink) topaz crystals, sometimes in their rhyolite matrix and

Topaz thumbnail with bixbyite from Juab County, Utah. Photo: Bob Cooke.

sometimes having popped out. These crystals are seldom large, although they are beautiful little gem specimens and every collector should have one from this still-producing classic American locality.

I've read several descriptions of "wine-colored topaz." Wine comes in colors ranging from white through pink to red and deep purple, so I find this particular descriptor not descriptive!

Uses

The primary use for topaz is as a gemstone. Topaz is very hard and therefore durable, but perfect cleavage makes cut gemstones prone to breaking if not handled carefully when cutting or wearing. The physical property of perfect cleavage also results in two specimens for the price of one—when a crystal on matrix becomes detached (breaks) because the piece is mishandled. This property also helps to render some of the Utah crystals as loose rather than matrix specimens, although some loose crystals were simply poorly attached when they grew.

Topaz is usually faceted, although it may be carved or formed into cabochons. Orange topaz is the November birthstone and the state mineral of Utah. Blue topaz is the state gemstone of Texas. Although Texas is not a major topaz producer, it has several pay-to-collect sites awaiting the public.

Technical Details

(The source is mostly Mindat.)

Chemical formula..... $Al_2(SiO_4)(F,OH)_2$
Crystal form ..... Orthorhombic
Hardness..... 8
Density ..... 3.4–3.6 g/cm^3 (measured)
Color..... Yellow, light blue, colorless, pink, brown, rarely red or pale green; often, colorless and brown topaz is heat-treated, as are other pale colored hues, to enhance them
Streak..... White
Cleavage..... One perfect cleavage
Fracture ..... Uneven to subconchoidal
Luster..... Vitreous

Many of us know the famous photograph of two immense Brazilian topaz crystals, weighing 70 pounds and 113 pounds respectively, with a child between them for scale. At the front of the image is the "American Golden Topaz," weighing 22,892.5 carets. The faceted gem is 6.9 by 5.9 by 3.7 inches in size! Too big to wear; too delicate for a doorstop—you don't really want it! These and other topaz specimens, cut and uncut, are on display at the Smithsonian's National Museum of Natural History for all of us to enjoy. Source: Smithsonian Mineral Gallery; photo: Chip Clark.

Sources

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Logan Cutshall

African Gemstones

May 21 Program

In my presentation for the Northern Virginia Mineral Club, I'll discuss some of the pros and cons of importing and exporting gemstone rough. I will base my remarks on my experience in the gemstone rough business, from a brief stint working with a mining operation in Kenya to working with a South African business to import material from an unstable South Africa. Based on my time in Kenya and Tanzania in mines and looking at rough, I will describe the trials and tribulations of selling rough, recounting some of my more memorable experiences.

I am a second-generation jeweler who grew up in a family business called Hunt Country Jewelers, where my dad, Ed Cutshall, and I make up to 300 pieces per year, specializing in 18K and platinum. My mom, Claire Cutshall, is a lapidary who's been cutting for close to 25 years. Needless to say, I was interested in gemstones and jewelry from an early age.

While completing my bachelor's degree in Geosciences in 2007 at Virginia Tech University, I had the opportunity to work with the late Campbell Bridges at his tsavorite mines in Kenya for a field study. After 5 weeks of digging and blasting while writing a paper for Virginia Tech, I returned to Hunt Country Jewelers to make jewelry with my dad full time.

In 2014, an old gemstone rough friend of my mom's named Hilmar Bosch asked if I was interested in joining forces with him. He's the owner of African Gemstones in South Africa, and he asked whether I would help him by importing rough into the United States, run his website, and ship the material from Virginia rather from than South Africa. For the past 4 years, we've been importing facet-grade gemstone rough from many continents but specializing in African material and offering it on our website to cutters all over the world.

Links:

African Gemstones: Hilmar's South African gemstone rough business, now being operated from Virginia.

Hunt Country Jewelers: My family business.

How we make our jewelry: For those who can't sleep.

Tsavorite USA Inc.: Information on the life (and death) of Campbell Bridges.

Tsavorite with graphite on apatite, from Tanzania. Source: Wikipedia; photo—Rob Lavinsky.

The Prez Sez

by Bob Cooke

I have a problem (or two). I have these great ideas and then don't have the time to follow through on them. Hopefully, none of you have any idea what I'm talking about.

The club has received several boxes of geology/mineral/jewelry books from the estate of Gerry Cox. They'll be priced and sitting in the Long Branch lobby for sale at the next club meeting. I have my eye on two of them, but what's the sense of buying more books that I won't have the time to read? Please, someone save me—buy the books before I give in to temptation!

As a kid, I always enjoyed watching a "coal plant" grow. I've recently found a recipe online for making coal plants: http://mrsstewart.com/magic-salt-crystal-garden/. It's basically a supersaturated salt solution with food coloring added. When poured over lumps of coal, the salt crystallizes as colorful "plants." I had difficulty tracking down some of the ingredients but now I've got them all. I plan to write a newsletter article on how it works out. But … you guessed it … I've got to find the time to do it.

I started to enter names and addresses from door prize tickets at last year's GMU mineral show to update our database on who has attended the show. I alphabetized the tickets and got as far as letter G before other events demanded my attention. I'll get back to that job … as soon as I find some time.

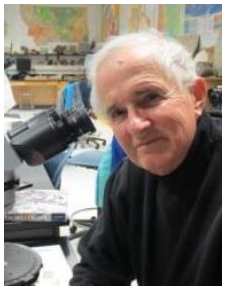
When Wayne Sukow stepped down as president, he told me one of his projects would be to revise the NVMC Constitution and By-Laws. I agreed to help him. We started with good intentions and we'll complete the job … when we find some time.

And of course there's tasks like organizing my mineral collection, yardwork, and all the other things that make up everyday life. I'm sure I'll get back to them … when I find some time.

I hope all of you have better luck (skill) running your life than I appear to have had running mine. At least summer is coming. There will be lots of time to catch up on all those overdue tasks. Uh-oh! Just remembered, my son's coming to visit in August for a couple weeks with his new wife and mother-in-law. That won't interfere with my work schedule, will it? ☺

Bob

Meeting Minutes
April 23, 2017



by David MacLean, Secretary

*P*resident Bob Cooke called the meeting to order at 7:45 p.m. at the Long Branch Nature Center, Arlington, VA.

