

Lake George Gem & Mineral Club

Club News

June, 2019



NOTE: LGGM Club meetings in April through October will start at 9:00 a.m.

Program for the Month: Saturday, June 8, 2019, 9:00 a.m.

Fluorescent Minerals

Conrad North

Conrad says “The talk will be about the general process of fluorescence, the role of activators in the fluorescent process, with some focus on the fluorescence of scheelite...or I may make stuff up as I go....”

Conrad North Biography

Conrad is the immediate Past President of the Fluorescent Mineral Society (FMS), an international organization of professional mineralogists, geologists, curators, amateur collectors, and others who study and collect fluorescent minerals. The organization’s mission is to *bring together people who are interested in fluorescent minerals, and to introduce the public to the hobby of fluorescent mineral collecting. The Society will celebrate its 50th anniversary in 2021 and has members in all but a few states, as well as a number of foreign countries.*

Conrad provides informational talks and demonstrations on fluorescent materials and processes to geology clubs, schools, scientific organizations, and scouting groups. He also assists organizations in the creation of fluorescent displays, most recently the McConnell Museum in Grand Junction and the Heritage Museum in Buena Vista. He is a member of the Show Committee for the annual Denver Gem and Mineral Show and serves as a chairman for the Ultraviolet Room at the Denver Mart.

He is a former professional photographer, an avid fly-fisherman, and author with published works in local publications as well as magazines such as Rock and Gem and ICJM’s Prospecting and Mining Journal.

His spare time is spent wandering the hills at night in search of Colorado fluorescents, and trying to find space for those finds.

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Special Presentation: Sunday, June 9, 2019, at 1:00 p.m.
Lake George Community Center, Hwy 24

Pikes Peak Region Mineral Collecting Fundamentals

John Rakowski will present the general geology of the Pikes Peak batholith and discuss nature's hints of how to look for mineral specimens. There will be a discussion about safety, mining claims, suggested tools, how to protect specimens you find, and how to clean those specimens. He will have representative specimens of the key rock types and examples of mineral specimens from the area. Some of the basic techniques for identification of commonly found local minerals will be discussed. This session is designed mainly for members new to the hobby or new to the area but all members are welcome.

Scheduled Programs at Club Meetings:

July - **Bob Carnein**, Basic geology of the Colorado Springs/Ute Pass area (field-trip prep)

August - **Steven Veatch**, Pebble Pup Presentation

September - **Steve Gorman**, History of the Gold City Claim

October - **Richard Walker**, Meteorite find near Cotopaxi. Use of metal detectors

November - **Doug White**, Newmont CC&V geology of Cripple Creek gold mine

December - Towel show, no presentation

Silent Auction: We need donations for the silent auction at our club meetings! If you have "extras", whether minerals, fossils, books, or other items, and if you have a label saying what the item is and where it came from, we can use it. If not, bring some cash and be prepared to help support Club activities, including scholarships, Pebble Pups, and other items.

LGGM Club Field Trips:

A note from the Field Trip Coordinators...

Colorado's spring is fully upon us, which means getting out and rockhounding one day, and staying in while it's snowing the next! We've had to reschedule several trips thus far, but that is always the case in the Colorado Rockies as the seasons change--one of many reasons that so many of us love living here! We have a very active field trip season planned already and are looking for more trip ideas, especially in July and August. We have great networking happening on joint field trips that are being planned with the Denver Gem and Mineral Guild, Mile High RAMS, Littleton Gem and Mineral Club, and other like-minded groups. It will be an amazing season. I'm looking forward to spending it with you!

Thanks to all of you who have offered to volunteer. Without you, we wouldn't be able to have such an amazing selection of field trips! That said, we need ideas for other places to go, and we also need more volunteer leaders. Please contact Dave Alexander (dave@davealex.com) or Laura Canini (CaniniLaura@gmail.com) with your ideas or to volunteer!

A reminder that field trips are for club members only. The official, and most up to date list of field trips will always be at <https://lggmcFieldTrips.com/>. You must always sign up on this site to go on field trips. We update this site frequently, so check back often! We already have a couple of limited-participant trips that are full. We ask that you remove yourself from the list if

you can't make a trip, even if that comes up at the last minute. Also let your field trip leader know. This can be done with a simple button on the field trip site. This may allow others to attend! Please read through the Field Trip Rules and Code of Ethics, which are also available on this site. Finally, ensure that you show your finds to trip leaders and others on the trips, and post them on our Facebook page so that all of us can enjoy the amazing colors and geometry that you discover! Happy prospecting!

