



The Mineral

minutes

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Volume 75-05

May 2017

Prez

Says...

by **Dave Nanney**,
MSDC President



Spring is finally here. It was just pretending for the first couple of weeks but by the first week in April, IT IS HERE. Our garden is getting really pretty as about a third of our plants are in bloom. Please join us on 30 April from 1-5PM for our open house where you can see our mineral collection, wander through our 2 ½ acre garden, while carrying fluids of your choice. Reach out and we can send you directions.

Scott Southworth spoke to MSDC almost 11 years ago. We were brand new members, absolutely clueless about our new hobby, but very excited to be there. Scott gave a super presentation on the Billy Goat Trail followed a couple of months later with a talk on the geology of Great Falls. I strongly recommend this presentation as Scott Southworth is a true expert on the geology of Virginia.

I want to report on our two newest members, Amanda and Steve Parker. They are new to mineral collecting, but are taking every opportunity to get involved. They have visited two of our members to see their collections, are going to a Maryland quarry dig, and are joining Pat Flavin on one of her patented Calvert Cliffs visits. They are all in. MSDC is delighted to welcome the Parkers and look forward to watching your adventures in geology.



May Program

“Geology of the National Capital Region”

Presented by **Scott Southworth**

by **Dave Hennessey**

Washington, DC is a complex place rich in history, and we are not talking about politics. A series of geologic events has shaped the National Capital Region. Behind the landforms we see, there is a billion plus year story of tectonic forces – rifting and mountain-building, continental plates drifting and colliding, faults and shear zones, volcanism, metamorphism, erosion, etc. Geologically, the history of the National Capital Region has long been and continues to be a work in progress.



Our speaker this evening is Scott Southworth, a Research Geologist with the U.S. Geologic Survey, who will talk to us on the geologic processes that have shaped the region. Scott received his BS from James Madison University and his MS from the University of Maryland. His main areas of research interest include geologic structures and history. He is a Fellow of the Geological Society of America and is the Project Chief and Principle Investigator of the Appalachian Blue Ridge Project (ABRP). The ABRP is an ongoing comprehensive effort to clarify the complex structural, metamorphic, and geomorphic evolution of the Southern and Central Appalachian Blue Ridge Province. The project is a collaborative one that involves multiple USGS Regions, State Geological Surveys, and academics from seven universities. ABRP includes detailed and regional-scale mapping, geochronology, petrologic and petrographic analysis. Scott is the author of numerous professional journal publications and an accomplished lecturer and field trip leader. He serves as a science advisor to the National Park Service and has provided internship training to numerous undergraduate and graduate students from multiple universities throughout his career.

Please join us in taking Scott to dinner on May 3rd before the club meeting. We will be meeting at 6:00 pm at Elephant & Castle Restaurant, 1201 Pennsylvania Ave, NW, Washington, DC, about 2 blocks from the Smithsonian Institution National Museum of Natural History (NMNH) where our club meeting is held. If you cannot make it to dinner, we will meet in the NMNH lobby at 7:30 pm and head up to the Cathy Kerby Room at 7:45 pm for Scott's presentation.

Geological and Mineralogical Terms

- Anisotropic** Lacking consistent hardness on all surfaces. For example, the hardness of Kyanite on the Mohs scale is between 6 and 7 lengthwise, and between 4 and 4½ crosswise.
- Granofels** A little-used name for a massive granoblastic metamorphic rock, consisting of equant grains of quartz and feldspar, hence lacking a foliation. Minor mafic minerals consist of pyroxene and garnet. The anhydrous mineral assemblages of such rocks are produced under the high-grade, anhydrous granulite facies conditions found at the base of the crust.
- Charnockite** A granofels that contains orthopyroxene, quartz, and feldspar. Charnockite is frequently described as an orthopyroxene granite. Granites are felsic rocks that usually contain no or very little pyroxene.
- Monoclinic** Any mineral that has three axes all of which are unequal in length. Two of the axes are at right angles to each other and the third axis lies at an angle other than 90°.
- Acicular** An aggregate of long, slender crystals. This term is used to describe the crystal habit of single, long, thin, slender crystals.
- Type Locality** Type locality, also called type area, type site or type section, is the locality where a mineral species, particular rock type or stratigraphic unit species is first identified.
- Solid Solution** A series formed when there are intermediary minerals between two isomorphous minerals. One example is the plagioclase feldspar group which contains albit and anorthite as end members. Another example would be olivine (Fe,Mg²⁺)₂SiO₄ with Fayalite (Fe) and Forsterite (Mg) as its end members. To quote Tony Nikisher: "there are lumpers and splitters." A solid solution is the stuff of splitters
- Conchoidal** A type of mineral fracture in which the indentation is rounded and resembles a shell. People are most familiar with this type of fracture typical in broken glass.

CLUB INFO

MINERALOGICAL SOCIETY OF THE DISTRICT OF COLUMBIA

MEETINGS

Meetings are the First Wednesday of the Month (Jan-Jun and Sep-Dec). We meet in the lobby of the Smithsonian National Museum of Natural History at 7:45pm.

WEBSITE

<http://mineralogicalsocietyofdc.org/>

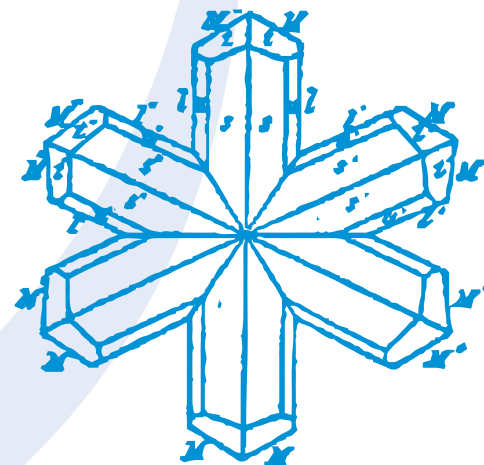
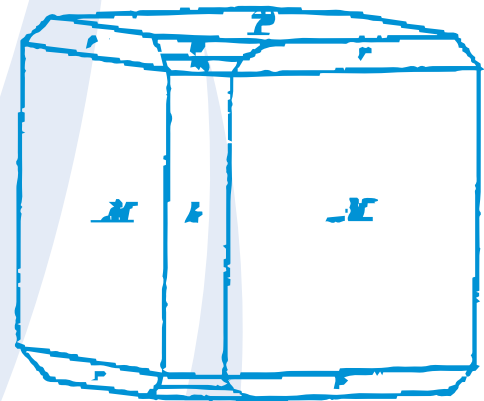
FACEBOOK

www.facebook.com/MineralogicalSocietyOfTheDistrictOfColumbia

2017 Officers & Directors

President	Dave Nanney, dnanney@cox.net
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Editor's Note: Crystal Shapes are from Goldschmidt's "Atlas der Krystallformen"



April Business Meeting Synopsis

By Andy Thompson, Secretary

President Dave Nanney welcomed club members and an unusually large number of guests (8) and thanked past MSDC presidents in attendance for their prior service to the club. He called for any recent "Geology in the News" items and Erich Grundel (pictured below) generously shared multiple media

clippings ranging from a report of the recent \$71 million dollar sale of the "Pink Star", aka the "Steinmetz Pink", to the report of political tensions surrounding the extraordinarily productive Indonesian Grasbert Mine, the world's largest gold mine and third largest copper mine. The Indonesian government is protesting the influence foreigners have over its natural resources. Another article told of the sad closing of the University of Louisiana Monroe branch museum's mineral exhibit; an interesting 1852 Smithsonian pamphlet which provided guidelines for handling minerals; a Nature magazine article for museum curators; and a 1943 booklet, Mineral Club History, written by H.C. Dake, which documented MSDC's December 1941 initial organizational meeting, and its first public meeting on 15 January 1942.



Bob Cooke contributed announcements of the Northern VA and Micromount clubs upcoming programs. Mark Dahlman and others shared information on upcoming mineral events and sales in northern NJ and elsewhere.

On a sad note, members shared the news of the passing of George Reimherr, the long time and well respected editor of the Mineral Mite newsletter (MNCA), avid collector and generous contributor to several local clubs. Born in 1937, he passed on 31 March 2017. He will be dearly missed by the collecting community of the National Capital Area. For more information, see the April issue of the Mineral Mite Newsletter found at DCMicrominerals.org.

Yearly, MSDC provides the Foshag-Hronik-Dhyse research grant to a worthy student to promote geological studies. This year, the recipient was Maggie Moss, a sophomore at George Washington University, who this summer will conduct research

on charnokites in the Blue Ridge mountain range under the guidance of Dr. Richard Tollo. Richard praised Maggie's studious dedication and reminded everyone that 2017 is the 16th year the MSDC club has supported student summer

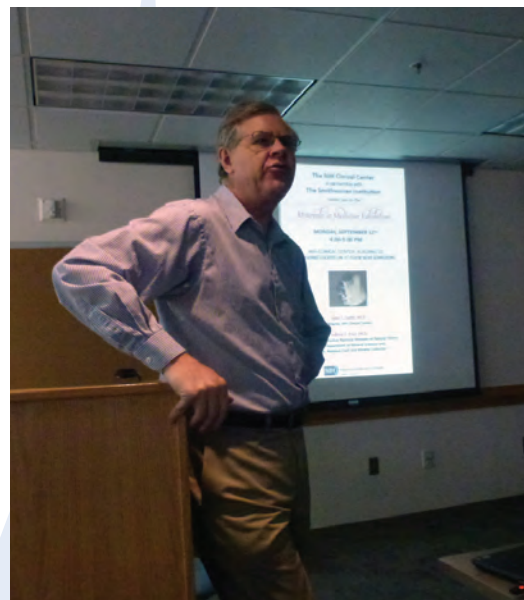


"What's New in Smithsonian Gems and Minerals" Presented by Dr. Jeffery Post, Curator-in-Charge of the National Gem and Mineral Collection

By Andy Thompson, Secretary

Dr. Jeffery Post treated the April MSDC gathering to a colorful photographic display of "What's New in Smithsonian Gems and Minerals". It was a retrospective sampling of the Mineral Department's past year's acquisitions, as well as descriptions of some of its collaborative sponsoring of educational exhibits, and the staff's collecting trips throughout the country. Jeffery concluded with an important plea for continued support for the mission of the Mineral Department.

As a member of the staff since 1984, Jeffery is well known to MSDC members. Currently he is the Curator-In-Charge of the National Gem and Mineral Collection of the Smithsonian. It is worth noting that his undergraduate work was in geology and chemistry. He concluded his geochemical doctoral work in 1981 and then spent three years as a post-doc in the geology



department at Harvard. The fact that he has spent thirty-plus years working with the Smithsonian's mineral collection, combined with the similar long tenures of two colleagues, means that when they explore for minerals or gifts from across the country and world, they actually know what minerals are already in the collection and which minerals (both type and locality) they need to build toward having a comprehensive and representative national mineral collection.

A few of the dizzying array of high quality newly acquired minerals are pictured below. They included: a very unusually shaped double triangular calcite which is actually a stalagmite found on the roof of a cave. It is here pictured upside down.

They also acquired a relatively large blue-black fluorite from inner Mongolia. Other additions included a deep purple botryoidal shaped calcedonia from Indonesia; a three-generation calcite from Mexico; a goethite from Spain; azurite from Australia; emerald from Ethiopia; chrysocolla from New Mexico; a deep blue halite from Carlsbad, NM; an aragonite from China; a yellow brucite from Pakistan; and a very large, 52 carat star ruby from Burma.



April Business Meeting (cont.)

research projects. He noted also that two prior grant recipients have recently received their doctoral degrees, Allison Ruben (2009) from Univ. of CA, Davis and Stanley Mordensky (2010), from the University of Canterbury, New Zealand.

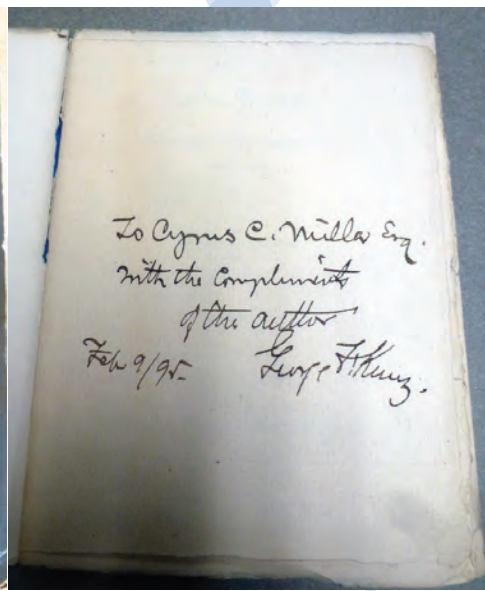
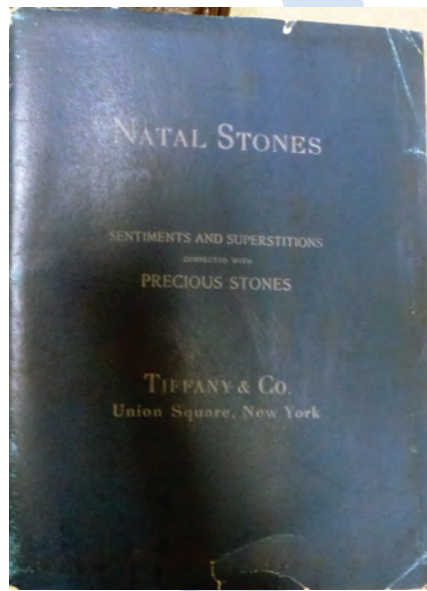
Vice President Dave Hennessey gave his Program Report by noting that the MSDC May meeting will feature Scott Southworth presenting the geology local to the DC area. The June program will be given by Jake Slagle, editor of Mineral Bliss, the newsletter of the Baltimore Mineral Society. Details TBA.

Ed proposed the attending members approve the MSDC March business minutes as published in the April newsletter, which motion was seconded and approved unanimously.

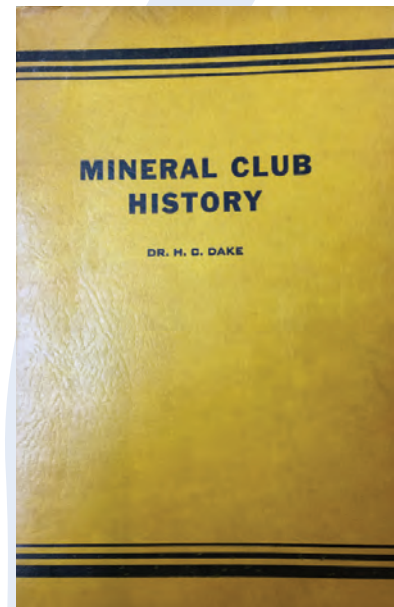
Dave Nanney called for a motion to close the business meeting which was made, seconded and approved. Dave Hennessey then introduced the evening's speaker, Dr. Jeffrey Post.



Dr. Jeffrey Post, April Presenter, Maggie Moss, 2017 Grant Recipient and MSDC President Dave Nanney



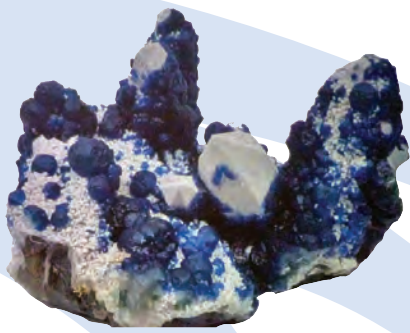
Erich brought in an autographed edition of George Kunz's Natal (Birth) Stones. Dr. Kunz was highlighted in last month's newsletter



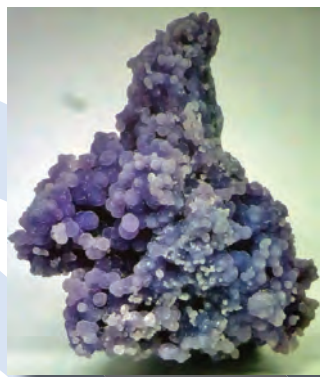
From 1948, courtesy of Erich, shows that MSDC was very alive and kicking from the start



Mesolite from Oregon recently added to the National Collection



Fluorite from Mongolia



Indonesian Chalcedony

Jeff also show a photo of the extraordinary large 187.67 carat Foxfire Diamond which is on loan from the Rio Tinto mine. That mine normally produced small diamonds, with the very largest being in the 10 to 15 carat range. When the company accidentally discovered the Foxfire in the tailings, they had no idea if there were other titanic specimens they had missed. So they shut the mine down for two months to examine all the tailings, but no other large specimens were found.