The minutes of the March 26 meeting were approved as published in *The Mineral Newsletter*.

Recognitions

The president recognized past Presidents Sue Marcus, Rick Reiber, and Barry Remer.

The president recognized guests Dan and Anne Andrianos, Andrea Andrianos, Gerry Christmas, and Joe Zeibel.

Winners of the raffle included Anne Andrianos, Linda Benedict, Hutch Brown, Cal Bentley, Kathy Hrechka, David MacLean, Barry Remer, Celia Zeibel, Jason Zeibel, and Joe Zeibel.

Reports

The treasurer reported that the proceeds to the NVMC's Fred Schaefermeyer Scholarship Fund from the March 2018 auction were $447, with half coming from the sale of Geraldine Cox's donated minerals.

The president said that the NVMC has or will receive a considerable quantity of rock and mineral specimens from the estate of Geraldine Cox. There was discussion of how to sell the better quality material, splitting the proceeds with Walter Cox and giving away the rest.

Announcements

The Chesapeake Gem and Mineral Show will be held on Saturday, May 19, from 10 a.m. to 4 p.m. at the Parkville Armory (new location) near Baltimore.

The Loudoun County library's Reading Rocks Program for summer 2018 wants a Saturday exhibit of Virginia rocks and minerals from 1 to 4 p.m. or a table with rocks and minerals and a club member to explain them to the children who come to the table.

More than one Loudoun County library branch made this request. Sue Marcus will check into it.

Kathy Hrechka passed out business cards for the Micromineralogists of the National Capitol Area, which meets the fourth Wednesday of the month at the Long Branch Nature Center. Herwig Pelckmans from Antwerp, Belgium, was scheduled to speak at the club's meeting on Wednesday, April 25, on "The Many Faces of Fluorite."

Display Table

Jeff Guerber showed metallic magnesium feathers, possibly from China, that he bought at the March 2018 GLMSMC.

Celia and Jason Zeibel showed specimens they collected in the Triassic diabase at the Manassas Quarry on the April 21 field trip, including calcite, stilbite, chabazite, and prehnite. In addition, Celia Zeibel brought photos showing the display case she made for her collection of fluorescents and the way it lights up the collection with the ultraviolet lamp she bought at the last club auction.

Presentation

The presenter was Professor Callan Bentley from Northern Virginia Community College in Annandale, VA. The topic of his outstanding PowerPoint presentation was "Geological Visualizations: A Brief History, Best Practices, and Dispatches from the Future." Although visualizations are not the actual thing, they can help the viewer understand actual features of geology if well done. Cal showed various techniques, successful and not so successful, for helping a viewer to visualize geological formations and other phenomena.

At the April meeting, presenter Callan Bentley used PowerPoint slides to show the ability of well-done images to convey geological concepts. Photo: Ti Meredith.

Nametags

By Bob Cooke, President

The design used for NVMC nametags, like the logo used in the newsletter masthead, is old.

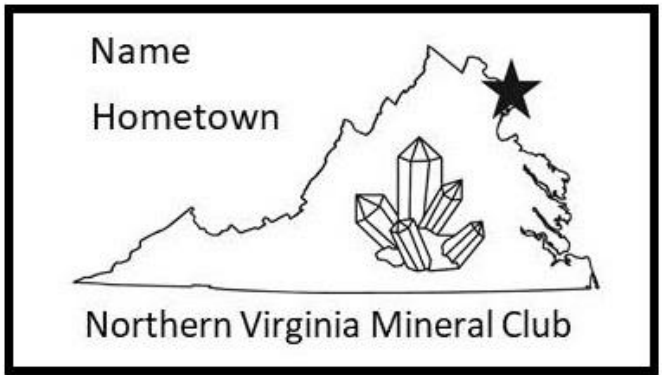
"How old?" you ask.

Well, old enough that the company that made our current nametags has gone out of business.

In what has turned out to be a lengthy process, your fellow NVMC members have updated the old design while retaining enough commonality that we can still use our old banners at the GMU mineral show.

If you'd like a new nametag, the club is subsidizing the cost for current members, so your cost is only $5 (limit one per family member). You did pay your 2018 dues, right?

To place your order, send an email to Bob Cooke at rdotcooke@gmail.com and specify your name as you'd like it to appear on the nametag as well as your hometown (if desired). Money will be collected when nametags are delivered.



New NVMC nametag design.

Save the Date!

New Location for CGMS Show

The Chesapeake Gem and Mineral Society is having its annual Gem, Mineral, Fossil and Jewelry Show at a new location. Admission free!

When: Saturday, May 19, 10 a.m. to 4 p.m.

Where: Parkville Armory, Parkville, MD

Directions: Take I–695 (Baltimore Beltway) to exit 32-North (Rt. 1, Belair Rd.). Proceed two traffic lights to Rossville Blvd. Turn left and proceed to Putty Hill Ave. The Armory is on the left.

Footprints Preserve Pleistocene Hunt

Thanks to Sue Marcus for the reference!

Researchers in New Mexico have discovered evidence in fossil footprints of a hunt that took place at least 20,000 years ago. Humans were tracking a giant sloth, a member of a megafauna species that is now extinct.

Such predator-prey interactions in the fossil record are extremely rare. The evidence comes from White Sands National Monument in New Mexico. Geologically, the sloth and human trackways were made contemporaneously, and the sloth trackways show evidence of evasion and defensive behavior in association with the human tracks.

Behavioral inferences from these trackways suggest that humans were harassing, stalking, and/or hunting the now-extinct giant ground sloth during the last Ice Age.

Read the article here.

Presentation at Smithsonian a Big Hit

by Sue Marcus

Some of our club members were treated to an extra-fun time when we ventured to the Smithsonian National Museum of Natural History for an evening presentation by Dr. Jeff Post titled, "Clues to the Blues."

Kathy Hrechka, Ken Rock, Craig Moore, John and Susan Weidner, newer members Thomas and Elijah Kim, and I enjoyed a presentation on what makes blue minerals—and gems---blue. Dr. Post is always interesting and informative. Takeaway information this time included the following:

- Most blue topaz is heat-treated and irradiated.
- Lapis lazuli is the only blue mineral that is ground up and used as pigment.
- The Hope Diamond went through many cuts to arrive at its current shape.