--dave

SCHEDULE OF LGGM CLUB PROGRAMS, FIELD TRIPS & EVENTS			
Date(s)	What	Where	Leader/Notes
Sa 6/1	Geology & History of Phantom Canyon Road	Phantom Canyon Rd.	Paul Combs
Sa 6/8	Fluorescent Minerals	LGGMC Presentation	Conrad North
W 6/12	Blue Moon Claims	Crystal Peak Mining Dist.	Gary Cline/Karen Vogl
F 6/14	North Table Mountain Zeolites		Dave Alexander
Sa 6/15	Fluorescent Minerals	Gold City Claim – Lake George area	Bob Baker Evening/Night Trip at full moon
Sa 6/22	Epidote, quartz	Calumet Mine - Salida	Dave Alexander & Richard Kawamoto --Joint Trip with RAMS
Su 6/23	Garnets	Sedalia Mines	Dave Alexander & Richard Kawamoto --Joint Trip with RAMS
Sa 6/29	Topaz Mountain Gem Mine	N of Lake George	Steve Kahler, Dave Alexander
W 7/10	Mushroom Gulch Jaspers	Trout Creek Pass	Linda Watson
Sa 7/13	Geology of Ute Pass	LGGM Club Presentation	Bob Carnein
Sa 7/20	Smokey Hawk	Crystal Peak Mining Dist.	Steve Kahler, Richard Kawamoto
Sa 7/27	Magnetite, fluorite	Badger Flats	Linda W
Sa 7/31	Blue Barite	Harvey Claim - Hartsel	Linda Watson
Sa 8/10	Pebble Pup Presentation	LGGM Club Presentation	Steven Veatch
F 8/16 – Su8/18	LGGM CLUB ANNUAL GEM & MINERAL SHOW	Lake George (between Post Office - Starkeys)	See lggmclub.org for more details
Sa 9/14	History of Gold City Claim	LGGM Club Presentation	Steve Gorman
Sa 9/21	Honey Bee/Queen Bee Mines		Dave Alexander
W 10/2	Fossils	Hwy 115 Pierre Shale	
Sa 10/5	Colorado Springs Area Geology Day #1	GOG, Manitou Spr, Cave of the Winds, Crystola	Bob Carnein
Su 10/6	Colorado Springs Area Geology Day #2	Ute Pass (Woodland Park to Rainbow Falls)	Bob Carnein
Sa 10/5	Book Cliffs & Other TBD -Day 1	Grand Junction Area	Dave Alexander, Richard Kawamoto – Joint trip with RAMS
Su 10/6	Book Cliffs & Other TBD -Day 2	Grand Junction Area	Dave Alexander, Richard Kawamoto – Joint trip with RAMS
Sa 10/12	Meteorite near Cotopaxi	LGGM Club Presentation	Richard Walker
Sa 11/9	Newmont CC&V Geology of Cripple Creek-Victor Gold Mine	LGGM Club Presentation	Doug White
Additional Presentations and Field Trips to be added after they are confirmed.			

Other Upcoming LGGM Club Events:

LGGM CLUB SHOW August 16-18 – VOLUNTEERS ARE NEEDED

Hello fellow club members. We are the volunteer coordinators for the Lake George Gem & Mineral Show. The show is **Friday, August 16th through Sunday, August 18th** from 9:00

Lake George Gem & Mineral Club

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a.m. – 5:00 p.m. at the usual location between the post office and Starkey's on Hwy. 24 in Lake George.

In past years, Don and I have volunteered two hours as a parking helper and a club tent host. The time passed by very quickly as we greeted visitors and made new friends. What was really enjoyable was watching the children who visited the club booth, all with big smiles on their faces as they handled rocks, minerals and fossils and selected one (or perhaps two) as a special treasure to take home.

The club needs your help to make this show one of the best in club history! At the June club meeting, you will have the opportunity to sign up for one or more of the following:

- Field Layout** immediately after the **Saturday, August 10** club meeting: 12 volunteers
- Show Teardown** on the last day of the show, **Sunday, August 18** at 5:00 pm: 6 volunteers
- Show Teardown** on **Monday, August 19** at 9:00 a.m.: 6 volunteers
- Parking Helpers** for two-hour shifts beginning at 9:00 am ending at 5:00 pm **each day of the show**: 2 volunteers for each two-hour shift
- Club Tent Hosts** for two-hour shifts beginning at 9:00 am ending at 5:00 pm **each day of the show**: 2 volunteers for each two-hour shift

You may volunteer for more than a two-hour shift. If you know the day(s) and time(s) you would like to volunteer, or if you have questions, please contact us at: donk1244@yahoo.com or: 719 275-5080

Thank you, **Don & Beverly Keith**

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ADDITIONAL COMING EVENTS OUTSIDE THE LGGM CLUB: (Nearby gem, mineral, fossil and geology events that you may enjoy.)

- **Cañon City Geology Club**, meets on the 2nd Monday of the month at 6PM in the United Methodist Church, Cañon City
- **Columbine Gem & Mineral Society**, meets on the 2nd Thursday of each month, 6:30PM in the meeting room, Mt. Shavano Manor, 525 W. 16th (at J St.), Salida
- **Colorado Springs Mineralogical Society**, meets on the 3rd Thursday of each month at 7PM in the Mt. Carmel Veteran's Service Center, 530 Communication Circle, Colorado Springs;
- **Pueblo Rockhounds**, meets on the 3rd Thursday of each month at 6:30PM in the Westminster Presbyterian Church, 10 University Circle, Pueblo.