In addition to maintaining and building the Smithsonian's own collection, the Mineral Department partners with 225 affiliated museums throughout the U.S., temporarily loaning specimen exhibits which educate and share this national treasure with the broader public. One such partnership is particularly touching, an 18-month long "Minerals in Medicine" display of 39 specimens intended to interest and distract the patients at the NIH Clinical Building in Bethesda who typically have long-term treatments and stays in this medical center. From azurite to zinnwaldite, the specimens are not only beautiful but each plays an important role in some aspect of human medicine or biology.

This unusual partnership came about due in part to the Center's Director, Dr. John Gallin, having a strong interest in minerals and their use in medicine. Once the specimens were selected, such as those pictured below, the medical staff then identified and wrote labels for how the human body and/or medicine in general uses these minerals to meet critical needs, for which task the NIH medical personnel were uniquely qualified. The



Photo by Andrew Propp

partnership is benefiting all who visit the exhibit.

Additional venues where the Smithsonian mineral staff provides annual exhibits include the world famous Tucson and Denver shows. This year they also participated in the Dallas, TX show, appropriately named for Texas' image: "Giant Gems", which runs through January of 2018. In all of these settings, the staff not only provides tailored, thematic mineral displays, but also gives lectures and are available for sharing their expertise with amateurs and professionals alike. Sometimes they even meet with donors who gratefully contribute special minerals to the national collection.

One such development happened when Oddy and Rick, from the Reel Mine in Iron Station, NC brought Jeff a stunning set of large amethyst specimens from the mine as a donation to the national collection. Upon making this extraordinary contribution, Rick told Jeff this was "the most important day" in his life.

Jeff also shared a less romantic side of mineral hunting, for sapphires in Sri Lanka. In one famous town Ratnapura, the government leases prospectors a tiny two foot by four foot plot.

The digging by hand then begins and may require descending to 100 feet before any sapphire-bearing gravel is found. The tiny hole requires a small forest of rubber tree timbers as supports to protect



Photo from fernandostours.com/

from cave-ins. The government forbids exporting rough minerals without special permission and so any lapidary work must be done in-country. This provides employment for locals, as well as sustainable mining for the future.

In conclusion Jeff shared his concern that due to inadequate funding, today's Smithsonian mineral staff is but half the size it was 20 years ago. Currently there are five slots for mineralogists that due to a hiring freeze have gone unfilled. A major challenge for the future is: what happens to the curation of the national mineral collection when the current cohort of seasoned mineralogists retires and there is no longer a living collective memory of the content of national collection? The collection holds 350,000 items, so mastery of its content takes years to absorb. So all forms of support to the Smithsonian's mission are needed and most appreciated.

After his presentation, President Dave Nanney thanked Dr. Post for his excellent, comprehensive and very interesting program. The MSDC members and guests added their appreciative applause.

A brief "Show and Tell" session traditionally puts the cap on the club's meetings and Mark Dahlman appropriately showed a specimen of postite, a mineral which in 2011 was named in honor of Dr. Jeffrey Post and an amethyst from Paterson, NJ. Ken, as always, brought in interesting specimens, including zeolites and datolite, as well as an aragonite from Sterling Hill and others from New Hampshire. Erich shared his 1948 book about mineral clubs which documented MSDC's 1941 origins and meeting open to the public in 1942. Dave Nanney thanked those who brought snacks and encouraged all to stay, welcome visitors and renew conversations among members.

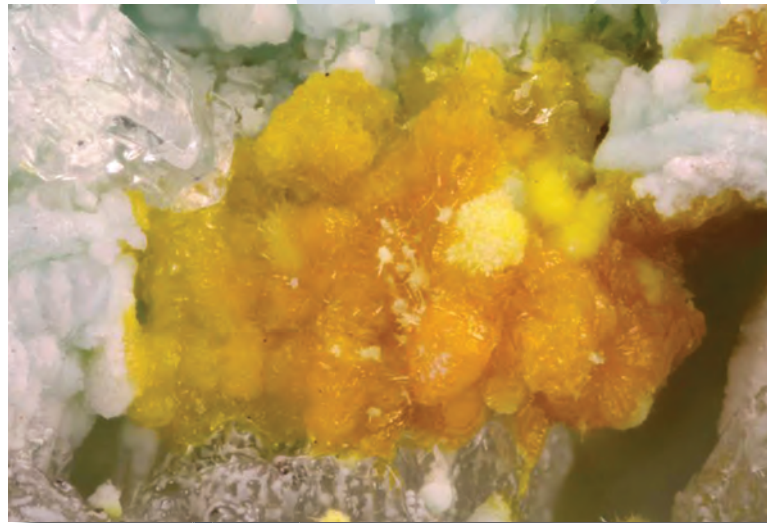
Geologists Uncover Three New Uranyl Minerals

By ScienceAlert Staff, ScienceAlert.Com

A team of geologists has discovered three new minerals — leesite, leószilárdite and redcanyonite — growing on the walls of old uranium mines in southern Utah.

Leesite, leószilárdite and redcanyonite are like uranium rust and while the glowing green stereotype of uranium is close it's not quite right. These three yellow minerals represent a small and unique slice of the Earth's crust where human activity spurred the formation of previously unknown minerals.

All three specimens were uncovered by Travis Olds, a graduate student at Notre Dame University, Owen Mills, director of Michigan Tech's Applied Chemical & Morphological Analysis Laboratory, and Shawn Carlson, an independent geologist. "The only way to better understand the chemistry of uranium is to go out and find new minerals — and describe their topology, their structures," Olds said. "They teach us a lot about how uranium can then be moved in the environment."



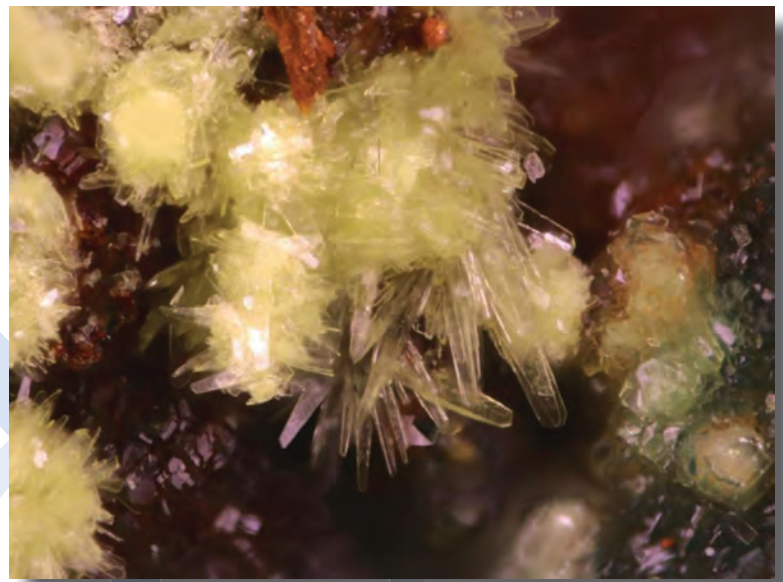
Uranyl minerals have distinct bright colors even after the uranium-rich ore interacts with air and water to form crusts like leesite. Image credit: Travis Olds.

Though small and barely visible to the naked eye, leesite occurs in bright yellow aggregates of stacked blades or radiating needles up to one millimeter in length. This mineral also forms powdery masses nestled against a backdrop of companion minerals, most notably gypsum.

Leesite's $(K(H_2O)_2[(UO_2)_4O_2(OH)_5] \cdot 3H_2O)$ atomic arrangement stacks in alternates of uranium and oxide layers, and potassium is what sets it aside as a new mineral. Given its chemistry and structure, it's a member of the schoepite mineral family; miners called the general mess of these minerals growing on the tunnel floors 'gummites.'

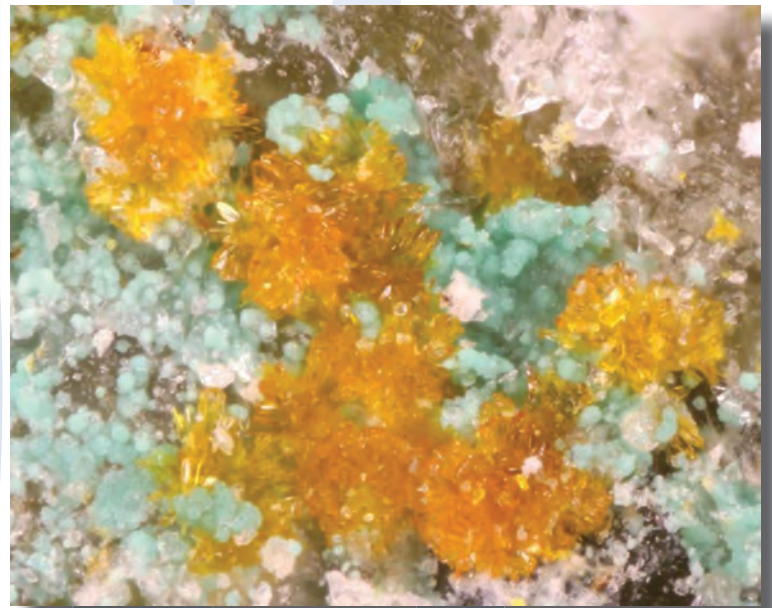
Leószilárdite $(Na_6Mg(UO_2)_2(CO_3)_6 \cdot 6H_2O)$ is pale yellow. A carbonate formed through uranium ore interacting with air, it's also water soluble. Its most distinctive feature are bladed crystals. "If you look at leószilárdite in a picture, you can kind of pick out that they have an unusual shape," Olds said. "But put them under the scanning electron microscope and it's obvious."

Redcanyonite $((NH_4)_2Mn[(UO_2)_4O_4(SO_4)_2](H_2O)_4)$ is named for the area where these rare minerals are found. This mineral varies in hue from orange to red-orange and the color comes from what chemically makes the mineral new — manganese and ammonium in its structure — and being a sulfate, it is not soluble in water, unlike leószilárdite.



The crystals of leószilárdite are only a couple millimeters long at most. Image credit: Travis Olds.

Redcanyonite is one of the rarest uranyl minerals known because it can only grow within narrow constraints: access to manganese ions is the main driver, but it also can only form in organic-rich layers, the most likely source of ammonium.



Redcanyonite. Image credit: Travis Olds.

The new minerals are described in the December 2016 issue of the Mineralogical Magazine.

Type Localities:

- Redcanyonite Blue Lizard Mine, Red Canyon, White Canyon District, San Juan Co., Utah, USA
- Leesite Jomac Mine, White Canyon, White Canyon District, San Juan Co., Utah, USA
- Leószilárdite Markey Mine, Red Canyon, White Canyon District, San Juan Co., Utah, USA

Large, Exceptional Gem Diamonds Formed from Metallic Liquid inside Earth's Mantle

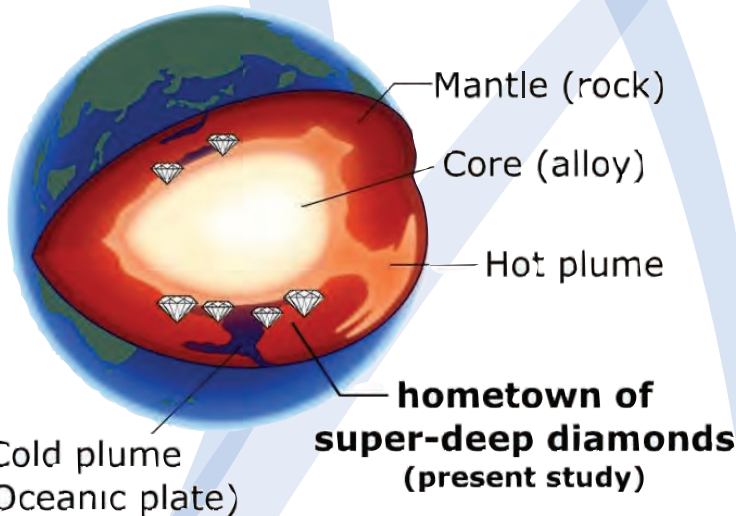
By ScienceAlert Staff, ScienceAlert.Com

New research in the journal Science explains how diamonds of exceptional size and quality formed — from metallic liquid deep inside Earth's mantle.

To date, researchers have puzzled over the origin of large diamonds like the famous Cullinan Diamond, discovered in South Africa in 1905; the Koh-i-Noor, found in India in the 13th century; or the widely publicized, uncovered in Botswana in 2015.



Lesedi La Rona, formerly known in media as Karowe AK6 is the third-largest diamond ever found, and the second-largest of gem quality. Photo: Wikimedia



Earth's interior and the location of super-deep diamonds. Credit: Fumiya Maeda

Historically, research into such diamonds has been nearly impossible due to the high value of the jewels and the fact that they rarely contain inclusions that might shed light on their geological origin. "Some of the world's largest and most valuable diamonds exhibit a distinct set of physical characteristics that have led many to regard them as separate from other, more common diamonds," said study senior author Dr. Wuyi Wang, director of research



World's biggest and most-valuable diamonds like the Cullinan, Constellation, and Koh-i-Noor formed in deep mantle metallic liquid. Image credit: Colin Behrens.

and development at the Gemological Institute of America. "However, exactly how these diamonds form and what they tell us about the Earth has remained a mystery until now."

Dr. Wang and co-authors studied large gem diamonds by examining their so-called 'offcuts,' which are the pieces left over after the gem's facets are cut for maximum sparkle. The researchers determined that these diamonds sometimes have tiny metallic grains trapped inside them. In addition to the metallic inclusions, some of these exceptional diamonds contain mineral inclusions that show the diamonds formed at extreme depths, likely within 224-466 miles (360-750 km) in the convecting mantle. This is much deeper than most other gem diamonds, which form in the lower part of continental tectonic plates at depths of 93-124 miles (150-200 km).

"This new understanding of these large diamonds resolves one of the major enigmas in the study of diamond formation — how the world's largest and most valuable diamonds formed," said study first author Dr. Evan Smith, also from the Gemological Institute of America. "The composition of the inclusions, however, provides the story."

The metallic inclusions are a solidified mixture of iron, nickel, carbon and sulfur, also containing traces of fluid methane and hydrogen in the thin tiny space between the metallic phases and the encasing diamond. Pure carbon crystallized in this mix of molten metallic liquid in Earth's deep mantle to form diamonds.

Small droplets of this metallic liquid were occasionally trapped within the diamonds as they grew. During cutting and polishing, parts of the diamond that contain inclusions are often cut off or polished away to craft exquisite polished gems with minimal flaws.

"Previous experiments and theory predicted for many years that parts of the deep mantle below about 155 miles (250 km) contain small amounts of metallic iron and have limited available oxygen," Dr. Smith said.

"Now, the metallic inclusions and their surrounding methane and hydrogen jackets in these diamonds provide consistent, systematic physical evidence to support this prediction." The results are also important for understanding how volatile substances like carbon might cycle through Earth's interior over time.