After the presentation and a question-and-answer period, Dr. Post showed us specimens of lazurite from Afghanistan, a huge faceted topaz, and several replicas of prior incarnations of what is now the Hope Diamond.

Dr. Jeff Post showing blue gems and minerals to audience members, including NVMC members Kathy Hrechka (in red) and Ken Rock (in blue).

Fred Schaefermeyer Award Presentations for 2018

Since 2009, the NVMC has maintained a scholarship fund in memory of Fred Schaefermeyer, a longstanding club member whose generous donations allowed the club to establish the fund. The fund's purpose is to award grants to promising students in fields related to our hobby. Proceeds from club auctions and from the auction at the club's annual show go into the Fred Schaefermeyer Scholarship Fund.

Last year, the club doubled the value of each scholarship award to $500. Those eligible include junior members of the NVMC itself and students in geology and related fields at George Mason University, James Madison University, and Northern Virginia Community College (Annandale campus). Recipients are asked to give a presentation at a club meeting or write an article for the club newsletter.

For 2018, the NVMC has awarded Fred Schaefermeyer scholarships of $500 each to Rachael Rappoccio at James Madison University, Kristen Chiama at George Mason University, and Mitch Mahoney at NOVA–Annandale. Congratulations to all!

Cindy Karns, a geology instructor at James Madison University, presented Rachael Rappoccio with a $500 Fred Schaefermeyer Scholarship at the JMU Geology Department's annual awards luncheon on the weekend of April 7. The award presentation, witnessed by over 100 people (including family and friends), came as a surprise to Rachael.

Save the dates!

June/July Field Trip Opportunities

Northern Virginia Community College

NOVA's Annandale campus offers 1-day weekend courses—essentially, field trips—related to our hobby. You can get more information at the Field Studies in Geology—GOL 135 Website.

Geology of Great Falls Park, VA

June 2, 9 a.m.–6 p.m. Study the modern and ancient forces that created Great Falls National Park, including some easy to moderate hiking. Meet in front of NOVA's main Bisdorf entrance at 9:00 a.m.

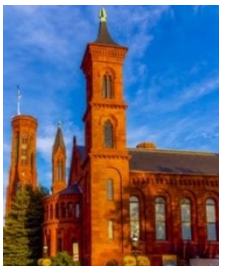
Miocene Geology of Calvert Cliffs, MD ***June 9, 9 a.m.–6:30 p.m.*** Learn how the Miocene seas spread across Chesapeake Bay region about 10 to 20 million years ago. We will visit the Calvert Marine Museum collections and study ancient sediments, stratigraphy, and paleoenvironments preserved in world-famous Calvert Cliffs, MD, collecting fossils along the way.

Triassic-Jurassic Rift Valley of Northern VA

June 23, 9 a.m.–7 p.m. Explore the geologic history of the famous Mesozoic rift basin, specifically across the Manassas, Leesburg, and Haymarket areas. Field stops will include quarry and roadside outcroppings of all rock types, dinosaur tracks, rift basin stratigraphy, and tectonic structures.

Building Stones of the National Mall, Washington, DC

June 30, 9 a.m.–6:30 p.m. We will visit over 20 sites on the Washington Mall, examining the geologic history and architecture, including the rocks used to construct the federal buildings and monuments.



Building Stones of the National Mall

July 21, 9 a.m.–6:30 p.m. We will visit over 20 sites on the Washington Mall, examining the geologic history and architecture, including the rocks used to construct the federal buildings and monuments.

Safety Matters
Mushroom Collecting

by Ellery Borow, EFMLS Safety Chair

Editor's note: *The article is adapted from* EFMLS News *(March 2018), p. 3.*

Yes, this is a great time of year for rockhounds to do some serious mushroom collecting. These mushrooms are not collected by mycologists but are specific to the rock collecting hobby. We are talking here about the mushrooms that form on the head and end of our rock-splitting and gap-widening chisels, as in the diagram to the left—if we are not careful.

Mushrooms growing on our chisels can indicate that the chisel is not working properly, that it might be developing dangerous fractures on its struck end, and that bits of sharp metal might be flying off when you strike the head.

Why do mushrooms form?

Good rock hammers are expensive, rock-splitting chisels much less so. It we want a thing to break, we would want the cheap chisel to break rather than the expensive hammer.

Well, engineers would rather not have anything break, so they created a better rock chisel, with two different degrees of hardness in the metal. The sharp end of the chisel is harder than the end being struck. That way, the head of the chisel absorbs some of the shock, deforming it slightly and transferring the energy to the rock being split. If the hammer and chisel are equally hard, one or the other could be damaged. Therefore, chisels are designed to wear out by mushrooming and thereby protecting the expensive hammer.

So, before you go out mineral collecting next time, collect all your mushroom-headed chisels. Grind down the damaged ends to create new, safe, strike surfaces.

How do you do that?

Many home workshops have a metal-grinding machine. Use the grinding wheels to reshape the chisel's end by grinding away the damaged parts to form a new shape for the head, as shown in the diagram on the upper right. Use water to cool the metal as it is being ground without sacrificing its metallurgical hardness or "temper."

If you don't have a grinding machine, other club members might be willing to help. If not, there are sharpening services available that specialize in reforming mushroom-headed chisels.

And while you're at it, how are your chisels' business ends, the ones that do the actual splitting? Now might be a great time to do a little judicious reshaping there as well.

Sharp chisels with sound heads are safer chisels. I wish everyone good and safe collecting. Please remember that your safety matters!

What Are You Waiting For?

by Steve Weinberger

Editor's note: *The article is abridged from* EFMLS News *(March 2018), p. 4.*

The Eastern Federation is most fortunate to be able to sponsor two annual weeklong workshops at the fabulous Wildacres Retreat in Little Switzerland, NC. If you've not yet attended one of these terrific sessions, what are you waiting for?

Each workshop features a variety of classes that you take, such as geology, silversmithing, and wire-wrapping, just to name just a few. For a complete list of offerings and a registration form, visit the Wildacres website.

Each session also features a guest speaker who lives with the group and presents six informative talks during the week. For the fall session, September 3–9, Alfredo Petrov, noted mineral dealer and collector, will be making a return visit. The mineral "alfredopetrovite" was named after him.