Pete Modreski suggests the following upcoming events:

Leonardo da Vinci at the Colorado School of Mines, Arthur Lakes Library: In addition to the **Leonardo da Vinci: 500 Years of Genius** exhibit now in progress at the Denver Museum of Nature and Science (see <https://secure1.dmns.org/leonardo-da-vinci-500-years-of-genius>), there is another excellent exhibit about his work, currently on display at the Lakes Library on the CSM campus. The **Machines of Change: The Da Vinci Machines** exhibit includes "over 60 authentic reproductions of machines and devices designed by Leonardo DaVinci were created using similar materials, building

techniques and tools that Leonardo would have had access to in his time”, plus full-size reproductions of Leonardo’s most famous paintings. The exhibit, free to all visitors, is spaced around the corridors and reading rooms of the main floor of the library. Library hours are 8 a.m. to 8 p.m. most days, 12 to 6 weekends.

Fri.-Sat.-Sun., May 31-June 2, Pikes Peak Gem & Mineral Show, Norris-Penrose Event Center, 1045 Lower Gold Camp Road, Colorado Springs, CO 80905. Sponsored by the Colorado Springs Mineralogical Society. Hours: noon-7 pm Fri., 10-5 Sat, 10-4 Sun. Adult admission \$5.

Wed., June 5, 3:00 p.m., Denver Museum of Nature & Science, Earth Sciences Colloquium, “**Deciphering dinosaur lives: From microscopes to Madagascar**”; by Kristi Curry Rogers, Macalester College. In Ricketson Auditorium (not in VIP Room) DMNS; all are welcome, museum admission is not required.

Mon., June 10, 3:00 p.m., Denver Museum of Nature & Science, Earth Sciences Colloquium, “**Cursed seashells: Deciphering one of the most ubiquitous Paleozoic fossils, Rafinesquina**”; by Ben Dattilo, Purdue University. In Community Room (3rd Floor), not in VIP Room, DMNS; all are welcome, museum admission is not required.

Sat. June 15. Susan Howard, Volunteer Coordinator, CSM Geology Museum, reports that the museum will be selling many of their used microscopes. Friends of the Museum and museum volunteers will get an additional 20% discount off of the asking price. You can join the Friends of the Museum at the sale. Anyone interested in more information or additional photos of an instrument should contact Susan at sdhoward@mines.edu. We will also be scheduling hours when people can come to the Museum to look at the microscopes. Additional information is available at <https://www.facebook.com/events/2097716470527460/>

Fri.-Sat., June 21-22, 9 a.m. to 4 p.m., **Mineral and Gem Sale** from the estate of Julie Hesse. 2545 Teller St., Lakewood. Julie Hesse, of Basalt, CO, passed away on March 30, 2018. Her family has decided to sell some of the collection to the public. The sale is hosted by Julie’s stepdaughter, Laura Mace.

July 18-21, “Home Rock Show” (Sale), by John Haney, 9 to 5 daily, 4242 Thompson Ct., Denver 80216. “Rough rock, slabs, cabs, fossils, amber, turquoise, minerals, metaphysical crystals, gemstone bowls & boxes, lapidary equipment & supplies”. Contact rocksisme@comcast.net, or 303-296-8268.

For more lecture series during the year see:

Colorado Beer Talks (2nd Tuesday, 6-8 p.m.), Windy Saddle Café, 1110 Washington Avenue, Golden, “Golden’s grassroots version of TED talks, Expand your mind with a beer in your hand”, <http://goldenbeertalks.org/>

Colorado Café Scientifique in Denver, monthly lectures on science topics held either at Blake Street Station or Brooklyn’s, Denver; open to the public, no charge other than refreshments you may choose to purchase; see <http://cafescicolorado.org/> .

Colorado Scientific Society (3rd Thursday, 7 p.m.), see <http://coloscisoc.org/> . Meets at Shepherd of the Hills Church, 11500 W. 20th Ave., Lakewood CO, except when noted.

CU Geological Science Colloquium (Wednesdays, 4 p.m.)

see <http://www.colorado.edu/geologicalsciences/colloquium>

CSU Dept. of Geoscience Seminars (Fridays, 4 p.m.),

see <https://warnercnr.colostate.edu/geosciences/geosciences-seminar-series/>

Van Tuyl Lecture Series, Colorado School of Mines, (Thursdays, 4 p.m.): <https://geology.mines.edu/events-calendar/lectures/>

Denver Mining Club (Mondays, 11:30), see <http://www.denverminingclub.org/> .

Denver Museum of Nature and Science, Earth Science Colloquium series, 3:00-4:00 p.m., VIP Room unless noted, day of the week varies. Museum admission is not required;

see <http://www.dmns.org/science/research/earth-sciences/>

Denver Region Exploration Geologists Society (DREGS; 1st Monday, 7 p.m.), <http://www.dregs.org/index.html>

Florissant Scientific Society (FSS); meets monthly in various Front Range locations for a lecture or field trip; meeting locations vary, normally on Sundays at noon; all interested persons are welcome to attend the meetings and trips; see <http://www.fss-co.org/> for details and schedules.