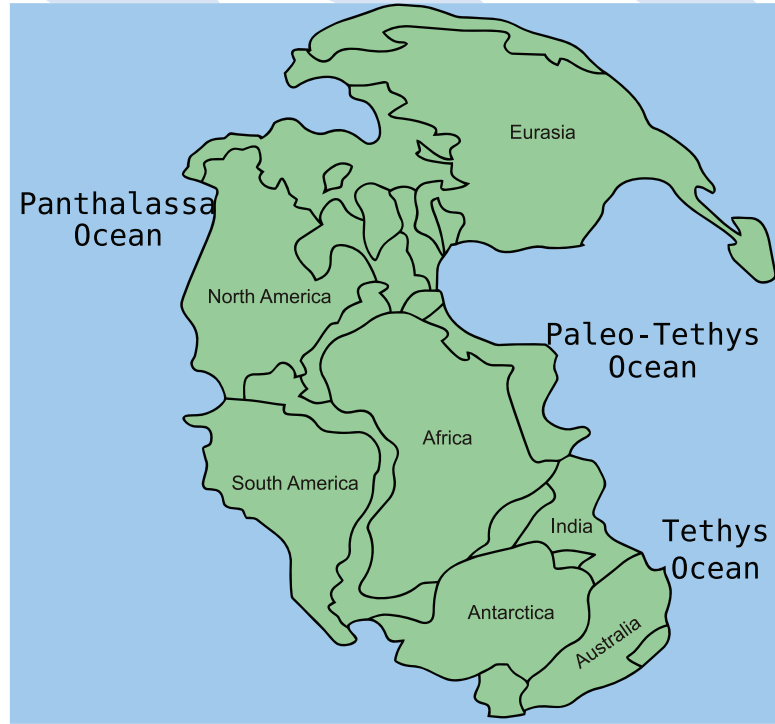


Cullinan I (l), British Royal Scepter; Cullinan II (r), British Crown. Both cut from the same stone. 9 total stones of varying sizes were cut from the original 3,106 carat uncut stone.

The Earth's Crust Is Getting Thinner Than Ever Before

From GeologyIn.Com

If you looked back at Earth 170 million years ago, you'd find a very different planet. The world's continents were all linked up into one vast 'supercontinent' called Pangaea, and according to a new study, the outermost layer of the planet was 1.7 km (1 mile) thicker than it is today.



Researchers have found that since the break-up of Pangaea, Earth's inner mantle has been cooling twice as fast as we thought, and it looks like its crust has been thinning out ever since. "It's important to note [that] Earth seems to be cooling a lot faster now than it has been over its lifetime," says geophysicist Van Avendonk from the University of Texas. "The current state of Earth, where we have a lot of plate tectonic events, this allows Earth to cool much more efficiently than it did in the past." To be clear, when we say Earth has been cooling at an unprecedented rate over the past 170 million years, we're not talking about the climate, which has definitely not been cooling.

What Avendonk and his team have been investigating is the internal temperatures of Earth over time, and they've found that the planet today is producing far less magma than it was during the time of the dinosaurs. To trace the changes in Earth's outer layer over the past 2.5 billion years, they analysed 234 measurements of crust thickness from around the world over a number of geological ages. They found that oceanic crust formed in the mid-Jurassic 170 million years ago was 1.7 km (1 mile) thicker than the crust that's being produced today, and since then, the mantle below has been cooling much more rapidly than expected.

So why is Earth's crust thinning out?

The outermost crust of Earth is formed by the mantle, which sits between the scorching hot core and the crust, spanning some 2,900 km (1,802 miles), and making up a whopping 84 percent of the planet's total volume.

Magma produced in the mantle forms the outer oceanic crust when it rises to the surface and cools into rock. Based on chemical analyses of lava rocks, Avendonk and his team found

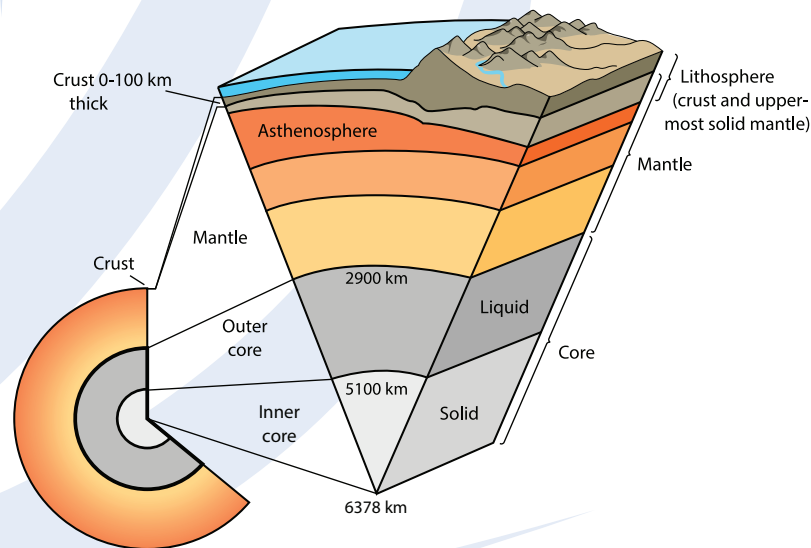
that since about 2.5 billion years ago, the mantle has been cooling at a rate of 6 to 11 degrees Celsius every 100 million years.

But then something happened around 170 million years ago to bump that cooling rate up to as much as 20 degrees per 100 million years ever since. "While scientists expected the mantle to cool over time as heat left over from Earth's formation and from radioactive decay dissipates, this degree of cooling was surprising," Thomas Sumner explains for Science News. The researchers suspect that plate tectonics - the theory that Earth's 'outer shell' is divided into several plates that glide over the mantle - could explain the cooling.

One of the biggest changes to Earth's plates occurred from 200 to 170 million years ago, when Pangaea split apart and eventually formed the separated continents we know today, and it looks like this spread led to everything cooling down. "What we think is happening is that the supercontinent was like an insulating blanket," Van Avendonk explains in a press release. "So when these continents started opening up and the deeper mantle was exposed, more or less, to the atmosphere and the ocean it started cooling much faster." It's thought that the way Earth's tectonic plates sink, shift, and form during significant eras of change like the gradual break-up of Pangaea shifts heat in the planet's interior, affecting how it cools in certain areas. "While mantle temperatures below the Pacific Ocean have decreased around 13 degrees per 100 million years, the mantle below the Atlantic and Indian oceans has cooled about 37 degrees per 100 million years," Sumner reports for Science News.

This difference appears to be linked to the oceans' distance from the continents. The study could not only explain why Earth's crust appears to be getting thinner with age - it could also explain why Pangaea split up in the first place: all the heat below that giant 'insulating blanket' might have eventually broke through and split the landmass apart. "This could explain why you get a breakup about 100 million years after you get a supercontinent assembled," Laurent Montési, a geodynamicist at the University of Maryland in College Park, who wasn't involved in the study, told Sumner.

The research has been published in Nature Geosciences.



Evidence of Ancient 'Geological Brexit' revealed

From GeologyIn.Com



White Cliffs of Beachy Head and Seven Sisters

Ancient 'Geological Brexit': How Britain Got Separated From Europe Thousands Of Years Ago

The UK has now started the formal process of leaving the EU, but scientists say they have evidence of a much earlier "Brexit". They have worked out how a thin strip of land that once connected ancient Britain to Europe was destroyed. The researchers believe a large lake overflowed 450,000 years ago, damaging the land link, then a later flood fully opened the Dover Strait.

The scars of these events can be found on the seabed of the English Channel. Professor Sanjeev Gupta, who led the study, from Imperial College London, said: "This was really one of the defining events for north west Europe - and certainly the defining event in Britain's history."

"This chance geological event, if it hadn't happened, would have meant Britain was always connected to the continent."

More than half a million years ago, in the midst of an Ice Age, a land bridge connected Dover in the South of England to Calais in northern France. Immediately to the north of it, was a huge glacial lake, which had formed at the edge of an ice sheet that covered much of Europe.

The researchers believe that this lake started to overflow, sending vast amounts of water crashing over the land bridge. The evidence for this was found at the bottom of the English Channel. Decades ago, engineers who were

surveying the seabed for the Channel Tunnel, discovered a series of mysterious large underwater holes.

Now further scrutiny has revealed that they were most likely caused by the lake overflow. Prof Gupta said: "These holes are now in-filled with sediment, but what's interesting is that they are not linear features like canyons or valleys - they are isolated depressions. "And they occur in a line - a whole series of them stretching between Dover and Calais. And they are huge, 100m-deep carved into the bedrock and hundreds of metres to several kilometres in diameter.

"So we interpret these as giant plunge pools. We think there was basically lake water plunging over this rock ridge in the Dover Strait through a whole series of waterfalls, which then eroded and carved out these depressions. "It's difficult to explain them by any other mechanism." The researchers believe the lake started to overflow about 450,000 years ago, which would have seriously weakened the land bridge.

But they think a second catastrophic flood that took place about 150,000 years ago would have destroyed it altogether. "We see this huge valley carved through the strait, about eight to 10km wide... and it has a lot of features that are suggestive of flood erosion," said Prof Gupta. Co-author Jenny Collier, also from Imperial College London, said it was not clear what caused either of these events. She said: "Perhaps part of the ice sheet broke off, collapsing into the lake, causing a surge that carved a path for the water to cascade off the chalk ridge. "In terms of the catastrophic failure of the ridge, maybe an earth tremor, which is still characteristic of this region today, further weakened the ridge.

"This may have caused the chalk ridge to collapse, releasing the megaflood that we have found evidence for in our studies." The researchers would now like to work out more precise timings of the "geological Brexit". This would mean drilling into the bottom of the Dover Strait and analysing the age of the sediment. "But that would be a huge undertaking," admitted Prof Gupta. "The English Channel is the world's busiest shipping lane and it has huge tidal currents. It will be hugely challenging."

The study is published in the journal Nature Communications.



Britain broke away from mainland Europe after a wave of dramatic megafloods nearly 450,000 years ago

Sapphire Rush Near Ambatondrazaka, Madagascar

from *Gems & Gemology*, Winter 2016, Vol. 52, No. 4 - The GIA Quarterly Publication

by Rosey Perkins and Vincent Pardieu

In October 2016, a sapphire rush of an estimated 45,000 miners occurred at Bemainty, about 35 km east of Ambatondrazaka, Madagascar. Author VP was informed of the rush by Marc Noverraz, a Swiss gem merchant based in Ilakaka, Madagascar. According to Mr. Noverraz, some large, highly saturated blue sapphires were found at the rainforest site in late September. This attracted people from all over the island, as well as traders (mainly from Sri Lanka) who settled in Ambatondrazaka to buy gems.

Author RP gained access to the site from October 23 to 26. When she arrived, miners were working along either side of a river. The mining area was slightly more than 2.5 km long. The miners were digging for gem-rich gravels near the river or in the forest while washing took place in the nearby stream. The sapphires produced were mainly blue, varying from light to deep blue (figure 1). Many of the blue specimens were very slightly green; most were milky and would benefit from heat treatment.



Figure 1. A rough blue sapphire at the rush site at Bemainty, near Ambatondrazaka, Madagascar. Photo by Rosey Perkins.

Particolored stones with pink/blue/colorless color zoning and pinkish orange sapphires (like those discovered at Mandraka near Toamasina in 2011) were also found.

This new rush area (figure 2) was clearly a secondary deposit. Miners had dug pits up to two meters deep in order to collect potentially gem-rich gravels for washing in the stream using hand sieves. Life at the mining site was very basic, with some people



Figure 2. Thousands of independent Malagasy miners work the sapphire deposit in the rainforest east of Ambatondrazaka. Photo by Rosey Perkins.



Sapphires of approximately 15 cts in size, reportedly from the gem rush near Ambatondrazaka, seen at KV Gems office in Bangkok in Dec 2016; stones courtesy KV Gems, Bangkok. Photo by Vincent Pardieu/GIA.

living in huts but most in makeshift tents under a plastic roof. There was no sanitation, and clean water was not available. While some police were present to keep the peace, it is now believed they took greater control of the area, and the number of active miners seems to have decreased.

Author RP accessed the site from Ansevabe, a one-hour journey from Ambatondrazaka by motorbike, though many people were reaching the area by tractor, bicycle, or on foot (an 11-hour walk from Ansevabe). On her return to Ansevabe, RP estimated a thousand people traveling toward the mine. In Ambatondrazaka, she saw blue stones from the rush weighing up to 75 ct. Fine, clean blue stones over 100 ct and some attractive pinkish orange stones over 50 ct were also reported.

As rubies and sapphires have been discovered fairly regularly in this region since 2000, a new sapphire find was not a huge surprise. The region is part of the Ankeniheny-Zahamena-Mandadia Biodiversity Conservation Corridor and



Restoration Project, which consists of Ankeniheny, Zahamena, and Mantadia National Parks. The rush site is therefore a protected area. Several sources in Madagascar have reported that by early November the authorities had started to control the foreign buyers, though stones continue to emerge from the mine.

About the Authors

Rosey Perkins is an independent gemologist in London, and Vincent Pardieu is senior manager of field gemology at GIA in Bangkok.

<https://www.gia.edu/gems-gemology/winter-2016-gemnews-sapphire-rush-near-ambatondrazaka-madagascar>

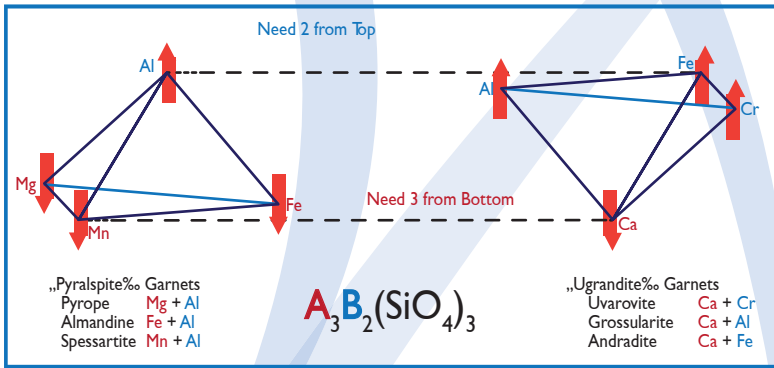
A Photo-Tour of Garnets...Now in Every Color!

by Dion Stewart

Originally from the Cob-L-Stones Newsletter of the Cobb County Gem & Mineral Society (Georgia), March 2015

Editor's Note: I have rebuilt the diagrams for readability, some minor editing for clarity and have substituted some photos for quality.

Almost everyone is familiar with the standard red garnet that is January's birthstone, but the common red color is just one of an array of beautiful colors that can be found in this mineral group. This article is a photographic tour of the colors of garnets coupled with a compositional diagram showing the chemical make up that determines the color in each variety of garnet. Many of the popular names used to categorize a distinctly colored garnet are known as a "variety" or a trade-name, and such name are often not recognized by the professional world of mineralogists as a true species. Trade names will be noted with an asterisk in the end of the garnet name in this article.



The cause of a garnet's coloration is said to be "idiochromatic", meaning the color is due to the chemical composition that is usually reflected in the minerals formula. To depict a garnet's chemical make-up, I created a "3-D" diagram showing two side-by-side pyramids – one points up and the other points down.

For a garnet to be electrically balance it must take three ions from the bottom of the diagram, which are placed in the red "A" spot in the formula; and two ions from the top of the diagram, which are placed in the blue "B" spot in the formula. The common combinations are shown by the sloping black lines that make the sides of the pyramids. Garnets forming in the right-side-up pyramid are a subgroup called "pyralspites" whereas garnets in the upside-down-pyramid are the subgroup called "ugrandites". These sub-group names are combinations of the species names that occur in the subgroups. In general, pyralspites form by metamorphism of basalt and shale and are found in schist and amphibolite rocks, whereas ugrandites are more common in metamorphosed limestone and are associated with marbles. Now to the colors, which are usually 100% natural; meaning they have not been enhanced in any way by heating, irradiation, or other man-made techniques that commonly are used on rubies, sapphires, topaz, diamonds, emeralds...etc.