A bit about Wildacres. Located just off the Blue Ridge Parkway about an hour north of Asheville, NC, the Wildacres Retreat nestles on top of its own mountain, called Pompey's Knob. The Retreat facility consists of two lodges, each featuring a series of comfortable, semiprivate bedrooms with their own bathroom. Well-equipped classrooms are scattered

throughout the campus, many equipped with specialized equipment such as cabbing and faceting machines and jewelry-making equipment.

Meals are included, served family style in a separate dining hall. Your tuition covers everything except materials for your classes and items you may wish to purchase in the canteen or at the annual auction. For 2018, tuition is $425 per person.

What are you waiting for?

Classes are kept small and are assigned, based on your listed preferences, on a first-come, first-served basis. We encourage you to register early to ensure that you get your first choice. Some classes do fill rapidly, so please indicate four choices per semester so you won't be disappointed.

What are you waiting for?

Introduction to Crystallography

by Bruce G. Sales

Editor's note: *The article is adapted from* Mineral Newsletter *(newsletter of the Colorado Mineral Society), January 2013, pp. 6–8.*

Crystallography involves the recognition of crystal faces, the angles between the faces, and the forms of specific minerals.

When the conditions of formation are favorable, most minerals take characteristic geometric forms known as crystals. The study of these bodies and the laws that govern their growth, shape, and internal structure are known as crystallography.

Crystallography originated as a branch of mineralogy. It has since grown into a complete science that deals with naturally occurring minerals as well as with crystalline substances that are manmade. Many different tools and techniques are used to determine the microscopic and macroscopic characteristics that determine a particular mineral's crystallographic classification.

Beryl forms crystals in the hexagonal system. Source: Wikipedia.

Crystals are divided into seven crystal systems: isometric (or cubic), tetragonal, orthorhombic, monoclinic, hexagonal, rhombohedral, and triclinic (fig. 1).

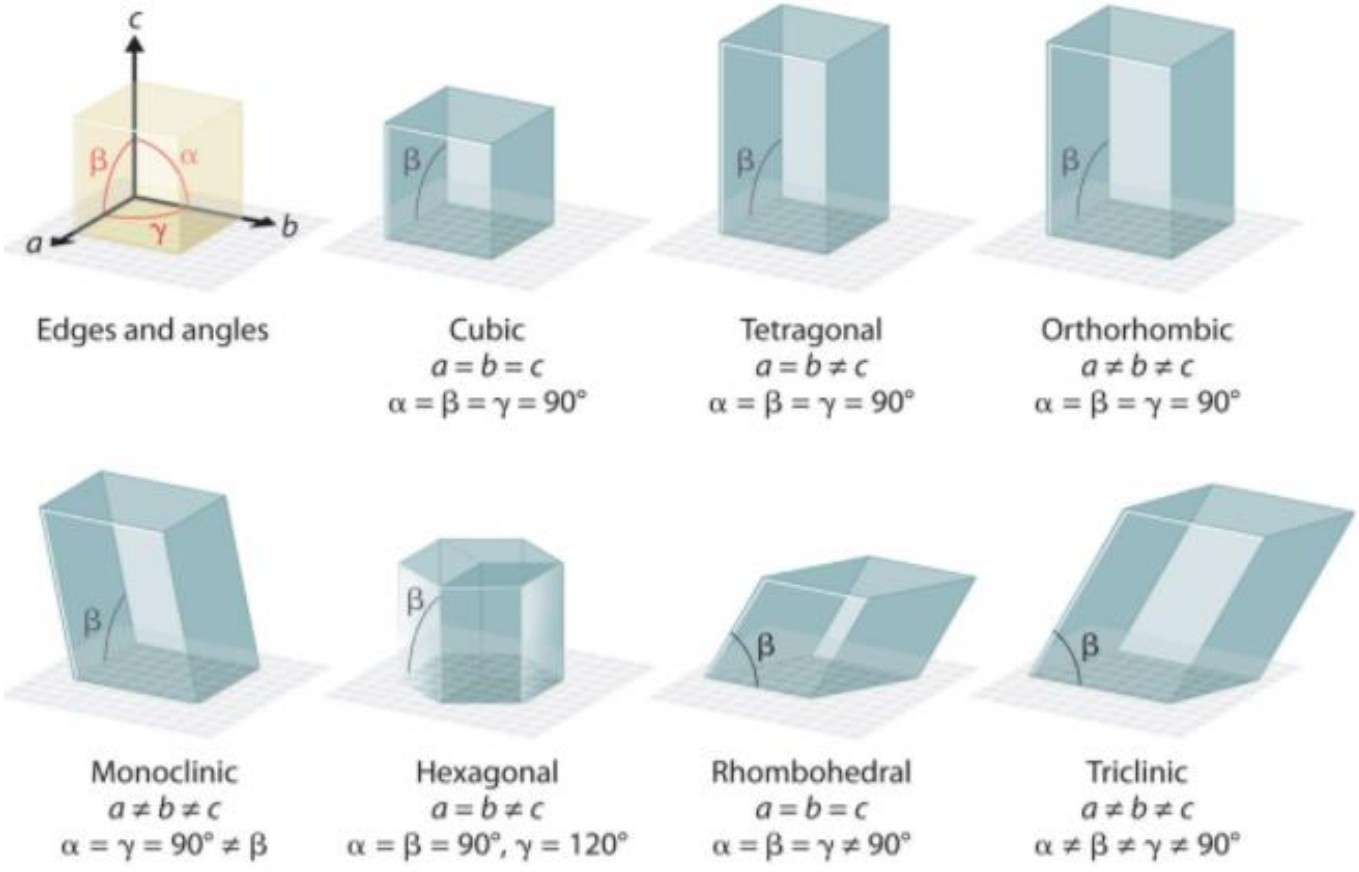


Figure 1—*The seven crystal systems are characterized by distinct sets of relationships between crystal edges and angles.*

Pyrite forms crystals in the isometric (or cubic) system. Source: Wikipedia.

By definition, a crystal is a homogeneous body bounded by smooth plane surfaces that are the external expression of an orderly internal atomic arrangement. The configuration of the plane surfaces and the angles between them are characteristic of the substance and can be a valuable tool in mineral identification. "Crystalline" is a general term that denotes the ordered arrangement of atoms in the structure of a solid substance, whereas the term "crystal" refers to the external expression of that order as faces of the crystalline substance.