Nerd Night Denver is a theater-style evening featuring usually 3 short (20-minute) TED-style talks on science or related topics; held more-or-less monthly at the Oriental Theater, 4335 W. 44th Ave., Denver; drinks are available; for ages 18+. Admission is \$6 online in advance, \$10 at the door. See <https://www.nerdnitedenver.com/> .

Rocky Mountain Map Society (RMMS; Denver Public Library, Gates Room, 3rd Tuesday, 5:30 p.m.), <http://rmmaps.org/>

Western Interior Paleontological Society (WIPS); beginning January 2019, WIPS will meet on the 1st Monday of the month, 7 p.m., at Lowry Conference Center, 1061 Akron Way, Denver. See <http://westernpaleo.org/> .

LGGM Club News:

Saturday, May 11, 2019, we thank **Markus Raschke** for providing us with his excellent presentation on Rare Earth Minerals in the Pikes Peak Batholith.



After the club meeting, a few of us including **Taylor Harper** and trip chairman, **Dave Alexander** took advantage of the fair weather to visit the club claims. We had the fortune to meet up with one of our new members **Alexander Genovese**.



Taylor Harper & Dave Alexander



Alexander Genovese

Wed May 16, 2019 – Our trip chairman, **Dave Alexander**, led a great mid-week excursion in search of blue barite to Pawnee National Grassland near Stoneham, Colorado.



Above: Pawnee National Grasslands
Below: The group, the terrain, and some of the finds.



RMFMS Annual Convention --The Lake George Gem & Mineral Club is a member of The Rocky Mountain Federation of Mineralogical Societies (RMFMS). This year, the 2019 RMFMS annual convention will occur in Prescott, Arizona on August 2-4. Full details about the convention are available at the following website:

<http://www.prescottgemmineral.org/wp-content/uploads/2019/03/2019-rmfms-convention-packet-final-v2.pdf>

From Wayne Orlowski we have the following abstract “ A Final Journey Set In Stone”. This is a summary of the longest "mortichnia" (a fossilized death track or last walk).

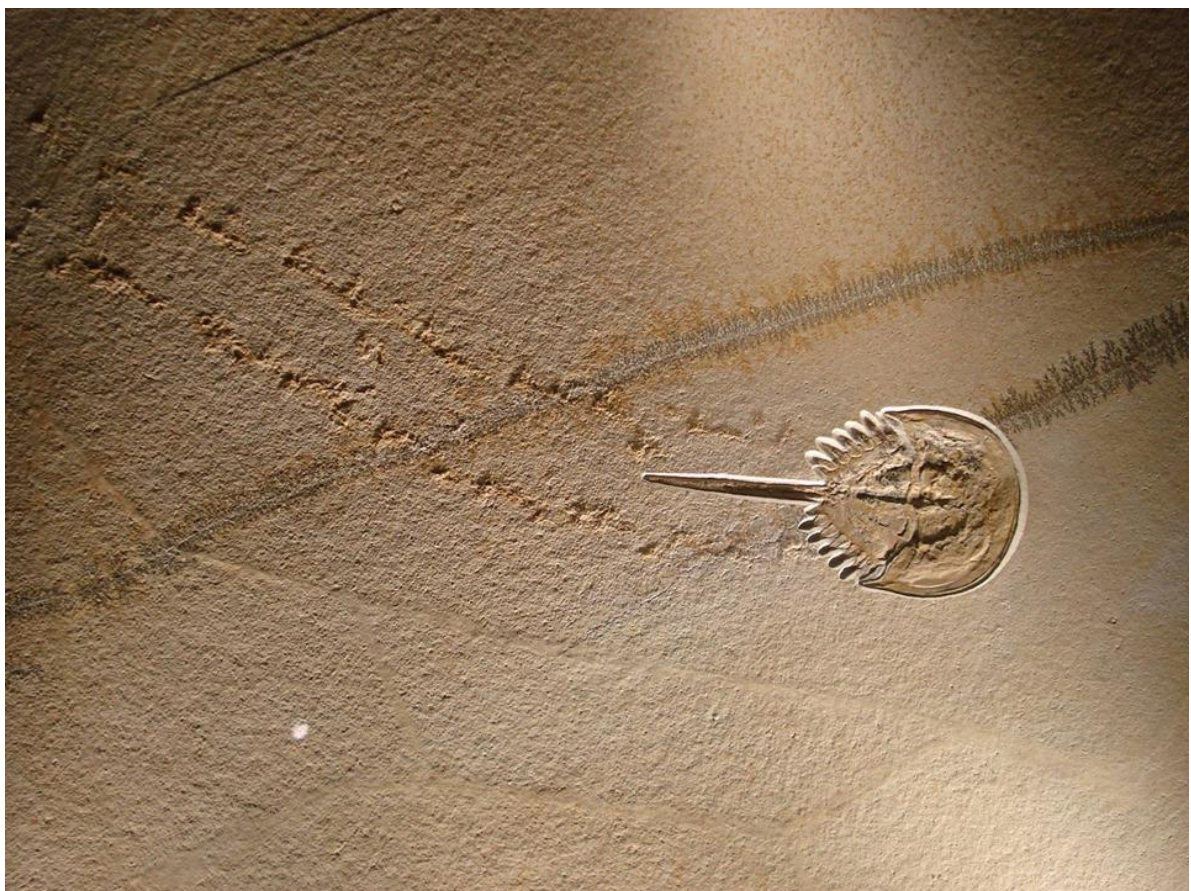
Something unfortunate happened to a horseshoe crab some 150 million years ago. A harsh storm washed it into a toxic lagoon, where it scrambled around and eventually died. What it left behind was remarkable - a perfectly fossilized story of its final, brief journey, capturing the longest, complete death track ever found.