(it is surprising how few gemstones are NOT enhanced in one way or another). For each color discussed a double-pointed, thick, red arrow will show where the composition occurs within the double-pyramid diagram.

ALMANDINE

This deep red species often displaying

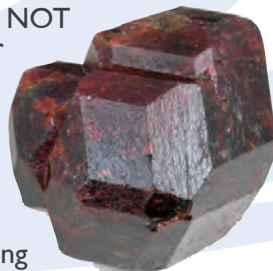
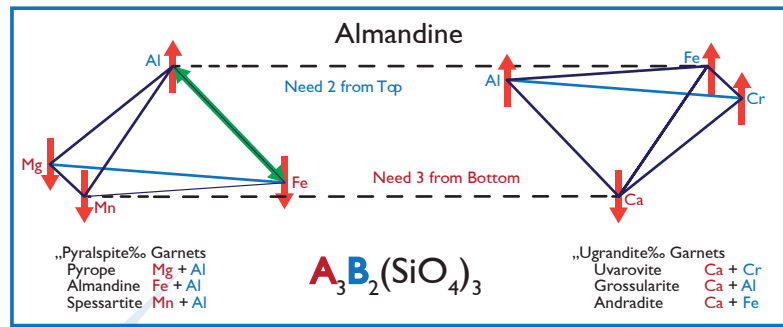


Photo: John Betts



a strong violet tint is the most common garnet in nature. The color is often so dark, due to the Fe²⁺ (divalent iron) in it, that almandine is commonly hollowed out or cut thin to allow the color to be seen.



Color visible due to coring of beads

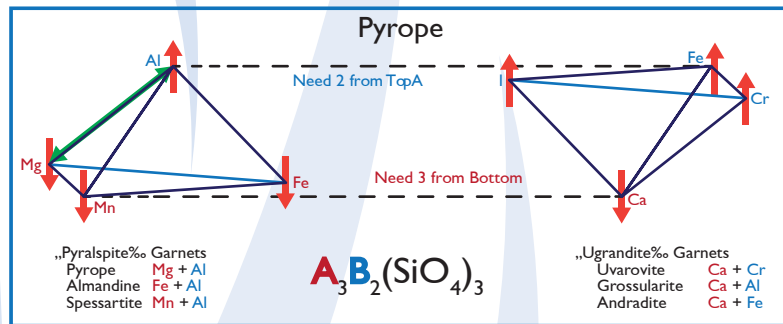


Selectively lighted facets



Pomegranate Seeds

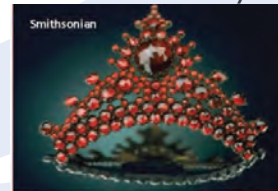
PYROPE



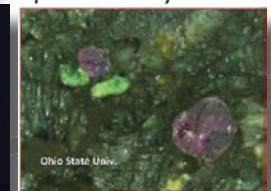
The bright red of pyrope
GemSelect.com

This species is a bright red garnet often with a light purple tint. It is the most common red garnet gemstone and is likely the source of the name "garnet", which came from the red pomegranate seeds that had the Latin name "Garanatus" and is an exact match to pyrope's color. Theoretically when pyrope is pure, all the magnesium should replace all the iron, however most pyrope has some iron as well as other trace coloring agents within its structure.

Some pyrope garnets form deep in the mantle of the Earth, and are brought to the surface by volcanic eruptions. These high pressure varieties can be lavender due to very low iron content and some chromium substituting for aluminum. There are several different trade names that occur with mixtures of pyrope and almandine as various color tints begin to dominate the stone, but the most commonly accepted variety is called rhodolite*.



Victorian Pyrope Hairpin



Lavender Pyrope in mantle xenolith

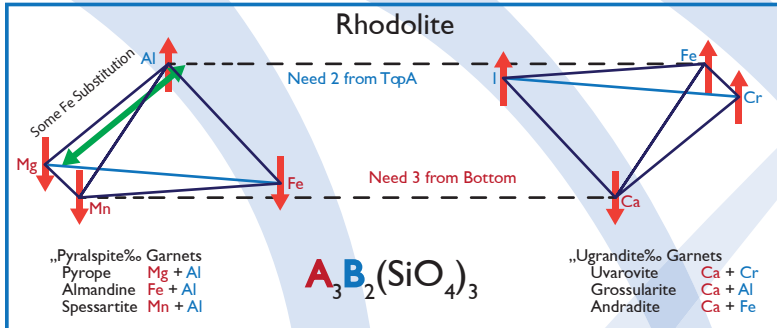


Pyrope from William Larson Collection

RHODOLITE



This variety of a mixed almandine-pyrope has a purple to pink tint and a lighter red color due to an increase in magnesium compared to pure almandine. Magnesium does not cause any color so it merely dilutes the influence of the iron. Some trivalent iron commonly substitutes for the aluminum, and a small amount of manganese also is often present.



hessonite and topazolite, and they can be confused with impure spessartite, and their colors will be seen latter in this article. The decrease in red coloration seen in cut spessartite gems (displayed on the next page) show the wide color range on the market. The next to last color (the oval gemstone) in the line is interestingly called the "Fanta Orange" spessartite, named after the soft drink.



Photo: John Betts

A group of variety names are also associated with spessartite; again, many of these are based upon locality and the true difference in color is often not distinguishable. The Malaya Garnet* has a peachy tint, and a range of these is displayed in the John J Bradshaw photo. The Mandarin Garnet* has the strong orange color with yellow tints that is called the "Fanta Orange Garnet."



Malaya Garnet*
- Spessartite

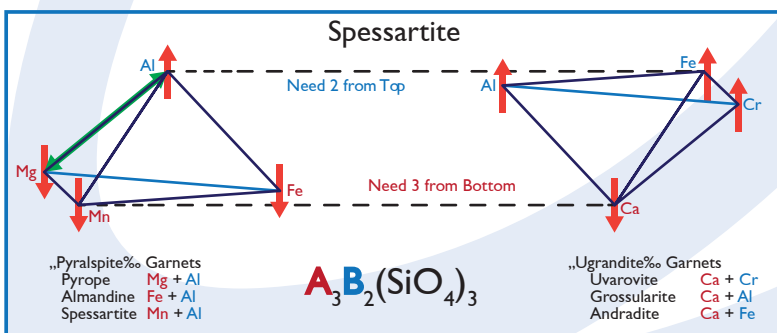


Mandarin Garnet*
- Spessartite

Interestingly as the pink color increases and the darker red diminishes the value of the stone decreases, but the popularity among the public has often increased ([http:// www.gemval.com/chart.php](http://www.gemval.com/chart.php)). Currently one of the most popular varieties is called the "Raspberry Rhodolite" with a strong pink tone. Umbalite* garnet (Umba) and Tanga* garnets are subvarieties of rhodolite that have minor variations in color from that of rhodolite. These subvarieties are based on locality names, and there are no established color guidelines for the naming of such sub-varieties; such names are very unreliable for giving you valid information about the color of the garnet. Tanga* garnet (near right) is a rhodolite that commonly has an orange tint, whereas Umba* garnet (far right) is a rhodolite with a more violet tint.

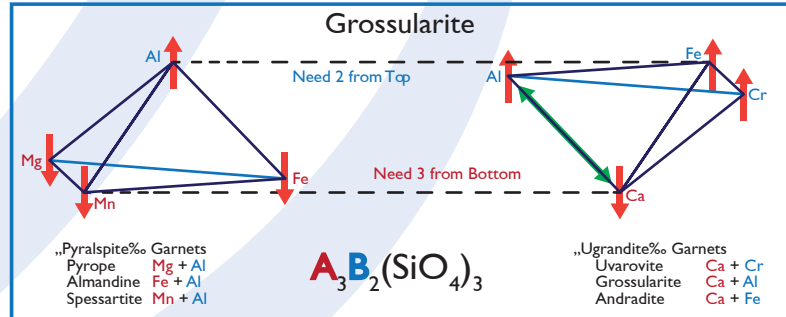


SPESSARTITE



Spessartite garnet (also called spessartine) in its pure form shows a very strong orange coloration with tints of red and yellow. As iron increases and manganese decreases the orange color diminishes and the red color grows stronger. Note that two other garnet varieties can have an orange tint; these are

GROSSULARITE



Most garnets are a true garbage pail of compositions, and it is rare to find a pure end-member species that matches the composition diagram. Most grossularite lie off the pure line having some iron and other impurities that give a host of colors, a few having their own variety name. Interestingly the pure calcium-aluminum specimens are so uncommon that when colorless this species has been given the variety name of leuco garnet*. Most grossularites have a tan color, often referred to as "honey brown", that can vary from very light to a quite rich tone having a distinct tint of orange and red, as seen from left to right below. Both

the calcium and aluminum from the pyramid diagram are ions that do not impart color to a mineral, however, grossularite is easily colored by minor substitutions of "color causing" ions that produce many different colors.

Two of the colored varieties of grossularite that have received trade names are Merelani Mint Garnet*, which has a light to medium green color, and Hessonite*, which has a distinct cinnamon color with its distinctive reddish brown tint. Some grossularites from Mexico and Tanzania have a light to medium pink coloration, and they are becoming quite popular. I feel certain that these pink colors will soon be given a variety name within the jewelry trade, but right now they are simply referred to as pink grossularite.



torraca.net

Leuco garnet*- pure grossular

color is the result of trace amounts of chromium or vanadium. The color is amazingly uniform within tsavorite jewelry. The name "tsavorite" was only coined in 1974 by Tiffany & Company for Tavor National Park in Kenya, where a major deposit was discovered; the name caught on very quickly and is now used worldwide.



Blue flash in corners is due to dispersion



iRocks.com



mineral-forum.com

ESTRELLA-2013



johnbetts-fineminerals.com



Johnbetts-fineminerals.com



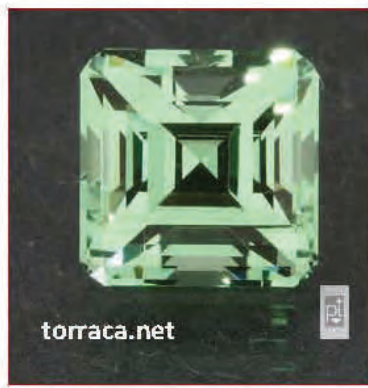
gemstoneguru.com

Green of Tsavorite



johnbetts-fineminerals.com

Pink Grossularite – No trade name yet.



torraca.net

Merelani Mint* – Grossularite



crystalclassics.co.uk

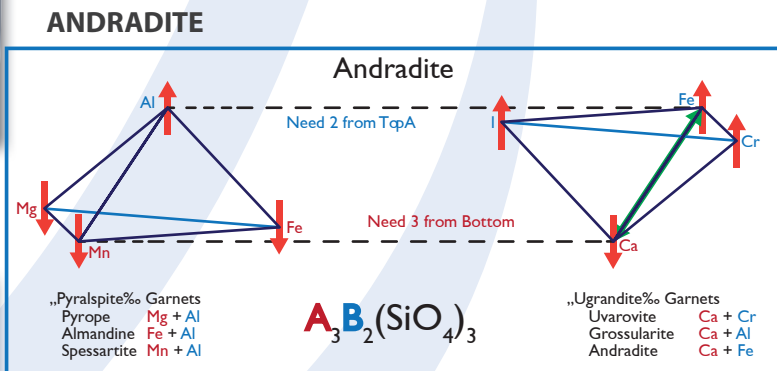
Hessonite* – Grossularite

TSAVORITE*

This variety of intense green grossularite deserves special attention because it is now outcompeting emerald as the green gem of choice among knowledgeable buyers. Peter Torraca, a gem cutter who regularly uses tsavorite, made the now often quoted remark that "Tsavorite is the green that emerald wishes it could be." This garnet has a higher dispersion (ability to break white light into colors) than an emerald. It is a close match to the hardness of the emerald but the tsavorite is much more durable and tougher.



Tsavorite - Isometric Crystal

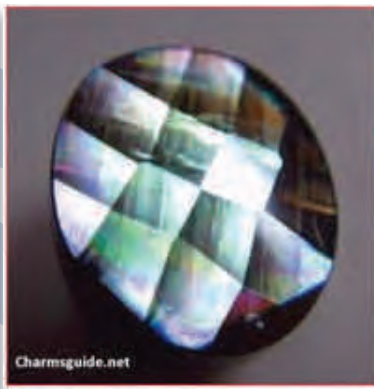


Pure andradite has a high trivalent iron concentration and this rarely makes for a gemstone as iron imparts a nondescript, dark yellowish brown to almost black color that is so strong that the mineral often appears opaque. Some andradite crystals grow in a series of stratified microscopic layers, which impart an iridescence to the andradite; jewelry pieces made from such crystals are called rainbow garnet*.

There are several distinctly colored varieties of andradite resulting from some chemical substitutions in its formula; below are two of these. Melanite*, which is jet black is on the left, and topazolite*, whose color varies from being similar to that of the famous imperial topaz to a yellowish olive green, is shown on the right. Melanite has titanium substituting for the iron at the top

Given a tsavorite and an emerald of equal splendor the tsavorite is only a fraction of the price, even though it is much rarer than the emerald.

The coloring agent is not on the composition diagram; the



in the Ural Mountains of Russia. Russian demantoid has long silky inclusions called “horsetails”, and the status associated with having the Russian gem is such that the occurrence of these inclusions is an asset when evaluating the worth of this gemstone. Later a major deposit of demantoid was found in Namibia, that lacks horsetails, giving an “eye clean” clarity to the stone, but many feel that the Nambian demantoids are a bit weaker in color. A North American deposit of demantoid with horsetails occurs at the Jeffery Mine in Canada, but the color is definitely weaker than that of the Russian demantoid. The colors of demantoid and tsavorite can be quite similar, and there is a simple test that will separate them.



High dispersion = many colors

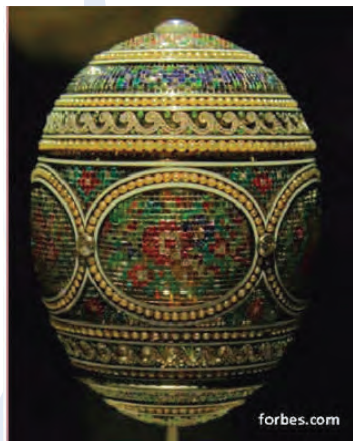
back corner of the inverted pyramid. Most melanite (often called “black garnet”) is opaque, the light entering the gem is completely absorbed within the stone, so any “sparkle” is the result of reflections off the surface of the cut. Therefore most faceted stones utilize a cut without a table or a cut with an oversized table to give maximum surface reflections.



Demantoid in Russian Antique



I purchased an N-52 magnet, which is very strong for its size (found at many train hobby stores or on-line for about \$5) and attached it to the head of a bolt...demantoid is the only green mineral that will be picked up by the magnet. As a side note, magnetism is a highly effective, but underused, property for distinguishing certain minerals, and a visit to the following website shows a video on using magnetism for gemstone identification <http://gemstonemagnetism.com>.



DEMANTOID*

This deep green variety of andradite is one of the rarest and most valuable of all garnet gemstones, and deserves a more in-depth consideration. The deep green color is again due to chromium substitution; in demantoid the Cr substitutes for some of the iron, whereas in tsavorite the Cr substitutes for some aluminum.