When the term "crystal" is used in the broader sense, a crystalline solid with well-formed faces is said to be euhedral; if it has imperfectly developed faces, it is subhedral; and if it is without faces, it is anhedral. Certain crystalline substances are in such fine subdivisions that the crystalline nature can only be determined with the use of a microscope; such materials are designated by the term "microcrystalline." If the crystal aggregate is so finely divided that the individual crystals cannot be distinguished under a microscope but yield diffraction patterns with x-rays, the term "cryptocrystalline" is used to describe the material.

Most solid substances, both natural and synthetic, are crystalline; a few lack any ordered internal structure. Such substances are said to be amorphous, and naturally occurring amorphous substances are designated as mineraloids.

Crystals form in three main ways:

1. From an evaporating solution. If a solution of sodium chloride (saltwater) is allowed to evaporate, at some point the solution can no longer hold all of the salt and small crystals of salt will precipitate. Eventually, all of the salt will precipitate as crystals.
2. From temperature and/or pressure changes in a fluid system. A crystal forms from a fused mass in much the same way as from an evaporating solution. The most familiar example of crystallization from fusion is the formation of ice crystals when water freezes.
3. From vapor deposition. The most familiar example of this type of crystallization is the formation of snowflakes: air that is saturated with water, when cooled, will form ice crystals or snowflakes directly from the vapor state. Another example is the deposition of sulfur crystals at volcanic fumerols: the sulfur is crystallized from the cooling of the vapor from volcanic temperatures to atmospheric temperatures.

Sources

Chemistry LibreTexts. 2017. 10.3: Crystal systems.

Dana, J.D. 1952. Manual of mineralogy. Hurlbut, Jr., C.S. (rev.). 16th ed.

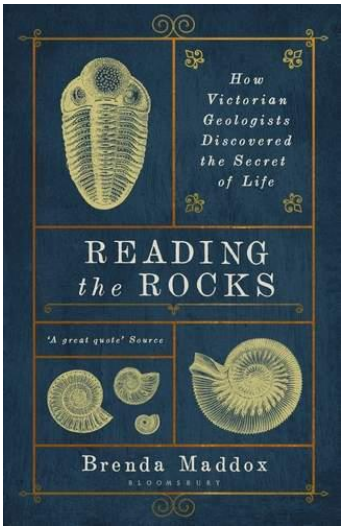
Book Review

Reading the Rocks: How Victorian Geologists Discovered the Secret of Life

by Timothy R. Smith

Editor's note: *Adapted from the* Washington Post. *Thanks to Sue Marcus for the reference!*

Author: Brenda Maddox
Details: Bloomsbury, 2017, 254 p.



In 1650, Archbishop James Ussher of Armagh counted the Bible's begats and determined that God created the Earth on the evening preceding October 23, 4004 BC. The idea of a young Earth was accepted by clergy and academics and was often printed in the margins of Bibles.

But in 1830, Charles Lyell, a lawyer with a passion for rocks, published *Principles of Geology*, which

argued that the Earth's geologic changes took place over millions of years [see the article on the next page]. An elegantly written book, it was a bestseller on par with the works of Jane Austen and Lord Byron. It went through multiple editions. A young Charles Darwin brought a copy of it with him on the HMS Beagle and read it before he reached his first destination. The idea of an ancient Earth would have a profound impact on the young man's thinking.

"It stirred him to wonder about the changes in life forms over time," Brenda Maddox writes in *Reading the Rocks*, her lovely, spry history of Victorian geologists. "He shifted his attention from rocks and fossils to man—a direction that would lead him to write *On the Origin of Species*."

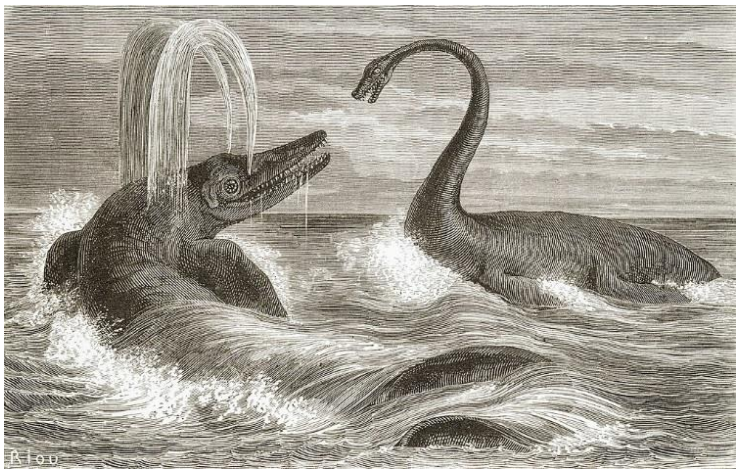
Maddox points out that such was Darwin's passion for geology that his notebook contained more jottings about rocks than creatures.

Victorian scientists found evidence of an Ice Age and determined that the world was once dominated by monstrous reptiles, long before man traipsed on his two legs.

Rock and fossil hunting was a popular pastime among the 19th-century British public. One could often find a top-hatted gentleman and his wife exploring the shores of Dover or the Scottish highlands. There wasn't much barrier for entry, either. All one needed, a Victorian writer noted, was "a quick eye, a good judgment, a clear notion of what had already been accomplished, and a stout pair of legs."

Reading the Rocks is filled with interesting characters: The surveyor William Smith, who created the world's first nationwide geologic map, was protected from pillaging highwaymen by a guard with a blunderbuss. The meetings of the Geological Society were so raucous they resembled the noisy proceedings of Charles Dickens' Pickwick Club. Two scientists had a dispute so intense over the division of two geologic ages that they didn't talk to each other for 20 years.

The fossil collector Mary Anning would scour the coastline near her home in Lyme Regis "in her long skirt, shawl, bonnet and basket." Her discoveries include the first fossil ichthyosaur, a marine reptile; the first two complete fossil reptiles known as plesiosaurs; and the first pterosaur, a flying reptile, found outside Germany. She was the greatest fossil hunter ever known.