The horseshoe crab, *Mesolimulus walchi*, was discovered in Solnhofen, Germany, along with many other beautifully fossilized animals. The soft carbonate mud preserved insects, sea jellies, and dinosaurs with great detail. *M. walchi* was likely a juvenile at the time of its death, measuring 12.7cm long by 6.9cm wide. The toxic lagoon that it was dropped into was highly salty and anoxic (no oxygen).

According to Dean Lomax of the Doncaster Museum & Art Gallery in the U.K. and Christopher Racay of the Wyoming Dinosaur Center, the disturbed surface at the beginning of its trail shows that the horseshoe crab sank to the bottom of the lagoon on its back and struggled to turn upright. It then began its mortichnia, meaning death track or last walk, meandering and making a few turns before becoming distressed. It then began to asphyxiate, leaving behind less uniform, deeper and more erratic imprints as it tried to escape. At the end of the 9.7-meter fossilized trail we find the complete specimen of the crab.

Lomax and Racay dismiss the hypothesis that it was dropped in the lagoon by a flying predator, such as a pterosaur, due to the lack of any predation marks. Lomax writes in the journal *Ichnos*, “Trackways and trace makers preserved together in the fossil record are rare and such specimens allow unique insights into behavior and ecology.”

So our little arthropod friend did not die in vain: its story was set in stone and survived millions of years as one of the most amazing specimens of its kind.



If you would like to read the full article, use the following link:

http://www.sci-news.com/paleontology/article00554.html?fbclid=IwAR2mnJhIKgY60DqJXfk0O2J4zqAKmd1xKmZ6_yYIRcbsa8zURDofS2Hi4F0

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Wayne also sent us this link to an article that does a great job of explaining the basics of how incredibly powerful ice-age floods shaped the rugged terrain of eastern Washington that is referred to as channeled scablands.

<https://wadnr.maps.arcgis.com/apps/Cascade/index.html?appid=84ea4016ce124bd9a546c5cbc58f9e29>

Use the Pg Dn key to step through the presentation

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Wayne's third link this month is a You Tube video showing selected images from ESA's Mars Express satellite that is orbiting Mars:

https://www.youtube.com/watch?time_continue=5&v=uoblCdedNNM

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and Wayne's fourth link is an unusual video shot from the SpaceX Starlink satellite

https://earthsky.org/space/wow-photo-video-spacex-starlink-satellite-train?utm_source=EarthSky+News&utm_campaign=cb6e9f91a6-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-cb6e9f91a6-394714909

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Paul Combs sent us this link to a VERY recent discovery of a dinosaur fossil in the Highlands Ranch suburb of Denver:

<https://www.krdo.com/news/top-stories/construction-workers-find-dinosaur-fossils-in-denver-suburb/1080086851>

We will try to post more detailed information from this excavation as it becomes available.

Pebble Pup News:

PEBBLE PUP AND EARTH-SCIENCE SCHOLARS FIELD TRIPS 2019

Greetings, I am pleased to announce the 2019 Pebble Pup/Earth-Science Scholars Field Trips. These trips are open to the Colorado Springs Mineralogical Society PPS/ESS and the Lake George Gem and Mineral Club PPS/ESS and their families. Each participant must register with me via email. Some of the trips have strict limits on the number of participants. I am looking forward to a summer of collecting fun.

Steve

SATURDAY, JULY 20th South Park Field Expedition

Leader: Steven Veatch

We will meet at the Wilkerson Pass Summit parking area at 10 am. From there we will go to an abandoned mine to collect a variety of rock and mineral specimens. Next, we will go to several sites in South Park to collect white botryoidal chalcedony, colorful jaspers, and possibly petrified wood and magnetite. We will look for other interesting specimens. We will go to an archaeological site and look for and collect arrowhead chips. Collecting these artifacts is lawful as this is private land. Bring your lunch and water. We will have a group picnic. Don't forget your rock hammer and specimen bags. We plan to end the day by 3 pm. There are no restroom facilities. Wear proper footwear and clothing for outdoor activity. You must register for this field trip with Steven Veatch at steven.veatch@gmail.com by July 10. Limit: 10 Pebble Pups/ Earth-Science Scholars. Carpooling advised.

SATURDAY, AUGUST 10th Pipe Springs Tourmaline

Trip Leaders: Laura Canini and Steven Veatch

This trip will take you on a winding road past a stand of aspen trees to a deposit of black tourmaline in white quartz. We will meet in Florissant at 9:00 am and travel to the site. Depending on time, we may search for other rocks and minerals. Bring a lunch and water. There are no restroom facilities. Wear proper footwear and clothing for outdoor activity. Don't forget your rock hammer and specimen bags. We plan to end the day by 2 pm. You must register for this field trip with Steven Veatch at steven.veatch@gmail.com by August 1. Limit: 10 Pebble Pups/ Earth-Science Scholars. Carpooling advised.