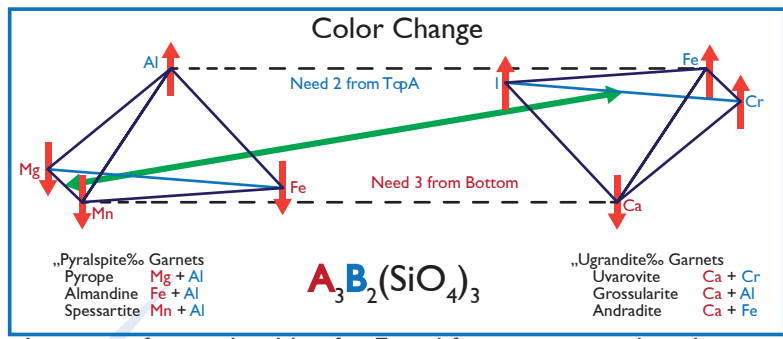
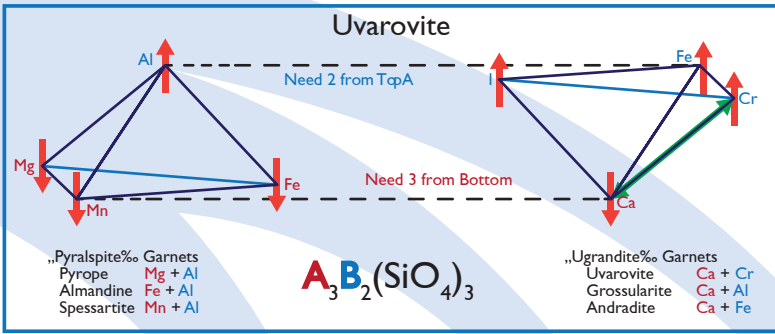
Isometric Crystal – Demantoid

Demantoid has one of the highest dispersions and when coupled with its high index of refraction it has the ability to sparkle in different colors. When making jewelry with multiple stones it is often desirable to have the various gems be of equal splendor; thus demantoid was often the choice to compliment the diamond studded jewelry of the Czars, and it was featured in many of the Faberge Eggs that were their yearly Easter gift, as seen in the 1914 Faberge Egg on the right. Even to this day many Faberge pieces, such as the modern one on the left, couple demantoid and diamonds. This rich history is in part due to the first major deposit of demantoid being located

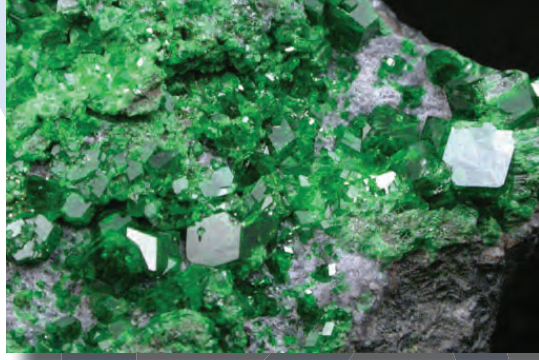


Matching diamond – demantoid

UVAROVITE



This is the green “true species” of garnet. The trade varieties of demantoid* and tsavorite* had some substitutions of chromium for the trivalent ions in the species called andradite. When the trivalent ion is only Cr the species is recognized in the mineralogical profession as uvarovite. Uvarovite, to my knowledge, has never been found in large carat pieces; it almost always occurs as a druse coating. Its deep green color and the sparkle off the minute faces of the druse crystals still makes this gemstone worthy of being in many pieces of jewelry, but the usual settings are as pendants, earrings, and bracelets.

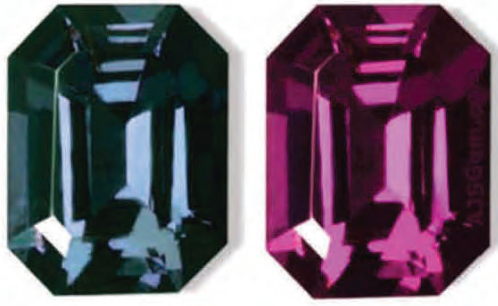


Uvarovite - Saranovskoye Mine, Sarany, Permskaya Oblast', Ural Mountains, Russia (Type Locality for Uvarovite). Photo: John Betts, johnbettsfinerminerals.com

change is often red to blue for East African varieties, but there are substantial differences in the colors from various localities ranging from Norway to Idaho. The color change can be as dramatic as that displayed by the most famous of color change gems – alexandrite. The color shift in garnet has been known since the 1970's, but it was not popular in jewelry until deposits were found in Tanzania and Madagascar (1980-90's) and Kenya in 2009 that displayed color changes that rivaled those of alexandrite. It is now true, as you can see from the above “tour of colors” that garnet can be found in every possible color. This is wonderful for jewelry makers and trade-names, but it presents an array of problems in finding the correct mineralogical name. The correct name, and where a particular gemstones lies within the wide range of solutions that are possible is now usually determined by the measurements of the refractive index, the specific gravity, and magnetic susceptibility.



Kenya Color Change - gem2000.com



Madagascar Color Change - ajsgems.com



Madagascar Color Change - rocksandco.com

COLOR CHANGE GARNET

Not that long ago there was saying; “If it's blue, it's not a garnet!”. This is no longer true. There are garnets on the market now, worldwide, that display a distinct blue color in fluorescent lighting. This unusual variety has not been given a trade name partly because its composition bridges the gap between the pyralspite subgroup and the ugrandite subgroup. It combines a mixture of pyrope-spessartite for the garnets having divalent ions, and a mix of grossularite-uvarovite for the garnets having trivalent ions, with some vanadium substitution for the chromium. The color



If you are interested in knowing more about garnet compositions, the Gemological Institute of America Inc. has extensive literature on how to determine the exact composition of a given garnet at <http://www.gia.edu/search/articles?subject=Chemical%20Composition&gemfilter=Garnet>

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Manson, D.V. and Stockton, C.M., "Pyrope-spessartite garnet with unusual color behavior." *Gem and Gemology*. V.20, n.4 (1984) Gemological Institute of America – Carlsbad, CA

Notes: The author, Dr. Dion C. Stewart, has a PhD in mineralogy from The Pennsylvania State University. He examined more than 3,000 images of garnets to select those that he felt best illustrated the colors for this article, and corresponded with more than 50 different individuals at the named websites in collecting permissions for photo use and photo credits. The colors illustrated are those deemed "best" by the author; other individuals within the mineralogy profession and jewelry trade may have different opinions regarding the best matching colors for the various trade names.



Blue Dravite-Uvite Tourmaline from Koksha Valley, Afghanistan

from *Gems & Gemology*, Winter 2016, Vol. 52, No. 4 - The GIA Quarterly Publication

by Ian Nicastro and Ziyin Sun

Tourmaline is popular among gem and mineral enthusiasts for its extensive variety of colors. Blue, one of the most sought-after hues, is usually encountered as elbaite, a sodium- and lithium-containing species with the chemical formula $\text{Na}(\text{Li}_{1.5}\text{Al}_{1.5})\text{Al}_6(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3(\text{OH})$. While it has been reported that very limited quantities of dark blue tourmaline crystals are being mined in Afghanistan's Koksha Valley, we have found that this material appears to be a hybrid species of dravite-uvite tourmaline (figure 1).

Around a dozen blue crystals in pale green and brown micaceous matrix first surfaced in the gem markets of Peshawar, Pakistan, in late 2009, as confirmed by two sources (S. Khan and P. Sloomweg, pers. comms., 2016). These crystals, reportedly from Badakhshan Province's Koksha Valley, were subsequently assumed to be a member of the tourmaline group based on their ditrigonal pyramidal habit. Since that time, only very small batches of these crystals have turned up; interestingly, a few of these specimens have been associated with sapphire in the same matrix (P. Sloomweg, pers. comm., 2016). In 2010, while examining sapphire rough believed to be from a deposit near the Koksha Valley,

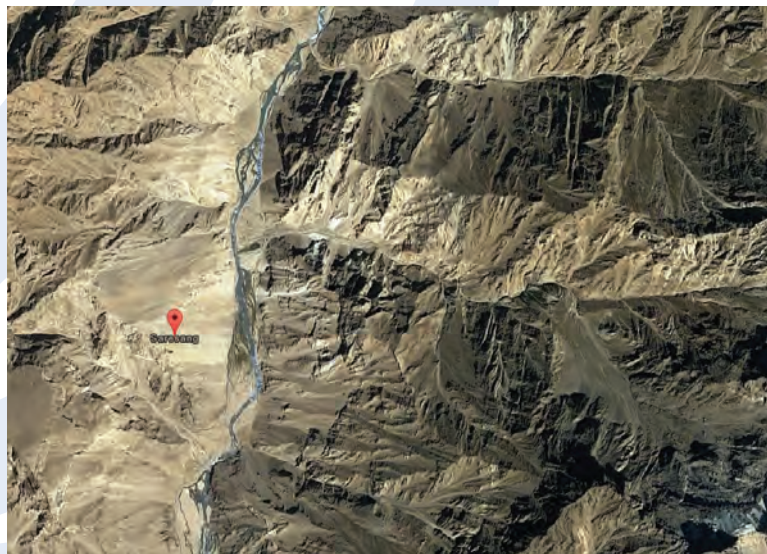
GIA's Bangkok laboratory identified bluish green crystals



Figure 1. This specimen of dark blue tourmaline on micaceous matrix, from the Koksha Valley of Badakhshan Province in Afghanistan, measures 28x25x17 mm. Photo by Kevin Schmacher.

present in some matrix specimens of sapphire as dravite tourmaline (Spring 2011 Lab Notes, pp. 53–54). While the Koksha Valley is most famous for extensive deposits of high-quality lapis lazuli near Sar-e-Sang, sapphire mining takes place near the village of Hazrat Saeed, 25 km north of Sar-e-Sang along the Koksha River (T.P. Moore and R.W.M. Woodside, "The Sar-e-Sang lapis mine," *Mineralogical Record*, Vol. 45, No. 3, 2014, pp. 280–336). The sapphire at Hazrat Saeed is recovered from mica-rich gneiss, and it appears that these green and blue tourmalines were uncovered as a by-product of sapphire mining operations.

Laser ablation–inductively coupled plasma–mass spectrometry (LA-ICP-MS) was used to analyze the chemical composition of



Sar-e-Sang and the Koska Valley, Badakhshan Province, Afghanistan.

Source: Google Maps

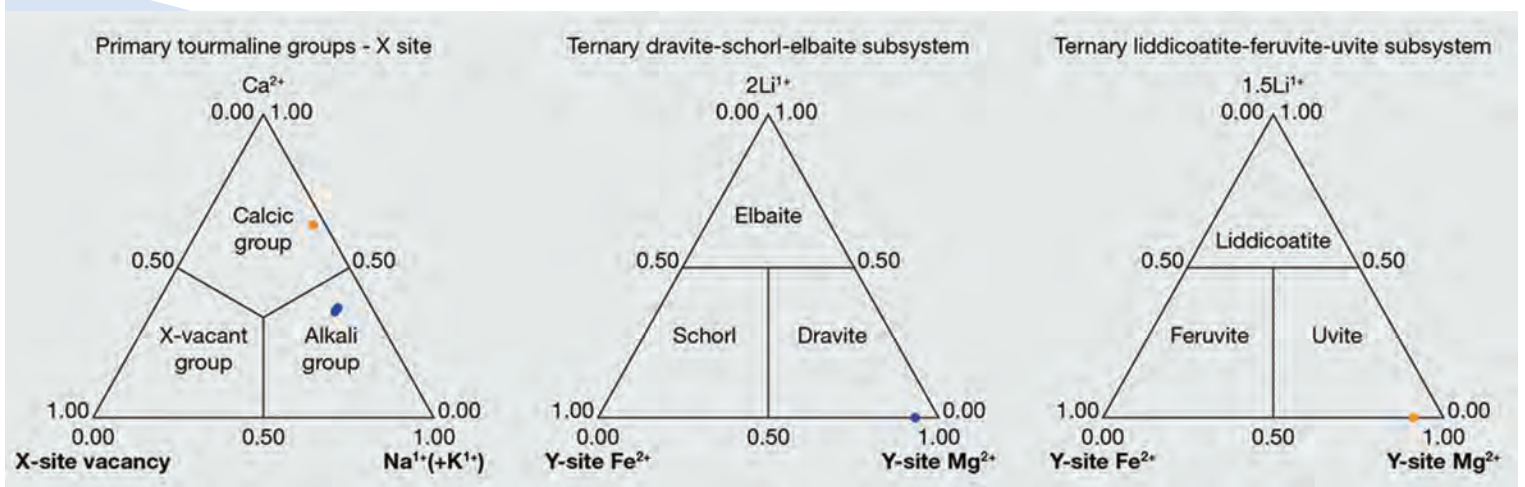
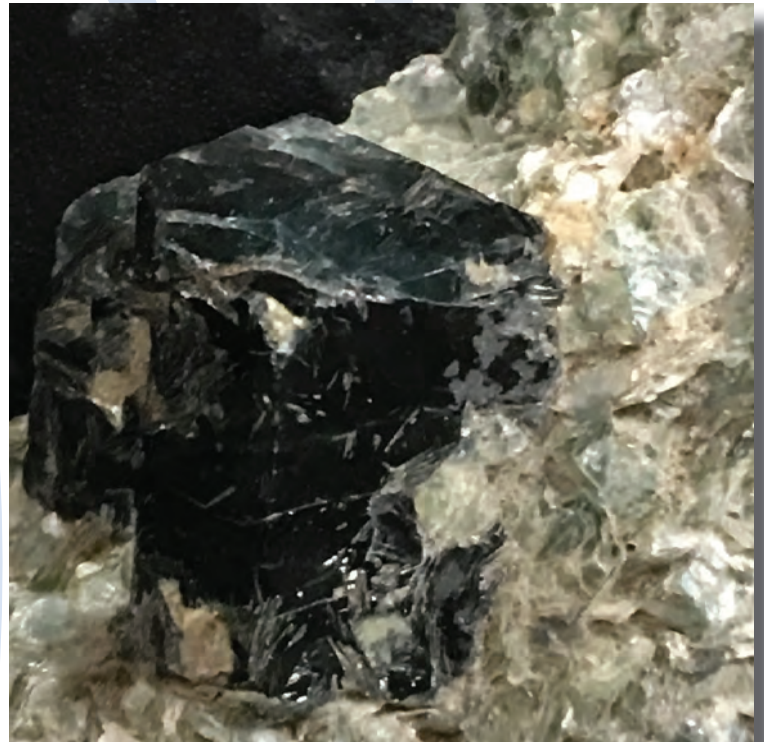


Figure 2. Left: Three laser spots were plotted in the ternary system for the primary tourmaline groups based on the dominant occupancy of the X site. Center: Two blue laser spots that belong to the alkali primary tourmaline group were further plotted in the ternary dravite-schorl-elbaite subsystem. Right: One orange laser spot that belongs to the calcic primary tourmaline group was further plotted in the ternary liddicoatite-feruvite-uvite subsystem. These findings show a range of composition consistent with the dravite-uvite series.

the dark blue tourmaline seen in figure 1. Three spots were measured and plotted (figure 2). Two of the spots showed that the tourmaline contained dravite; the third revealed the presence of uvite (D.J. Henry et al., "Nomenclature of the tourmaline-supergroup minerals," *American Mineralogist*, Vol. 96, No. 5–6, 2011, pp. 895–913). Dravite, $\text{NaMg}_3\text{Al}_6(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})_3\text{OH}$, is a sodium- and magnesium-rich tourmaline typically encountered in brown, yellow, black, and rarely as intense green. Uvite, $\text{Ca}(\text{Mg}_3)\text{MgAl}_5(\text{Si}_6\text{O}_{18})(\text{BO}_3)_3(\text{OH})(\text{F}/\text{OH})$, is a calcium- and magnesium-rich tourmaline that is often brown, green, or deep red. Our analysis suggests that this blue tourmaline specimen is composed of a mixture of dravite and uvite. While fibrous blue dravite has been reported in the Czech Republic (M. Novak, "Blue dravite as an indicator of fluid composition during subsolidus replacement processes in Li-poor granitic pegmatites in the Moldanubicum, Czech Republic," *Journal of the Czech Geological Society*, Vol. 43, No. 1–2, 1998, pp. 24–30), this is the first large single-crystal blue dravite-uvite tourmaline the authors have encountered.