Édouard Riou, Ichthyosaur and Plesiosaur *(1863). The 19th-century fossil collector Mary Anning discovered both species. Such breakthroughs in geology fired Victorian imaginations.*

Later generations of scientists would uncover continental drift and radiometric dating and would begin to understand the cataclysm that exterminated the dinosaurs, but the Victorians launched the first great broadside against young-Earth creationism. Their discoveries, which culminated in Darwin's theory of evolution by natural selection, "led them," Maddox notes, "to a bigger truth than they had been looking for."

Humor

Fossils

by Ogden Nash

At midnight in the museum hall
The fossils gathered for a ball
There were no drums or saxophones,
But just the clatter of their bones,
A rolling, rattling, carefree circus
Of mammoth polkas and mazurkas.
Pterodactyls and brontosauruses
Sang ghostly prehistoric choruses.
Amid the mastodonic wassail
I caught the eye of one small fossil.
"Cheer up, sad world," he said, and winked—
"It's kind of fun to be extinct."

Story of Geology

Charles Lyell

by Hutch Brown

Editor's note: *The author 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.*

In the early 1800s, many naturalists believed that the Earth's landforms had been shaped by a great global flood, in accordance with the biblical story of Noah and the Ark. Most people still thought of the Earth as no more than about 6,000 years old.

Clash of Ideas

However, the Bible no longer pervaded scholarly thinking as it once had. By the 1800s, Enlightenment scholars had made key discoveries in the evolution of both landforms and lifeforms. Nonbiblical explanations for the origins of the Earth—and of life itself—had come from such luminaries as Georges-Louis Leclerc, Count of Buffon (1707–1788); Karl Linnaeus (1707–1778); James Hutton (1726–1797); Jean Baptiste Lamarck (1744–1829); Georges Cuvier (1769–1832); and William Smith (1769–1839).

However, most scholars still followed the Bible-inspired teachings of Abraham Gottlob Werner (1749–1817). Werner espoused a theory known as Neptunism—that an ocean churning across the planet had shaped its landforms. Werner's followers included such leading lights as Juan Ignacio Molina (1740–1829), a Spanish Jesuit and geologist; Gustav Bischof (1792–1870), the founder of geochemistry; and Robert Jameson (1774–1854), a professor of geology at the University of Edinburgh in Scotland.

Their opponents, known as Plutonists, suggested that ongoing processes of subterranean uplift had contributed to the landforms we see around us. Espoused by James Hutton and others, such Plutonist views unsettled contemporary belief in the divinely created beauty and harmony of Nature. In particular, Plutonism seemed to defy the message of divine redemption behind the story of Noah and the Ark.

In response, a great literary light of the period thrust his paddle into these troubled waters. The German author Johann Wolfgang Goethe (1749–1832), in his masterpiece *Faust*, featured a debate between Neptunism and Plutonism, with the demon Mephistopheles espousing the latter. When Mephistopheles described underground heat as a source of terrestrial uplift, the protagonist Faust scorned such views as *tolle Strudeleien*—"crazy delusions." Goethe envisioned a harmonious Nature settling into place following divine Creation, untroubled by subterranean uplift. With his tremendous credibility in the world of arts and letters, Goethe contributed to the ascendancy of Werner and Neptunism in the early 19th century.

George J. Stodart, Portrait of Charles Lyell (1797–1885), Scottish Lawyer, Geologist. *Source: Wikipedia.*

Yet Plutonism ultimately prevailed, thanks in good part to a scientist born in the same year that James Hutton died: his fellow Scotsman and avid disciple, Charles Lyell (1797–1885).

A Born Naturalist

Born in 1797 into a prosperous family in east-central Scotland, Lyell spent much of his childhood at his family's second home in southern England. Lyell's father was a lawyer and naturalist, and the boy spent long hours reading in the family library and exploring the nearby woods. From an early age, he developed a keen interest in geology.

Lyell studied at Oxford University, where he heard lectures by William Buckland, a prominent Neptunist who spent his career seeking evidence for Noah's

Flood. Put off by the contrived nature of Buckland's search for proof of preestablished truth, Lyell found an alternative in James Hutton's empirical studies of landforms and rock formations in his native Scotland.

In addition to geology, Lyell studied law, and he practiced as a lawyer until 1827, when he turned to geology as a full-time profession. Throughout his career, Lyell traveled widely, collecting geological data and presenting it in painstaking detail to illustrate the precepts of Hutton's work.

Uniformitarianism

Like Hutton, Lyell recognized the rock cycle—the continuous process of erosion, sedimentation, compaction, and uplift that shapes the Earth's landforms. Adopting Hutton's motto that "the present is the key to the past," Lyell demonstrated that geological change occurs at the same barely perceptible rate we see in the rock cycle today. For example, Lyell showed that Europe's valleys formed through gradual erosion rather than through catastrophic floods.

Lyell's work thus repudiated Neptunism, which posited a cataclysmic Act of God to explain the Earth's landforms. The contemporary scientist and theologian William Whewell (1794–1866), a gifted wordsmith, coined the terms "Catastrophism" and "Uniformitarianism" to describe the two competing schools of thought. The names stuck.

In 1830–1833, Lyell published his signature work, the three-volume *Principles of Geology*. Called "the most important scientific book ever written" (PBS 2001), *Principles* was a clear and compelling elucidation of Uniformitarian theory, shaking the prevailing belief in Catastrophism to the core. Deeply influenced by Lyell's *Principles*, Charles Darwin (1809–1882) praised "the wonderful superiority of Lyell's manner of treating geology, compared with that of any other author" (N.a. 2016).

The Pozzuoli Puzzle

A case in point was Lyell's treatment of a contemporary mystery of science that the Catastrophists had struggled to explain.

The town of Pozzuoli in southern Italy lies on the northern edge of a bay inside the Gulf of Naples (fig. 1), with Mount Vesuvius visible to the south. The bay covers part of a huge caldera called the Phlegraean Fields (in Italian, *Campi Flegrei*), with Pozzuoli smack dab in the middle. The caldera has long been active, with local earthquakes, smoking fumeroles, and other signs of volcanism (fig. 1).