Note: it is essential to register for all trips with Steven Veatch as the meeting place may change. I will email a final announcement with more trip details to all participants. Also, check out the field trips offered by the Colorado Springs Mineralogical Society and the Lake George Gem and Mineral Club. If you are a member of either club you may go on their field trips. Check out these websites:

CSMS <http://www.csms1936.com/>

Lake George Club <https://www.lggmclub.org/>

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Here is the latest installment of “**Bench Tips**” by Brad Smith: (www.BradSmithJewelry.com)

EMERY BOARDS

The sanding boards for doing your nails are one of my favorite finishing tools. I use the ones with a thin foam core. They have enough resistance to sand just the high points off a flat surface and yet give a little when you're trying to smooth off a curved surface. Plus they're inexpensive and come in a variety of grits. Some grits are so fine they give an almost finished surface. Pick up a few at a beauty supply company or at your local drug store.



Lake George Gem & Mineral Club

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DENTAL FLOSS

When testing the fit of a stone in the bezel, it's all too easy to get it stuck. If tapping the finding or opening up the bezel a bit with a knife blade doesn't dislodge it, you might have to drill a small hole in the bottom and push it out with a needle.

To avoid all this frustration, use the old dental floss trick. Lay a piece of dental floss over the top of the bezel before you seat the stone. Then just pull on the floss to remove the stone.

Work Smarter With Brad's "How To" Jewelry Books

www.Amazon.com/author/bradfordsmith

Happy hammering,
- Brad

Notes from the Editors

Jerrolynn Kawamoto
Editor

jerrolynn@wildblue.net

719-748-8152

Bob Carnein
Associate Editor

ccarnein@gmail.com

719-687-2739



Bob Carnein's article on the geology of pegmatites will interest both club members who are new to rockhounding in our area, and other members who have collected minerals from the pegmatites and would like a better understanding of their geology.

Jerrolynn Kawamoto, Editor

What the Heck is Pegmatite? (The Basics)

by **Bob Carnein**

Introduction. As a Colorado mineral collector, you have no doubt run into the term *pegmatite*. If you've spent any time exploring what a pegmatite is or how they form, you probably find the concept a bit confusing. This and a future article should help clear up the confusion.

Igneous Rocks. Pegmatites are generally classified as **igneous** rocks. This means that they form by crystallization of material that was originally molten (called *magma*). As you may have learned elsewhere, petrologists (scientists who study the origins of rocks) divide igneous rocks into two types.



Volcanic (aka extrusive) rocks form when magma issues from fissures or vents at the Earth's surface. The rapid decrease in temperature and pressure as magma is extruded results in explosive eruptions (especially if the magma is viscous and rich in dissolved gases) or lava flows (if the magma is relatively "runny"). Volcanic rocks are generally fine grained (average particle size is less than 1 mm—1/25 inch), because the magma cools quickly and there isn't time for large crystals to form (Figure 1).

Figure 1. Volcanic rock (basalt), showing very fine grained texture due to rapid cooling from a melt. The rock consists mainly of plagioclase, pyroxene, and olivine. San Carlos Reservation, Arizona. (Carnein photo and collection)



Plutonic (aka intrusive) rocks form by crystallization of magma at some depth below the surface. The magma is often thought to move upward from below, as a result of buoyancy or, in zones where two tectonic plates converge, squeezing outward and upward. Because plutonic rocks remain buried during crystallization, there is more time for large crystals to form—they tend to be relatively coarse grained (average grain size more than 1 mm).

Figure 2. Coarse texture caused by slow cooling of magma beneath Earth's surface. Pikes Peak Granite. Minerals are quartz (pale gray), potassium feldspar (pinkish), and biotite (black). Plagioclase feldspar is also present. (Carnein photo and collection)

Naming Rocks. Like all rocks, igneous rocks are classified on the basis of two things. The first is their mineral composition. Geologists can't assign a name to a rock until they know what minerals are present and in what proportions. That's why they spend a lot of time looking at thin slabs of rocks (called *thin sections*) under a microscope or using a 10X magnifier in the field.

Considering how many different minerals there are (currently around 5470 recognized species; www.Mindat.org), this could get pretty complicated. However, when classifying rocks, geologists generally recognize two categories of minerals: (1) *essential minerals* are the ones that **must be present** to give a rock a particular name. For example, granite **must** contain quartz, potassium feldspar (microcline or orthoclase), and lesser plagioclase feldspar. The proportions of these three minerals can vary within definite limits, but all must be present if the rock is to be called granite (Figure 2). (A commonly used igneous rock classification system can be found in Streckeisen, 1973.)