Photos of a specimen from this locality from the editor's collection. Purchased in 2011 in Kabul. Photos taken with iPhone. Large crystal is approximately 2cm.

Mineral of the Month – Native Platinum– From Wikipedia and Mindat

Platinum (Pt) is an extremely rare metal, occurring at a concentration of only 0.005 ppm in Earth's crust. From Spanish "platina", diminutive of "plata", silver. The new metal was found in large placer deposits during the sixteenth-century Spanish conquest of South America and was called "platina del Pinto" after the Rio Pinto, Columbia. It is sometimes mistaken for silver. Platinum is rarer than gold and is typically more expensive by weight than gold. Chemically, platinum is very non-reactive and can facilitate many chemical reactions without being altered in the process. The alluvial deposits used by pre-Columbian people in the Chocó Department, Colombia are still a source for platinum-group metals. Another large alluvial deposit is in the Ural Mountains, Russia, and it is still mined.



Exploitation of Mexico by Spanish Conquistadors Mexico City, Palacio Nacional by Diego Rivera:

Platinum is rarely found as well formed crystals. It is typically found as placer nuggets, grains or as veins in host rock. Pure platinum is unknown in nature as it usually alloys with other metals such as iron, copper, gold, nickel, iridium, palladium, rhodium, ruthenium and osmium. The presence of iron can result in slight magnetism in the nuggets. The most common source of platinum is placer deposits where the platinum has weathered out of igneous rocks and tumbled down streams and rivers over many years. Placer deposits form in streams and rivers behind rocks where the heavier materials such as platinum and gold are deposited and are too heavy to be washed downstream.

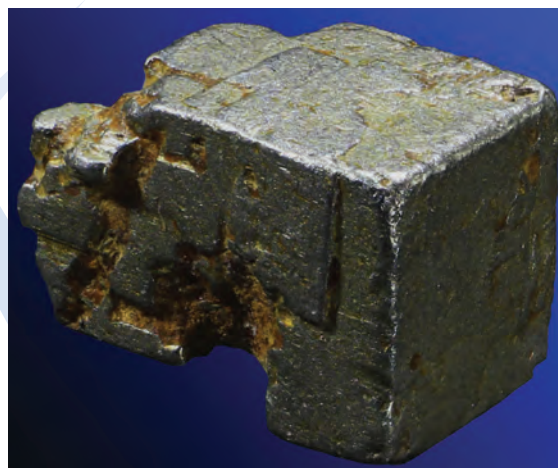
The first European reference to platinum appears in 1557 in the writings of the Italian humanist Julius Caesar Scaliger as a description of an unknown noble metal found between Darién and Mexico, "which no fire nor any Spanish artifice has yet been able to liquefy". Antonio de Ulloa is credited with the discovery of platinum. Ulloa returned to Spain from the French Geodesic Mission in 1746 after having been there for eight years. His historical account of the expedition included a description of platinum as being neither separable nor calcinable. Ulloa also anticipated the discovery of platinum mines.

In 1750, after studying the platinum sent to him by Charles Wood, William Brownrigg presented a detailed account of the metal to the Royal Society, stating that he had seen no mention of it in any previous accounts of known minerals. He also made note of platinum's extremely high melting point and refractoriness toward borax.

Other chemists across Europe soon began studying platinum. In 1752, Henrik Scheffer published a detailed scientific description of the metal, which he referred to as "white gold", including an account of how he succeeded in fusing platinum ore with the aid of arsenic.



Scheffer described platinum as being less pliable than gold, but with similar resistance to corrosion. Because the other platinum-family members were not discovered yet, early researchers made the false assumption that due to its hardness—which is slightly more than for pure iron—platinum would be a relatively non-pliable material, even brittle at times, when in fact its ductility and malleability are close to that of gold. Their assumptions could not be avoided because the platinum they experimented with was highly contaminated with minute amounts of platinum-family elements such as osmium and iridium which embrittled the platinum alloy.



Photos: Wikimedia

In nickel and copper deposits, platinum-group metals occur as sulfides (e.g. (Pt,Pd)S), tellurides (e.g. PtBiTe), antimonides (PdSb), and arsenides (e.g. PtAs₂), and as end alloys with nickel or copper. Platinum arsenide, sperrylite (PtAs₂), is a major source of platinum associated with nickel ores in the Sudbury Basin deposit in Ontario, Canada. At Platinum, Alaska, about 17,000 kg (550,000 ozt) was mined between 1927 and 1975. The mine ceased operations in 1990. The rare sulfide mineral cooperite, (Pt,Pd,Ni)S, contains platinum along with palladium and nickel. Cooperite occurs in the Merensky Reef within the Bushveld complex, Gauteng, South Africa.

In 1865, chromites were identified in the Bushveld region of South Africa, followed by the discovery of platinum in 1906. The largest known primary reserves are in the Bushveld complex in South Africa. The large copper–nickel deposits near Norilsk in Russia, and the Sudbury Basin, Canada, are the two other large deposits. In the Sudbury Basin, the huge quantities of nickel ore processed make up for the fact platinum is present as only 0.5 ppm in the ore. Smaller reserves can be found in the United States, for example in the Absaroka Range in Montana. In 2010, South Africa was the top producer of platinum, with an almost 77% share, followed by Russia at 13%; world production in 2010 was 192,000 kg (423,000 lb). Large platinum deposits are present in the state of Tamil Nadu, India.

PLATINUM	
Category	Native Minerals
Formula	Pt
Strunz Classification	1/A. 14-70
Crystal System	Isometric
Crystal Class	m3m (4/m 3 2/m) - Hexoctahedral
Color	Steel grey to dark grey
Cleavage	None Observed
Fracture	Hackly
Mohs Scale	4-4.5
Luster	Metallic
Tenacity	Malleable
Streak	Steel grey to dark grey
Specific Gravity	21.45
Melting Point	3,214.9°F / 1,768.3°C

Minerals from Ireland

by Dr. Michael Pabst

In preparation for a talk that I will give at the 50th anniversary of my graduation from Boston College, I took these photographs of minerals from Ireland in my collection. I do not have many specimens from Ireland, and I must try to get more! Boston College was founded by the Jesuits in 1863, at a time when Irish immigrants were pouring into Boston, making up about 25% of the total population. This past summer, we took a tour of Ireland, and discovered a beautiful country, despite some horrible history. One of the beauties of Ireland is its scenery and geology, which these few micro minerals reflect.

The photos were taken with my new Olympus OMD EM5 Mark II 16.1 MP Mirrorless Digital Camera, attached to my B & L stereo microscope (20X to 140X). The new camera can be remotely controlled by a laptop computer, and has an electronic shutter to reduce vibration. The final photos were formed by stacking 4-8 images with CombineZP. The cropping, contrast, sharpness and color were improved with Photoshop.

Croagh Patrick means St. Patrick Mountain, a place of pilgrimage since 3,000 BC. St. Patrick is said to have fasted on the mountain for 40 days in the 5th century AD. Gold was discovered in the 1980's, but mining is not allowed.

Among the photos are three different views of the same specimen of Langite (blue), with some minor Brochantite (green). The specimen is from Allihies, County Cork, Ireland. Some of the Langite crystals are reticulated, a nice feature of this specimen.

My little minerals make good souvenirs from beautiful Ireland.

Erin go Bragh!



Azurite (blue, $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$) and Willemite (pale yellow, Zn_2SiO_4), Tynagh Mine, Killimor, County Galway, Ireland. FOV 5 mm



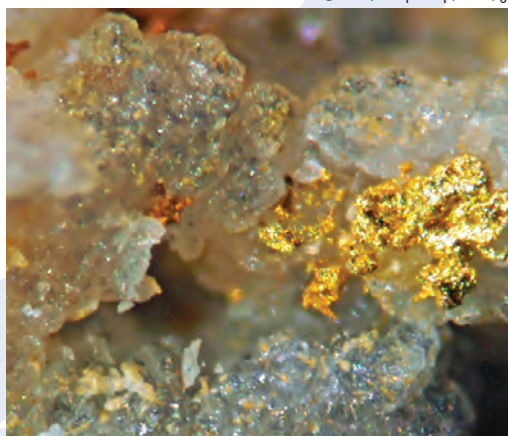
Langite ($\text{Cu}_4\text{SO}_4(\text{OH})_6 \cdot 2\text{H}_2\text{O}$), Allihies, County Cork, Ireland. FOV 4 mm.



Langite ($\text{Cu}_4\text{SO}_4(\text{OH})_6 \cdot 2\text{H}_2\text{O}$), Allihies, County Cork, Ireland. FOV 3 mm.



Gmelinite (orange, $(\text{Ca}, \text{Na})_4(\text{Si}_8\text{Al}_4)\text{O}_{24} \cdot 11\text{H}_2\text{O}$) on Calcite? (pale yellow), County Antrim, Northern Ireland. FOV 5 mm. The form is hexagonal, with a pyramidal top and bottom.



Gold on Quartz, Lecanvey prospect, Croagh Patrick, County Mayo, Ireland. FOV 3 mm



Langite, ($\text{Cu}_4\text{SO}_4(\text{OH})_6 \cdot 2\text{H}_2\text{O}$) Allihies, County Cork, Ireland. FOV 4 mm.

Editor's Note: Gmelinite is one of those minerals that splitters would love. It has a -CA and a -NA end member. The formula was modified to reflect either/or:

Extended Focus—Or How To Get More Depth of Field in Your Macro Photos Than the Laws of Optics Allow

by Neal Immega, Ph.D. Paleontologist and Member of the Houston Gem & Mineral Society (HGMS)

Originally published in The Backbender's Gazette (Houston Gem & Mineral Society) in October 2015

Editor's Comment - I've included this article since in the previous one, Mike Pabst refers to this software. In addition to CombineZ (a free program) there are other products out that too - Helicon focus (not free) is probably the best competitor.



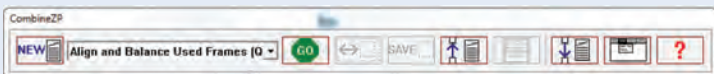
You can cure the depth of field limitation in macro photography by taking a number of pictures and just extracting the parts that are in focus. Seems simple but would be a lot of work with scissors. Fortunately, there are computers and people who write and distribute the programs for free. I am talking about the British program CombineZP written by Alan Hadley. I am a great fan of this program. It has not been updated since Windows XT, but it runs fine on Windows 7 and probably Windows 8. I have written about it before, but I find it is still unknown in HGMS.

I have a few tips that will make everything go much more smoothly.

- First, Google "CombineZP," and you will find a site <http://www.hadleyweb.pwp.blueyonder.co.uk/>. *[Editor's Note: This site is no longer functional. Go to http://micropics.org.uk/Czimps_web/Czimps.htm and you'll find CombineZP at the bottom of the page.]*
- You will be invited to download and install CombineZP. On my system the files are at C:\Program Files (x86)\Alan Hadley\CombineZP\.
- Then download the zip file from the same site, unzip it, and put the files at C:\Program Files (x86)\Alan Hadley\CombineZP\.
- This will get you a few bug fixes and is necessary. Don't give up—this is the hardest thing you will have to do. I promise.
- Next you have to shoot your pictures. You need a manual focus camera, a focusing rail, and a tripod. Don't even think of trying this technique without a rigid setup.
- Set your macro lens on manual focus, and using the focusing rail, crank the camera to focus on the point closest to the lens. Adjust your lighting. Shoot a picture every 2 mm while cranking the camera out.
- Your camera should look something like this - Camera mounted on a focus rail, mounted on a tripod.



Suppose you have taken 7 photos in sequence from near to far. Execute CombineZP, and you will first see a menu bar with the word "NEW" on the far left side.



This is what it looks like.

Beginning menu Click on the "NEW" (on left) and you will be able to navigate to where your string of pictures is located. Select them and click on OPEN. You will then see this menu: Pictures are loaded. Click on "GO" to "Align and Balance Used Frames."

You are going to make sure all the frames are squared up by clicking on "GO." On my fast machine, it only takes seconds.

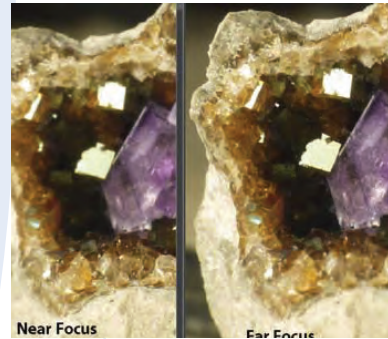
Next you are going to select the method of stacking the frames. Make it easy on yourself and select "All Methods," and then click on "GO."

Use "All Methods" of stacking the frames.



You are using all the stacking methods so you can select the results you like, rather than trying to understand each of the methods. On my machine, it takes less than a minute. Wow, it is wonderful having a fast computer.

Let's see if we did anything. This is a composite of the near and far images. Notice that different parts of the specimen are in focus. There are five other pictures between these.



Go to the folder where you selected the images to stack, and you will see another folder called "OUTPUT." The "All Methods" command generated seven pictures, and I like "New-Output99999-Do Stack[1,0,1]"



My selection of the best stack results.

The program is a little daunting because it can do many things, but you need some successes first before you attempt to read the manual. We have simplified the process by having the camera rigidly mounted and thus can use the automatic "Align and Balance Frames." We have avoided reading about 1/2 of the manual by running the "All Methods" for stacking the frames and just picking the one we like. We have accepted the default parameters in the stacking process, and the results support the programmer's choices. An easy first success!



Mineralogist of the Month - John Sinkankas

(1915-2002)

from the Mineralogical Record, (Jul/Aug 2002): 282., Wendell E. Wilson

Everyone in the modern mineral world knew John Sinkankas, through his achievements as an author, artist, mineralogist, bibliophile, bookseller, field collector, lapidarist and gemologist.



Born in Paterson, New Jersey on May 15, 1915, John Sinkankas (the name is Lithuanian) began his nature studies as a young boy, collecting botanical specimens. His first exposure to minerals came during a chance visit to the Lower New Street quarry immediately following a blast; prehnite-filled cavities were everywhere, along with calcite, apophyllite, and stilbite—all of which he found "irresistibly fascinating." Following graduation from high school he attended New Jersey State Teachers College in Paterson (where he met his future wife, Marge), graduating in 1936.

Sinkankas then enlisted in the Naval Aviation Reserve and became a qualified pilot, serving in many locations around the world and taking time to do a little mineral collecting at places like Ivigtut, Greenland as opportunities arose. (He once told me that he had "seen" Saint John's Island, Egypt, the famous olivine locality, but "only on radar" as his ship passed the island at night.) After the war he took the full sequence of gemology courses from the Gemological Institute of America (GIA) and the American Gem Society (AGS), and focused his attention on gemology and lapidary.