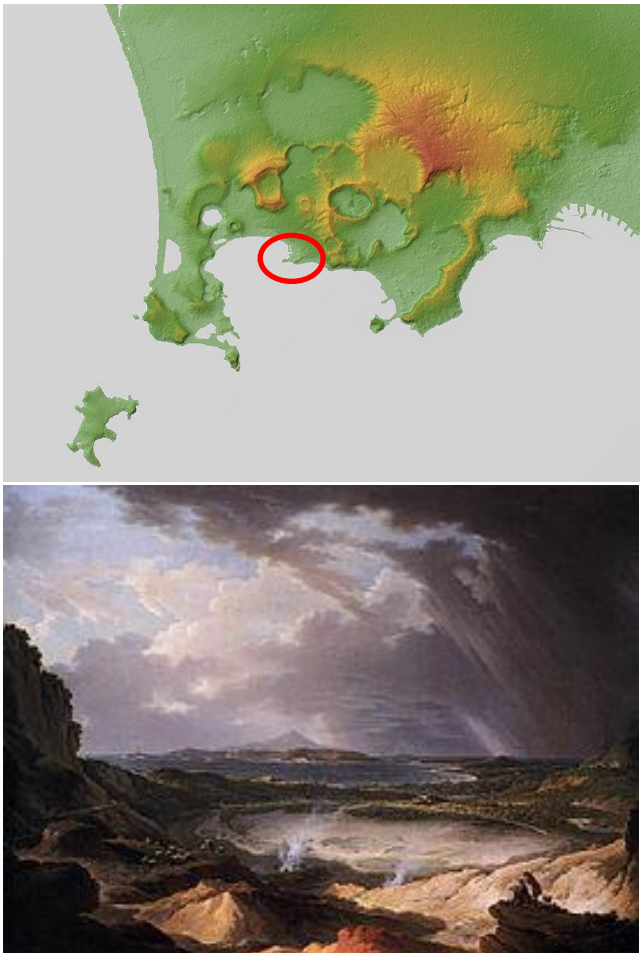
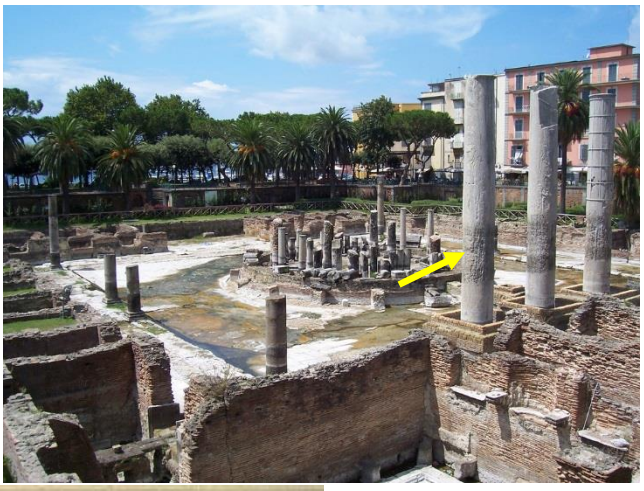


Figure 1—*The giant caldera of the Phlegraean Fields (top), with the ancient Greco-Roman town of Pozzuoli circled. The caldera, depicted in an 18th-century painting (bottom), has smoking fumerols and other signs of volcanic activity. Mount Vesuvius is visible in the distance across the Gulf of Naples. Source: N.a. (2017a); top—NASA relief map, 9 March 2016; bottom—Michael Wutky,* The Phlegraean Fields *(1780s).*

Greeks colonized the area in about 530 BC, and the Romans incorporated the town of Pozzuoli (called Puteoli in Latin) into their growing dominions by 194 BC. By the third century AD, the town had a centrally located marketplace not far from the harbor (fig. 2). The market was a massive structure with a roof supported by columns.



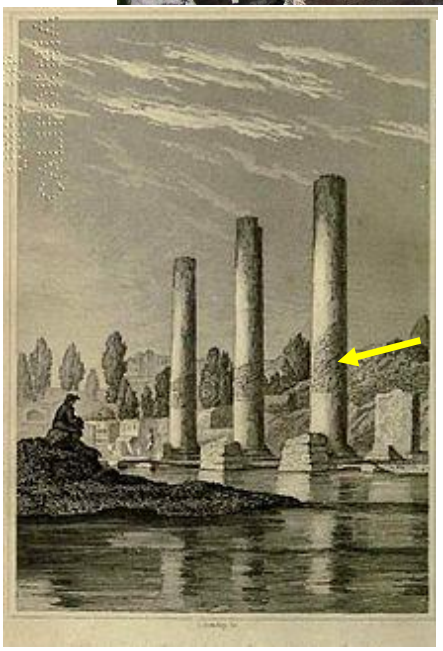
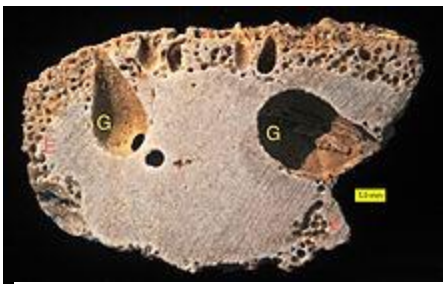


Figure 2—*Ruins of the ancient marketplace in Pozzuoli, Italy, today (above) and in the 1820s (left—frontispiece of Charles Lyell's* Principles of Geology*). The three marble columns show trace fossils (arrows) left by a marine mollusk, proving that the columns were once under the Mediterranean Sea. Because sea levels never rose after the marketplace was built, the only explanation is local subsidence and subsequent uplift caused by magma shifting in the underlying caldera. Source: N.a. (2017b).*

Three columns still exist today (fig. 2). At one time, they were partially underwater. All three columns have trace fossils left by a kind of marine mollusk (*Lithophaga*) that drills holes into limestone and marble. The fossils extend to 19 feet above the floor of the ancient marketplace, suggesting that the sea, at one point, reached that high.

By the fifth century AD, the town of Pozzuoli was largely abandoned due to local seismic activity and social turmoil attending the collapse of the Roman Empire. Ash and sediments covered the bases of the columns before they went underwater. The tops of the columns, exposed to weathering, would have been visible above the waves long enough for mollusks to drill extensive holes. In the 1750s, well after the ruins were again on dry land, archeologists excavated them



Chambers drilled in marble (above) by a bivalve mollusk called date mussel (Lithophaga) *(right). Source: Wikipedia.*

down to the floor of the ancient marketplace, revealing the undamaged bases of the columns below the exposed zones of mollusk activity (fig. 2).