(2) *Accessory minerals* include everything else that is present but isn't essential to naming the rock. For example, granite often contains the micas *biotite* and *muscovite*, as well as the common amphibole *hornblende*. These common accessories are often used to modify the name of the rock. Thus the Pikes Peak Granite is a biotite-hornblende granite; the Silver Plume Granite (which occurs west of Lake George) is a biotite-muscovite (or binary) granite. As some of you know, the Pikes Peak Granite may also contain a variety of other accessory minerals, including magnetite, zircon, garnet, etc. These are minor accessories and are not mentioned in the rock name.



All rocks are also classified according to their *texture*. This term refers to different things, depending on the major rock group (igneous, sedimentary, or metamorphic). For igneous rocks, we often talk about **coarse grained** (average particle size generally greater than 1 mm; Figure 2) vs. **fine grained** (average grain size less than 1 mm; Figure 1) rocks (aka phaneritic vs. aphanitic textures). Granite, by definition, is a coarse grained rock. A rock having the same mineral composition as granite but with an aphanitic texture can't be named granite—it's rhyolite. If you've been following what I have written so far, you might guess that phaneritic texture is typical of plutonic rocks; aphanitic texture occurs mainly in volcanic rocks.

Figure 3. Porphyritic texture, caused by crystallization of magma under changing conditions. Pink and light gray crystals are potassium feldspar and plagioclase; groundmass is dark brown or gray. Vanda Porphyry, Wright Valley, Victoria Land, Antarctica. (Carnein photo and collection)

Some igneous rocks have relatively coarse and fine mineral grains mixed together in the same rock. The coarse grains are called *phenocrysts* (“feen’-oh-crists) and the finer surrounding grains are called the *groundmass*. Such rocks have a porphyritic (“pore-fer-it’-ick”) texture (Figure 3). This occurs where the magma began to crystallize slowly beneath the surface (forming the coarser phenocrysts) but then moved upward into cooler host rocks or was ejected at the surface (forming the finer grained groundmass). For example, a porphyritic granite might contain plagioclase crystals that are 2 cm across surrounded by finer grained quartz and potassium feldspar grains that are 5 mm across.

So, both mineral composition and texture must be taken into account when naming a rock.

Note: the terms “coarse”, “medium”, and “fine grained” are also used in other ways that are not described here.

The Pegmatites. Now, here’s the first problem when defining what a pegmatite is. *Pegmatite* is the name of an igneous-rock texture, **not a rock type**. On the average, mineral grains in a pegmatite are more than 1 cm (about ½ inch) across (Bates and Jackson, 1980). They may be huge (crystals more than 10 m or 30 ft across occur at the Devils Hole mine, in Fremont County, Colorado). More typically, they are on the order of 2 to 10 cm (about 1 to 4 in) across.



Figure 4. Typical granite pegmatite with accessory schorl (black), muscovite (silvery gray), and garnet (dark brown). Devils Hole mine, Fremont County, Colorado. (Carnein photo and collection)

So, if we have a rock made up of quartz, potassium feldspar, and plagioclase crystals in a certain proportion that are, on average, more than 1 cm across, it’s still granite. However, to communicate the fact that the mineral grains are very coarse, we call it *granite pegmatite*. (It should be obvious that there is no such thing as rhyolite pegmatite.) If the mineral composition is not that of a granite, we have to call the rock some other kind of pegmatite (for example, granodiorite pegmatite or gabbro pegmatite). Luckily for beginners, most pegmatites are granite pegmatites. The reason has to do with things that are beyond the scope of this article. You should be aware that, although granite pegmatites are very coarse grained, this doesn’t imply that they cooled slowly. Laboratory experiments using realistic magma compositions and

temperatures and pressures (e.g. London, 2008, 2013) suggest that many pegmatites cool and crystallize in a matter of days or weeks—very rapidly, in geologic terms. How can this be possible? That's a topic I'll talk about in the next installment.

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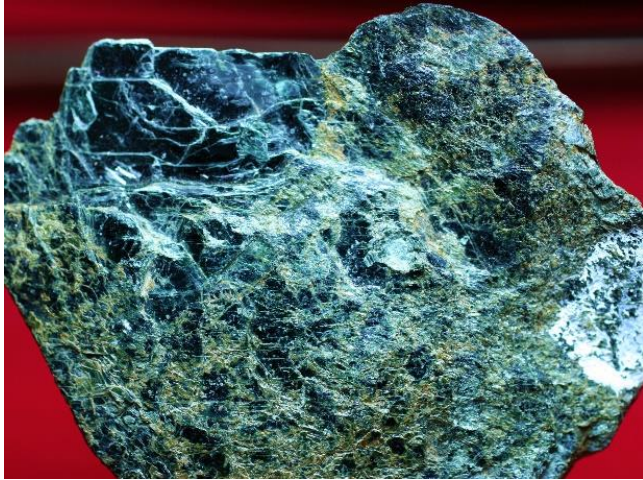
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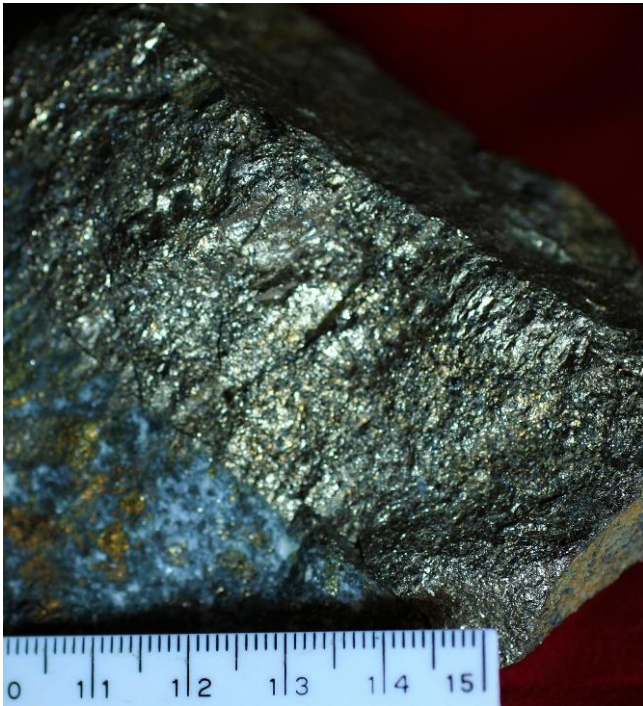
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Monthly Mineral Quiz