In 1948 he began writing a regular lapidary column for Rocks & Minerals magazine, and over the next eight years he wrote 33 installments on various gemological/mineralogical topics. He also began building a book collection which would one day become

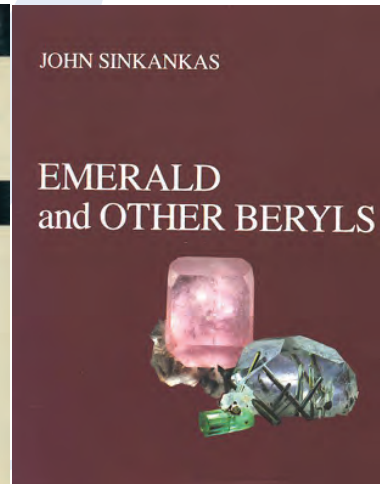
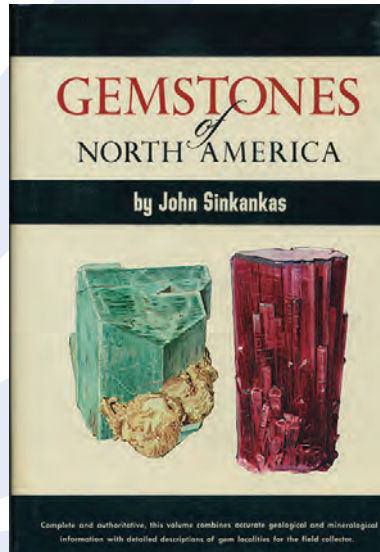
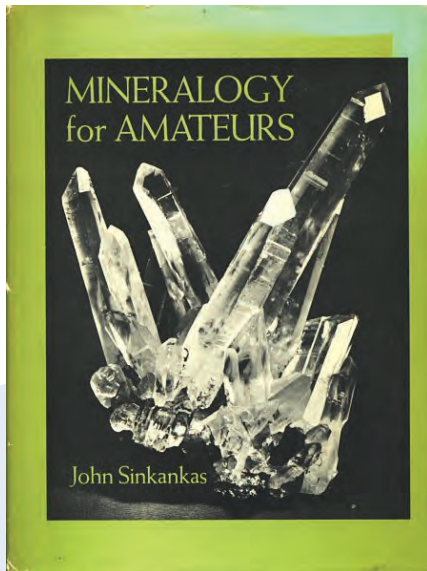
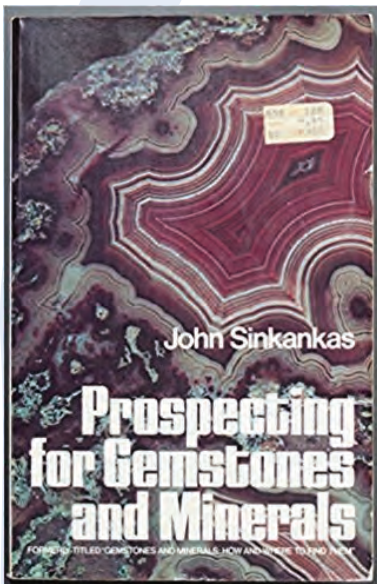
the finest private collection of gemological works in the U. S. In 1955 Van Nostrand published the first of John's many books: Gem Cutting—A Lapidary's Manual, followed by his Gemstones of North America vol. I in 1959 (two more volumes would later follow). *John was also the president of the Mineralogical Society of the District of Columbia in 1959.* In 1960, now a Captain in the Navy, he was elected a Fellow of the Mineralogical Society of America, and in 1961 retired from the Navy after 25 years of service. He soon published Gemstones and Minerals—How and Where to Find Them (1961), the first of a dozen such textbooks.

John and Marge retired to their first permanent home, in San Diego, California. He wrote articles regularly for Lapidary Journal, worked part-time as a Research Assistant in mineralogy at the Scripps Institute of Oceanography, and studied mathematics and languages as a "special student" at the University of California. He also spent much time field collecting in the San Diego County localities. He published Mineralogy for Amateurs (still a commonly used book among mineral collectors) in 1964, and Mineralogy: A First Course in 1967.

As their book collection grew to over 3,000 volumes, John and Marge formed Peri Lithon Books to market the excess titles coming in, and to help spread mineralogical literature. Meanwhile John poured extensive hours of research into one of his most admired books, Emerald and Other Beryls, published in 1981.



Honors poured in during his later years. In 1982 he was awarded an honorary Doctor of Humane letters degree from William Paterson University in New Jersey. The American Federation of Mineralogical Societies presented him with their Scholarship Foundation Award in 1983. The new mineral sinkankasite



$(\text{Mn}^{2+}\text{Al}(\text{PO}_3\text{OH})_2(\text{OH})\cdot 6\text{H}_2\text{O})$ was named in his honor in 1984. And in 1991 he was given the prestigious Carnegie Mineralogical Award.

In 1988 John and Marge turned over their incredible 14,000-volume library to the Gemological Institute of America, where it now forms the core of the GIA's Richard T. Liddicoat Library. John never slowed down, though. At an age when most men would be satisfied to rest on such considerable laurels, John finished researching his long-time project, the monumental three-volume *Gemology: An Annotated Bibliography*, and saw it published in 1993; it totalled 1,179 pages of concentrated scholarly information.

Only a sampling of his more important publications and achievements can be given here (for more information see the references below). John Sinkankas was an extraordinary and influential individual, a true Renaissance man, who in many ways helped to shape the modern world of mineral collecting and mineralogical literature studies as we know it.



Photo: Rob Lavinsky & irocks.com



Photo: Stefan Wolfsried

Sinkankasite, Barker-Ferguson Mine, Keystone, Keystone District, Pennington Co., South Dakota, USA Photo: Rob Lavinsky & irocks.com

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In Memoriam - George Reimherr

by the Editor

George Reimherr passed away at home on Friday, March 31.

George was a longstanding and very active member of mineral clubs in the area and he would attend MSDC meetings occasionally, especially if it was a presentation that he was particularly interested in hearing.

He promoted our hobby constantly. He would routinely give club members free specimens—nice ones—that he'd collected. He'd also have really nice donations for the NVMC auction. I was always amazed at his skill at cleaning up specimens. I purchased one of his prehnites solely because of how good he'd made it look. He could also usually be found manning the ticket table at the NVMC show too.

I remember a collecting trip to the Vulcan quarry in Stafford. George seemed to have the magic touch that day. We drove in and parked. George walked maybe 20 feet and started pulling out lots of nice laumantites. He had so many that he was generously sharing with the other members there. The next area we went to in the quarry, George was on fire again when he walked a short distance from his car and started finding more interesting things. And again, he was just a generous with his extra material.

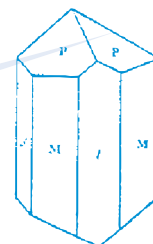
On one of my trips to Afghanistan, George asked me if I would pick him up a kunzite and I said I'd be happy to. I looked around while I was there and found him a nice one at a very reasonable price. When I gave it to him, he asked me how much he owed me. When I told him it was only \$30, he was very pleasantly surprised and thanked me profusely. He will be missed.

The visitation was on Sunday, April 9, from 4 to 6 p.m. at the Demaine Funeral Home, 5308 Backlick Road, Springfield, VA. George's funeral mass was held at 10:30 a.m. on Monday, April 10, at St. Bernadette Catholic Church, 7600 Old Keene Mill Road, Springfield, VA.

Cards and condolences can be sent to Helen Reimherr, 7944 Jansen Drive, Springfield, VA.



Photo at show from NVMC Newsletter. Other photos contributed by family (from funeral home website)



Mineralogical Society of America Editors' Picks

With the permission of Keith Putirka, the following are the Editor's picks of Highlights and Breakthroughs & Invited Centennial Articles from the April 2017 issues of the American Mineralogist: Journal of Earth and Planetary Materials.

<http://www.minsocam.org>

How to Dissolve Kidney Stones

On page 701 of this issue, Hill et al. present a new computer model, based on current thermodynamic measurements, that can be used to predict the solubility of Ca phosphates in body fluids. As noted by the authors, the human body must in places remain supersaturated in hydroxyapatite for healthy bones and teeth but that oversaturation in the kidneys can lead to the development of unwanted stones. This new model attempts to predict mineral saturation under some of the various complex fluids of the human body, and so better inform the conditions that lead to kidney stone development, and thus better inform preventative measures.

Found: Magmatic graphite

On page 728 of this issue, Perez-Soba et al. present a case for what they argue is the first occurrence of graphite (in a granite host) that is of magmatic origin. Their study focuses peraluminous granites of the Variscan Belt, and three different types of magmatic apatite contained in these. Because peraluminous compositions have a high solubility for apatite, these minerals tend to record late stage processes. They find that some fluorapatite grains of apparent magmatic origin contain needle-like inclusions of graphite. They interpret the graphite inclusions as forming at a very late stage of crystallization, where the fluorapatite is in equilibrium with a fluid phase and two immiscible (perphosphorous and peraluminous composition) magmatic liquids and they suggest that a C-rich system may induce liquid immiscibility. These intriguing results point to the usefulness of apatite as a means to investigate the P-T conditions of very late-stage magmatic processes....

An Apatite Barometer

On page 743 of this issue, Ashley et al. calibrate an equation of state for complex apatite solid solutions. They find that their equation of state may provide a powerful tool to obtain P estimates from apatite included in garnet. They find that garnet is an ideal host in that this isotropic mineral also has a very high bulk modulus, and so more ably preserves the stress state of included minerals. Their tests further indicate that the pressures recorded by apatite are not highly sensitive to T. Apatite inclusions in garnet may thus provide an accurate barometer in whatever systems they may be found, and may be especially useful when P-sensitive exchange equilibria are absent.

A Precise Ni-in-Olivine Thermometer

On page 750 of this issue, Pu et al. calibrate a new Ol-liquid thermometer, based on the partitioning of Ni between Ol and co-existing silicate melt. The thermometer is calibrated with some several limitations: it uses experimental data collected at 1 bar only, of liquids saturated only with Olivine, containing 0.1 wt% NiO. But the resulting experimental calibration data set still spans a wide range of T (1170-1650 C) and liquid compositions (37-66 wt% SiO₂), and the resulting model ably predicts T from experiments performed at 10 kbar, and so may have an advantage over Mg-exchange based thermometers in requiring no knowledge of P (or rather to allow P to be estimated, at least at P<10 kbar, by determining the P at which the Ni and Mg exchange thermometers yield identical temperatures). Finally, their study also hints at the possibility that their Ni exchange thermometer may also be only slightly dependent on magmatic water (H₂O, more appropriate than water) contents, thus offering the promise of a highly versatile thermometer that requires minimal input parameters for application.

Water from Recharge Magmas May Help Expel Felsic Melt from Mush

On page 766 of this issue, Pistone et al. conduct rather clever experiments to examine the role of recharge magmas in aiding the expulsion of melt from overlying felsic mush systems. Their experiments, which place aphyric, hydrous andesite below a dacite mush, show a significant transfer of water from the andesite to the dacite, and an increase in the SiO₂ contents of dacitic mush glasses as the addition of water apparently drives the dissolution of quartz in the mush. The authors suggest that mush rejuvenation occurs in two stages, the first dominated by heat transfer and the second by water transfer, from the mafic recharge magma to the felsic mush. Both these processes lead to an increase in melt fraction in the dacitic mush, and a decrease in melt density and viscosity, which are expected to aid felsic melt extraction.

Determining Impact Histories on Ancient & Weathered Planetary Surfaces

On page 813 of this issue Montalvo et al. survey some 11,000 zircon grains recovered from sedimentary deposits that may have the Verdefort impact site as a possible provenance. From that survey, the authors recovered three zircon grains that show tell-tale signs of shock-induced formation ({112} twins), with age dates of ca. 3 Ga that are consistent with the bedrock ages of the impact site. This work reveals the possibility for determining impact locations (and apparently maximum ages for impact) by examining the detrital zircon record.

A Non-Pyrolitic, Fe-rich Lower Mantle?

On page 824 of this issue, Kaminsky and Lin compare and find discrepancies between ferropericlase (fPer) and nominal bridgmanite (Bridg) (transformed to enstatite, so not true Bridg) compositions that occur as inclusions in diamonds, and as obtained from experiments. Some experiments are performed on non-Al bearing bulk compositions, and this work implicitly shows why experiments performed on natural compositions are so crucial. In any case, the authors find that some natural fPer have both high Fe and low Ni, from which the authors infer equilibration with a Fe-Ni alloy, a phase that presumably only inhabits the deepest mantle. They also find that certain nominal Bridg grains exhibit high Al, which is also inferred to be a lowermost mantle signature, on the expectation that Al-in-Bridg increases with increased P. The highest Al-in-Bridg crystals do not coexist with the lowest Ni-in-fPer grains, so the precise interpretation is unclear, but these compositions may still indicate important heterogeneity in the lower mantle. And while pyrolite is a highly flexible term (intended only to indicate rough proportions of basalt and peridotite), this study may still lead to the identification of distinct mantle domains—which if real, should connect to ocean island basalt compositions, or at least those exhibiting high mantle potential temperatures.











Wavellite as a Near-Surface Sink for Fluorine

On page 909 of this issue, Kampf et al. describe the new mineral, fluorwavellite, and its solid solution behavior relative to the non-fluorinated wavellite. In surveying wavellite from various localities, the authors find complete solid solution between the two end-members, but no connection between F content and mode of occurrence (e.g., F contents are not different for minerals obtained from pegmatites, ore deposits, or hydrothermally altered systems). The authors thus infer that F contents are controlled by the activities of Al, P, and F, and perhaps also by pH, since wavellite-fluorwavellite are highly soluble only under the uncommon conditions of pH>9. At lower pH, the authors suggest that wavellite-fluorwavellite is an important near-surface sink for F.

Upcoming Local (or mostly local) Geology Events: Useful Mineral Links:

- May**
- 3 MSDC Meeting
 - 3 GSW Meeting, 7:30pm Refreshments, 8:00pm Meeting, John Wesley Powell Auditorium, 2170 Florida Avenue NW, Washington, DC
 - 6-7 Topsfield, Mass. - Annual North Shore Gem & Mineral Show
 - 6-7 Pittston, Pa. - 14th Annual Treasures of the Earth Gem & Mineral Show, St Joseph's Rt. 315 South, Pittston, PA. (Scranton Area)
 - 10 GLMSMC Meeting
 - 12-14 Gem and Mineral Society of Franklin NC Annual Show. 1288 Georgia Rd.
 - 13 Chesapeake Gem & Mineral Show 10am-4pm. Ruhl Armory, Towson, MD (Exit 26 - York Rd South off of I-695)
 - 13 The Rock and Mineral Club of Lower Bucks County Annual Show, 501 Wistar Rd, Fairless Hills, PA
 - 13-14 Hamilton, NJ - Annual Cape Atlantic Rockhounds Gem & Mineral Show
 - 22 NVMC Meeting
 - 24 MNCA Meeting
- June**
- 3 Spring Mineralfest - Macungie, Pennsylvania - 68th semi-annual Mineralfest
 - 3 Greensboro Gem & Mineral Club, Annual Show Piedmont Triad Farmers Market; 2914 Sandy Ridge Road, Colfax, NC
 - 3-4 Monroe, NY - Annual Orange County Gem & Mineral Show, Museum Village, off Rt. 17, Monroe, NY
 - 3-4 Canandigua, NY - Annual Wayne County Gem Fest - Canandigua Civic Center
 - 7 MSDC Meeting
 - 14 GLMSMC Meeting
 - 14 Treasures of the Earth, Inc., Virginia Beach Convention Center; 1000 19th Street; Fri. 12-6, Sat. 10-5, Sun. 10-5;
 - 17 Southern Maryland Rock and Mineral Club Swap/Sale/Picnic, Gilbert Run Park; 13140 Charles Street, Charlotte Hall, MD, Sat. 9-5
 - 26 NVMC Meeting
 - 28 MNCA Meeting
- July**
- 1-6 Spruce Pine NC, Annual show; Parkway Fire and Rescue, 136 Majestic View; Daily 10-6; Free Admission;
 - 22-23 Frankfort, NY - NEW LOCATION!! - 3rd Annual Herkimer Diamond Festival and Gem Show, at the Herkimer County Fairgrounds, 135 Cemetery St., Frankfort, NY (Approx. 7 miles from Herkimer, on Rt. NY 5S, 1 mile West of Iliion.)
- August**
- 11-13 W. Springfield, Mass. - Annual East Coast Gem & Mineral Show
 - 26-27 Canton, NY - Annual St. Lawrence County Gem & Mineral Show, Lincoln St. Park Pavillion
- September**
- 6 MSDC Meeting
 - 13 GSW Meeting - Alternate Location
 - 13 GLMSMC Meeting
 - 24 NVMC Meeting
 - 26 MNCA Meeting
- October**
- 4 MSDC Meeting
 - 11 GLMSMC Meeting
 - 23 NVMC Meeting
 - 25 MNCA Meeting
- November**
- 1 MSDC Meeting
 - 8 GLMSMC Meeting
 - 11-13 W. Springfield, Mass. - Annual East Coast Gem & Mineral Show
 - 22 MNCA Meeting - depending on Thanksgiving
 - 27 NVMC Meeting