For 19th-century Neptunists, the Pozzuoli marketplace posed an insoluble puzzle. The Great Flood could not explain the trace fossils because the columns were obviously built long afterwards—and on dry land, not underwater. Historical records showed no evidence of a worldwide sea level rise since antiquity, and mollusks are not known for climbing. So how did they manage to bore into the columns at points more than 19 feet above sea level?

To explain the riddle, the Werner disciple Robert Jameson published an 1823 essay by Goethe, an avid naturalist. After visiting what he mistakenly thought was a ruined temple, Goethe speculated that a volcanic eruption had destroyed the structure, burying the foundations with ash. The ash had then formed a dam and a "coincidental pond" (*zufälliger Teich*), inundating the upper columns in the pond and giving mollusks access to the marble (Franz 1949).

But how could a saltwater species of rock-boring mollusks have gotten into a volcanic freshwater pond, let alone survived there?

Never mind, said Goethe—the pond *must* have existed (Franz 1949); it was the only explanation commensurate with divine harmony in Nature. And the pond must have contained rock-boring mollusks, whether freshwater or in "waters salinated by volcanic ash" (*durch vulkanische Asche angesalzte Wasser*).

In an effort to deny the obvious, Goethe was grasping at straws—making up events and inventing species based on faith supported by sheer speculation.

Subsidence and Uplift

The simplest explanation was local subsidence of the land itself as the site sank into the sea. Numerous Plutonists had already made the connection, including the Scottish scientist John Playfair (1748–1819), who helped to popularize James Hutton's Uniformitarian theories. Charles Lyell expanded on Playfair's arguments, devoting a section of his *Principles* to a disquisition on the Pozzuoli "temple."

Lyell showed from marine sediments that coastal lands in the area had a history of sinking beneath the sea and rising again. He pointed to recent shifts in coastal elevations as evidence of ongoing cycles of subsidence and uplift. He also noted the negligible tides in the Mediterranean Sea and the absence of any general sea level rise. Clearly, it wasn't the sea that was rising and falling; it was the land itself, impelled by subterranean forces of heat and pressure.

Accordingly, Lyell dismissed "preposterous theories" (such as Goethe's pond) "advanced in order to dispense with the elevation of the land, in the face of all this historical and physical evidence" (Lyell 1830). He blamed "the interminable controversies" surrounding the Pozzuoli marketplace on "an extreme [Neptunist] reluctance to admit that the land rather than the sea is subject alternately to rise and fall."

Lyell set the stage for later geologists to explore and explain subsidence and uplift in the Pozzuoli region. Both have to do with underground shifts in magma within the huge and active caldera underlying the Phlegraean Fields. Such subterranean fluctuations have made the land slowly sink from time to time, only to rise again.

Lasting Impact

For all practical purposes, Lyell's *Principles* ended the debate. With its basis in biblical thinking, Catastrophism had failed to account for subterranean influences on landforms—and for the gradual processes of the rock cycle over geologic time. Rejecting Neptunism, a new generation of scientists worldwide embraced the Uniformitarian point of view. In recognition for his scientific achievements, Lyell was knighted in 1848 and made a baronet in 1864.

Charles Darwin was so impressed by Lyell's clear and fact-based reasoning that he used the same approach in his own interpretations of the Earth on his *Beagle* voyage (1831–1836). Under Lyell's influence, Darwin developed his theory of evolution "as a sort of biological Uniformitarianism" (Macomber 2007). Indirectly, Lyell helped to lay the foundations for evolutionary theory as well as modern geology.

Despite his appreciation for the subterranean forces of heat and pressure, Lyell never dreamed of plate tectonics—or of the asteroid collision that caused the Cretaceous–Tertiary extinction event, an occurrence more in line with Catastrophism than with Uniformitarianism. Although Lyell helped to ground geology in empirical science rather than Bible-based wishful thinking, countless mysteries remained.

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Italian Supervolcano Is Stirring

Thanks to Sue Marcus for the reference!

A supervolcano caused the largest eruption in European history. Now it's stirring again. The Italian name for the volcano—*Campi Flegrei*, or "burning fields"—is apt. Its caldera, half submerged under the Mediterranean Sea, is almost 8 miles wide. The whole area seethes with hydrothermal activity: sulfuric acid spews from active fumaroles; geysers spout water and steam; the ground froths with boiling mud; and earthquake swarms shudder through the region, 125 miles south of Rome. *Read more*.

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

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2 MSDC mtg, Washington, DC	3	4	5
6	7 GLMSMC mtg, Rockville, MD	8	9	10	11 Show: Franklin, NC	12 Shows: Franklin, NC; Fairless Hills, PA
13 **Mother's Day** Show: Franklin, NC	14	15	16	17	18	19 Shows: Parkville, MD; Chesapeake, VA
20	21 **NVMC mtg, Arlington, VA**	22	23 MNCA mtg, Arlington, VA	24	25	26
27	28 **Memorial Day**	29	30	31		

Event Details

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

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

11–13: Franklin, NC—Annual show; Gem & Mineral Society of Franklin, NC; Fri/Sat 10–5, Sun 10–4; Carpenter Community Center, 1288 Georgia Rd. (US441); no admission charge; info: Norman Holbert, 828-634-0350, normholbert@comcast.net.

12: Fairless Hills, PA—The Earth Science Show & Sale; The Rock & Mineral Club of Lower Bucks County, PA; Christ United Methodist Church, 501 Wistar Road; 9–3; $2 adults, children 12 & under free; info: Brian, 215-788-3993.

19: Chesapeake, VA—29th Annual Chesapeake Gem, Mineral & Fossil Show; Chesapeake Gem & Mineral Society; Ruhl Armory, York Rd just south of I–695; info: chesapeakegem@gmail.com.

19: Parkville, MD—29th Annual Chesapeake Gem & Mineral Show; Chesapeake Gem & Mineral Society; Parkville Armory; 10–4; admission free.

22: Arlington, VA—Monthly meeting; Northern Virginia Mineral Club; 7:45–10; Long Branch Nature Center, 625 S Carlin Springs Rd.

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

Deadline for Submissions

May 20

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

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THE NORTHERN VIRGINIA MINERAL CLUB INC
Crystals are the flowers of the Mineral Kingdom

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The Northern Virginia Mineral Club

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OR

Bring your dues to the next meeting.

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

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

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

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