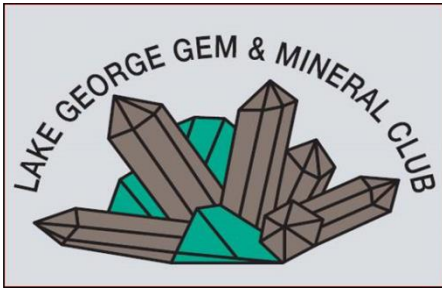
Last Month's Mineral: Chlorite is the generic name for a group of minerals that have similar structures and physical properties and that are very hard to distinguish without sophisticated testing. Included are chamosite, clinocllore, penantite, and sudoite (Klein, 2002). Chlorite is important as a metamorphic *index mineral*: its presence in slate, phyllite, or schist tells us that the rock was subjected to low temperature and pressure metamorphism. However, it is also common in other kinds of metamorphic and altered igneous rocks. It's one-direction of cleavage, green color, and low hardness serve

to suggest its presence. If you visit the Sedalia mine, near Salida, you will see large almandine garnets and small magnetite crystals embedded in a chloritic schist.



This month's mineral is commonly mistaken for pyrite, in that it is relatively dense and has a gold to silver metallic luster. However, its hardness is only 4 (pyrite's is 6 to 6 1/2), its crystal habit is completely different (pyrite is isometric, this mineral is pseudo-hexagonal), and it is often slightly magnetic (pyrite is not). You might find it in metallic mineral deposits (the specimen illustrated came from the Sudbury, Ontario copper-platinum deposit—a huge mass of basic igneous rock formed by an asteroid impact), contact metamorphic rocks, hydrothermal veins, and pegmatites. What is it?

Reference: Klein, C., 2002, *The 22nd Edition of the Manual of Mineral Science, after James D. Dana*: New York, John Wiley & Sons.



The Lake George Gem and Mineral Club is a group of people interested in rocks and minerals, fossils, geography and history of the Pikes Peak/South Park area, Indian artifacts, and the great outdoors. The Club's informational programs and field trips provide opportunities to learn about Earth science, rocks and minerals, lapidary work and jewelry making, and to share information and experiences with other members. Guests are welcome to attend, to see what we are about!

The Club is geared primarily to amateur collectors and artisans, with programs of interest both to beginners and serious amateurs. The Club meets on the second Saturday of each month at the Lake George Community Center, located on the north side of US Highway 24 on the east edge of town, sharing a building with the county highway shops. **In the winter, we meet at 10:00AM. From April through October, we meet at 9:00AM, to allow more time for our field trips.**

Our organization is incorporated under Colorado law as a nonprofit educational organization, and is a member of the Colorado, Rocky Mountain, and American Federations of Mineralogical Societies. We also sponsor an annual Gem and Mineral Show at Lake George, where collectors and others may purchase or sell rocks, minerals, fossils, gems, or jewelry. Annual membership dues (Jan. 1 through Dec. 31) are \$15.00 for an individual (18 and over), and \$25.00 for a family (parents plus dependents under age 18).

Our Officers for 2019 are:

Richard Kawamoto, President
7584 Cedar Mountain Rd.
Divide, CO 80814
719-748-8152
kawahome@wildblue.net

John Rakowski, Vice President
PO Box 608
Florissant, CO 80816
719-748-3861
rakgeologist@yahoo.com

Lorrie Hutchinson, Secretary
10915 Grassland Rd.
Colorado Springs, CO 80925
719-382-3503
4lohutch@gmail.com

Cathy McLaughlin, Treasurer
11595 Owls Nest Rd.
Guffey, CO 80820
702-232-3352
cathy_mclaughlin@hotmail.com

C.R. (Bob) Carnein
Newsletter Associate Editor
507 Donzi Trail
Florissant, CO 80816
719-687-2739
ccarnein@gmail.com

Jerrolynn Kawamoto
Newsletter Editor
7584 Cedar Mountain Rd.
Divide, CO 80814
719-748-8152
jerrolynn@wildblue.net