	American Federation of Mineralogical Societies (AFMS)	www.amfed.org
	Eastern Federation of Mineralogical and Lapidary Societies (EFMLS)	www.amfed.org/efmls
	MINDAT	www.mindat.org
	Mineralogical Society of America (MSA)	www.minoscam.org
	Friends of Mineralogy	www.friendsofmineralogy.org/
	WebMineral	webmineral.com
	The Geological Society of America (GSA)	www.geosociety.org/
	Jeff Scovil Mineral Photography (not advertising - just great photos)	scovilphotography.com/
	United States Geological Survey (USGS)	www.usgs.gov
	The Geological Society of Washington (GSW)	http://www.gswweb.org/



AFMS Code of Ethics



- I will respect both private and public property and will do no collecting on privately owned land without the owner's permission.
- I will keep informed on all laws, regulations of rules governing collecting on public lands and will observe them.
- I will to the best of my ability, ascertain the boundary lines of property on which I plan to collect.
- I will use no firearms or blasting material in collecting areas.
- I will cause no willful damage to property of any kind - fences, signs, and buildings.
- I will leave all gates as found.
- I will build fires in designated or safe places only and will be certain they are completely extinguished before leaving the area.
- I will discard no burning material - matches, cigarettes, etc.
- I will fill all excavation holes which may be dangerous to livestock. [Editor's Note/ Observation: I would also include wildlife as well as livestock.]
- I will not contaminate wells, creeks or other water supply.
- I will cause no willful damage to collecting material and will take home only what I can reasonably use.
- I will practice conservation and undertake to utilize fully and well the materials I have collected and will recycle my surplus for the pleasure and benefit of others.
- I will support the rockhound project H.E.L.P. (Help Eliminate Litter Please) and will leave all collecting areas devoid of litter, regardless of how found.
- I will cooperate with field trip leaders and the se in designated authority in all collecting areas.
- I will report to my club or Federation officers, Bureau of Land management or other authorities, any deposit of petrified wood or other materials on public lands which should be protected for the enjoyment of future generations for public educational and scientific purposes.
- I will appreciate and protect our heritage of natural resources.
- I will observe the "Golden Rule", will use "Good Outdoor Manners" and will at all times conduct myself in a manner which will add to the stature and Public "image" of rockhounds everywhere.

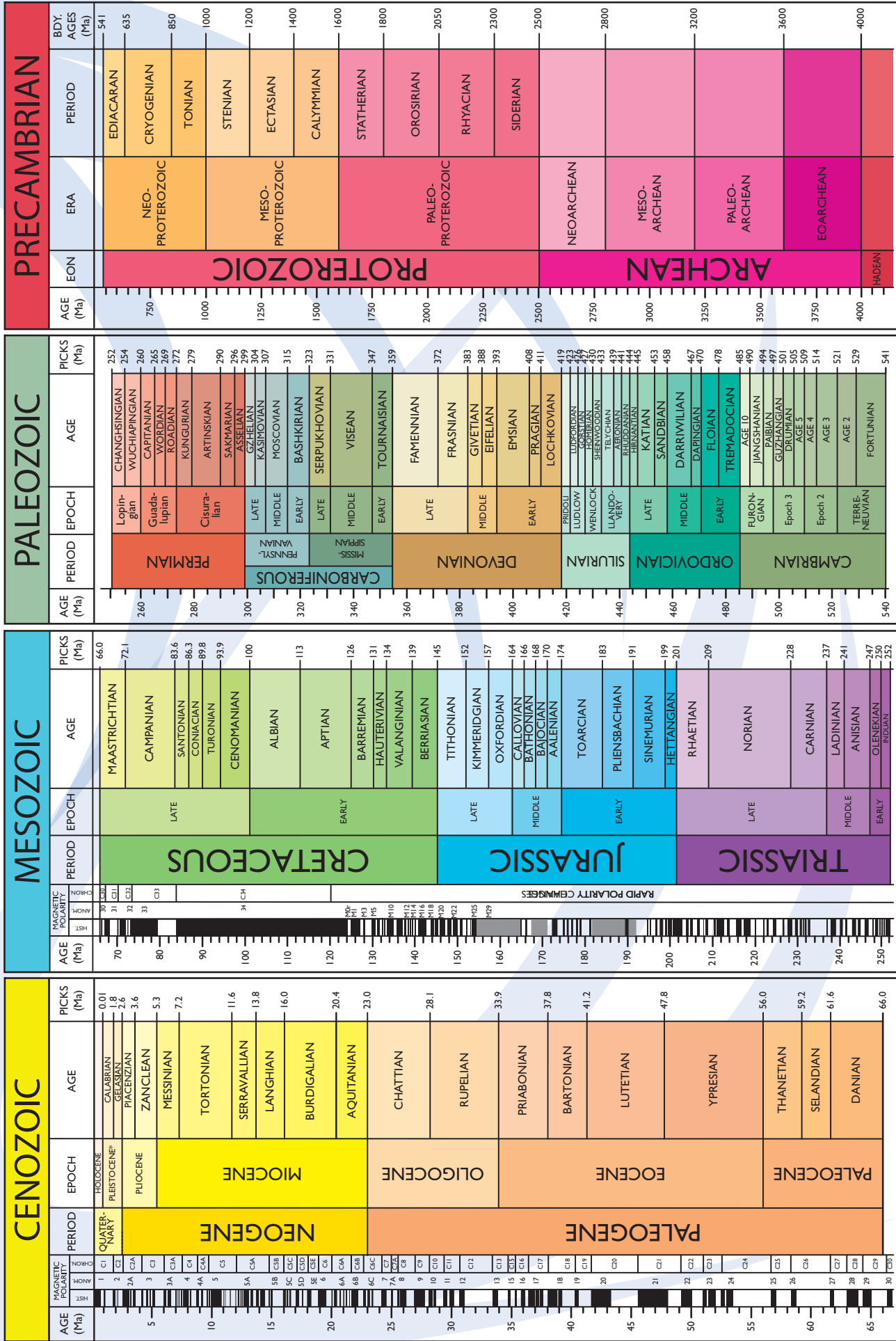
MSDC Past Presidents

Name	Years served as President
Charles H. Robinson	1941-1945
James H. Benn	1946-1947
John J. Livingston	1948-1950
Phillip R. Cosminsky	1951
Benjamin J. Chromy	1952
John J. Livingston	1953-1954
Paul J. Rees	1954
Antonio C. Bonanno	1955
Paul E. Halter	1956-1957
John O. Griesback	1958
John Sinkankas	1959
William R. Smith	1960
Paul E. Desautels	1961
John R. Cranford	1962
Robert Highbarger	1963
Harry Van Tassel	1964
Grant C. Edwards	1965
Kenneth V. Zahn	1966
Douglas C. Alverson	1967-1968
Robert W. Dunning	1969
John W. Gruger	1970-1971
Angelo G. Cicolani	1972-1973
William H. Wilkinson	1974
Ellsworth E. Sinclair	1975-1976
Angelo Cicolani	1977-1978
	1979
Cynthia C. Payne	1980
Paul E. Smith	1981-1982
Fred C. Schaefermeyer	1983-1984
Erich Grundel	1985
James O'Connor	1986-1989
Erich Grundel	1990
Wilson (Ed) Fisher	1991-1996
Jennie Smith	1996-1997
Wilson (Ed) Fisher	1998-2003

Name	Years served as President
Andy Thompson	2004-2010
Tom Tucker	2011-2012
Stephen Johnson	2013-2015
David Nanney	2016-present

GSA GEOLOGIC TIME SCALE

v. 4.0



*The Pleistocene is divided into four ages, but only two are shown here. What is shown as Calabrian is actually three ages—Calabrian from 1.8 to 0.78 Ma, Middle from 0.78 to 0.13 Ma, and Late from 0.13 to 0.01 Ma. Walker, J.D., Geissman, J.W., Bowring, S.A., and Babcock, L.E., compilers, 2012, Geologic Time Scale v. 4.0, Geological Society of America, doi: 10.1130/2012.CT5004R3C. ©2012, The Geological Society of America. The Cenozoic, Mesozoic, and Paleozoic are the Eras of the Phanerozoic Eon. Names of units and age boundaries follow the Gradstein et al. (2012) and Cohen et al. (2012) compilations. Age estimates and picks of boundaries are rounded to the nearest whole number (1 Ma) for the pre-Cenomanian, and rounded to one decimal place (100 ka) for the Cenomanian to Pleistocene interval. The numbered epochs and ages of the Cambrian are provisional.

REFERENCES CITED
 Cohen, K.M., Finney, S., and Gibbard, P.L., 2012, International Chronostratigraphic Chart: International Commission on Stratigraphy, www.stratigraphy.org (last accessed May 2012). (Chart reproduced for the 34th International Geological Congress, Brisbane, Australia, 5–10 August 2012.)
 Gradstein, F.M., Ogg, J.G., Schmitz, M.D., et al., 2012, The Geologic Time Scale 2012, Boston, USA, Elsevier, DOI: 10.1016/B978-0-444-59425-9.00004-4.



Old Dana Classification	New Dana Classification
I Native Elements	Class 01 - Native Elements
II Sulfides	Class 02 - Sulfides - Including Selenides and Tellurides
	Class 03 - Sulfosalts
III Oxides and Hydroxides	Class 04 - Simple Oxides
	Class 05 - Oxides Containing Uranium and Thorium
	Class 06 - Hydroxides and Oxides Containing Hydroxyl
	Class 07 - Multiple Oxides
	Class 08 - Multiple Oxides with Nb, Ta, and Ti
IV Halides	Class 09 - Anhydrous and Hydrated Halides
	Class 10 - Oxyhalides and Hydroxyhalides
	Class 11 - Halide Complexes; Alumino-fluorides
	Class 12 - Compound Halides
V Carbonates, Nitrates, Borates	Class 13 - Acid Carbonates
	Class 14 - Anhydrous Carbonates
	Class 15 - Hydrated Carbonates
	Class 16a-Carbonates - Hydroxyl or Halogen
	Class 16b-Carbonates - Hydroxyl or Halogen
	Class 17 - Compound Carbonates
	Class 18 - Simple Nitrates
	Class 19 - Nitrates - Hydroxyl or Halogen
	Class 20 - Compound Nitrates
	Class 21 - Iodates - Anhydrous and Hydrated
	Class 22 - Iodates - Hydroxyl or Halogen
	Class 23 - Compound Iodates
	Class 24 - Borates - Anhydrous
	Class 25 - Anhydrous Borates Containing Hydroxyl or Halogen
	Class 26 - Hydrated Borates Containing Hydroxyl or Halogen
	Class 27 - Compound Borates
VI Sulfates, Chromates, Selenates	Class 28 - Anhydrous Acid and Sulfates
	Class 29 - Hydrated Acid and Sulfates
	Class 30 - Anhydrous Sulfates Containing Hydroxyl or Halogen
	Class 31 - Hydrated Sulfates Containing Hydroxyl or Halogen
	Class 32 - Compound Sulfates
	Class 33 - Selenates and Tellurates
	Class 34 - Selenites - Tellurites - Sulfites
	Class 35 - Anhydrous Chromates
	Class 36 - Compound Chromates
VII Phosphates, Arsenates, Vanadates	Class 37 - Anhydrous Acid Phosphates
	Class 38 - Anhydrous Phosphates
	Class 39 - Hydrated Acid Phosphates
	Class 40 - Hydrated Phosphates
	Class 41 - Anhydrous Phosphates Containing Hydroxyl or Halogen

	Class 42 - Hydrated Phosphates Containing Hydroxyl or Halogen
	Class 43 - Compound Phosphates
	Class 44 - Antimonates
	Class 45 - Acid and normal Antimonites, Arsenites and Phosphites
	Class 46 - Basic or Halogen-Containing Antimonites, Arsenites and Phosphites
	Class 47 - Vanadium Oxysalts
	Class 48 - Anhydrous Molybdates and Tungstates
	Class 49 - Basic and Hydrated Molybdates and Tungstates
IX Organic Minerals	Class 50 - Salts of Organic Acids and Hydrocarbons
VIII Silicates	
Nesosilicates	Class 51 - Nesosilicate Insular SiO ₄ Groups Only
	Class 52 - Nesosilicate Insular SiO ₄ Groups and O, OH, F, and H ₂ O
	Class 53 - Nesosilicate Insular SiO ₄ Groups and Other Anions of Complex Cations
	Class 54 - Nesosilicate Borosilicates and Some Beryllsilicates
Sorosilicates	Class 55 - Sorosilicate Si ₂ O ₇ Groups, Generally with No Additional Anions
	Class 56 - Sorosilicate Si ₂ O ₇ Groups and O, OH, F, and H ₂ O
	Class 57 - Sorosilicate Insular Si ₃ O ₁₀ and Larger Noncyclic Groups
	Class 58 - Sorosilicate Insular, Mixed, Single, and Larger Tetrahedral Groups
Cyclosilicates	Class 59 - Cyclosilicate Three-Membered Rings
	Class 60 - Cyclosilicate Four-Membered Rings
	Class 61 - Cyclosilicate Six-Membered Rings
	Class 62 - Cyclosilicate Eight-Membered Rings
	Class 63 - Cyclosilicate Condensed Rings
	Class 64 - Cyclosilicates
Inosilicates	Class 65 - Inosilicate Single-Width Unbranched Chains, W=1
	Class 66 - Inosilicate Double-Width Unbranched Chains, W=2
	Class 67 - Inosilicate Unbranched Chains with W>2
	Class 68 - Inosilicate Structures with Chains of More Than One Width
	Class 69 - Inosilicate Chains with Side Branches or Loops
	Class 70 - Inosilicate Column or Tube Structures
Phyllosilicates	Class 71 - Phyllosilicate Sheets of Six-Membered Rings
	Class 72 - Phyllosilicate Two-Dimensional Infinite Sheets with Other Than Six-Membered Rings
	Class 73 - Phyllosilicate Condensed Tetrahedral Sheets
	Class 74 - Phyllosilicate Modulated Layers
Tektosilicates	Class 75 - Tectosilicate Si Tetrahedral Frameworks
	Class 76 - Tectosilicate Al-Si Framework
	Class 77 - Tectosilicate Zeolite group
Not Classified Silicates	Class 78 - Unclassified silicates

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THE MINERALOGICAL SOCIETY OF THE DISTRICT OF COLUMBIA (MSDC)**

Family ~ \$25.00 per year. One address.

Individual ~ \$20.00 per year.

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For new members who join in the last months of the year, membership will extend through the following year with no additional dues.

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Pay at next meeting or mail to:

Mineralogical Society of DC
c/o John Weidner
7099 Game Lord Drive
Springfield, VA 22153-1312

Name(s) (First and Last) _____

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City _____ State _____ Zip: _____

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OK TO INCLUDE YOU ON CLUB MEMBERSHIP LIST?

Yes – Include name, address, phone, email.

If you want any information omitted from the membership list, please note:

Omit my: Email, Home phone, Work phone, Mobile phone, Address, Name

SPECIAL CLUB-RELATED INTERESTS? _____

Meeting Dates, Time, and Location: The first Wednesday of each month. (No meeting in July and August.) The National Museum of Natural History, Smithsonian Institution, 10th Street and Constitution Ave, Washington D.C. We will gather at the Constitution Avenue entrance at 7:45 PM to meet our guard who will escort us to the Cathy Kirby Room. Street parking: Parking is available in the Smithsonian Staff Parking – Just tell the guard at the gate that you are attending the Mineral Club Meeting.



THE MINERAL MINUTES

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NEWSLETTER OF THE MINERALOGICAL SOCIETY OF THE DISTRICT OF COLUMBIA

Mineralogical Society of DC

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