PICK&PACK
THE BULLETIN OF THE COLORADO SPRINGS MINERALOGICAL SOCIETY Published Since 1960

Colorado Springs Mineralogical Society
Founded in 1936

December 2014
PICK&PACK
Vol 54..... Number 10

CSMS General Meeting

Thurs. December 18, 2014 7:00 PM

Christmas Party

Please Bring Desserts or Hors d'oeuvres to Share

Last Name Starts with A-L—Dessert

Last Name Starts with M-Z— Hors d'oeuvres

Gift Exchange—If you would like to participate, please bring a hobby related wrapped gift. If bringing a mineral, please properly label.

Silent Auction—We have some nice specimens already but we can always use more. Please bring any donations properly labeled for the Silent Auction.

Inside this Issue:	

CSMS Officers for 2015

President: Mark Lemesany

Vice President: Jean Luce

Secretary: Melanie Glascoe

Treasurer: Ann Proctor

Membership Secretary: Ariel Dickens

Editor: Lisa Kinder

Member at Large: Yam Yamilokoski

Member at Large: Doreen Schmidt

Dues are Due for 2015 !!!

Dues received before January 31st will be discounted.

CSMS Calendar

December 2014

Tue., Dec 2—Fossil Group, 7 p.m., Senior Center. Jerry Suchan 303 648-3410

Thu., Dec 4—Board Meeting, 7 p.m., Senior Center.

Tue., Dec 9—Micromounts, Cancelled—No Meeting, Dave Olsen, 719 495-8720

Thu., Dec 18—General Assembly, 7 p.m., Senior Center—Christmas Party

Pebble Pups & Juniors, 5:30 to 6:15 p.m., Steven Veatch, 719 748-5010

Thu., Dec 25—Crystal Group, Cancelled—No Meeting, Kevin Witte, 719 638-7919

Faceting Group, Cancelled—No Meeting, Paul Berry, 719 578-5466

Lapidary Group, By Appointment, Sharon Holte, 719 217-5683

Jewelry Group, By Appointment, Bill Arnson, 719 337-8070

January 2015

Tue., Jan 6—Fossil Group, 7 p.m., Senior Center. Jerry Suchan 303 648-3410

Thu., Jan 8—Board Meeting, 7 p.m., Senior Center.

Tue., Jan 13—Micromounts, 7 p.m., Senior Center. Dave Olsen, 719 495-8720

Thu., Jan 15—General Assembly, 5:30 p.m., Golden Corral, 5410 E. Woodmen Rd.

Thu., Jan 22—Crystal Group, 7 p.m., Senior Center. Kevin Witte, 719 638-7919

Faceting Group, 7 p.m., Senior Center. Paul Berry, 719 578-5466

Lapidary Group, By Appointment, Sharon Holte, 719 217-5683

Jewelry Group, By Appointment, Bill Arnson, 719 337-8070

The Senior Center is located at 1514 North Hancock in Colorado Springs. For more information on any of the sub-groups, meetings, and other CSMS valuable information, go to our website, csms.us

Other Events of Interest to CSMS Members

Wed., Dec. 17, 3:00 pm, DMNS Seminar Series, VIP Room, "**On the trail of Colorado's newest, oldest sedimentary rock formation: Eluded at every turn by the Tava sandstone**", Christine Siddoway (Colorado College). See http://sites.coloradocollege.edu/csiddoway/ for background info on the speaker. This should be a very interesting talk; Chrinstine Siddoway and George Gehrels have published a paper giving a new interpretation of the "sandstone dikes" found along the Ute Pass fault zone near Manitou Springs; that they are late Proterozoic in age (around 700 m.y.) rather than Paleozoic, and may represent sand deposits forced downward underneath a continental ice sheet that covered present North America, into fault fissures during the breakup of the Rodinia supercontinent. See a news story about this: http://news.sciencemag.org/earth/2014/09/strange-formation-colorado-rockies-sheds-light-earths-past

Sat., Jan. 3, 10:00 a.m. to 3:00 p.m.—Family Exploration Day! GEOLOGY!, Western Museum of Mining and Industry (go to http://www.wmmi.org for additional information.) 25 North Gate Blvd, Colorado Springs, CO— "Learn about Colorado's mineral and mining heritage, identify common or your own minerals-in-hand specimens, understand processes important to the formation mineral deposits, and identify modern methods of mineral exploration and mine development. Among the activities, see what it is like to run a mining company with 'Cookie Mining', try your hand with 'Keep What you Find Gold Panning', take part in some hands-on mineral identification, and spend some time in the company of our two burro mascots Nugget and Chism! Join WMMI, the Florissant Fossil Beds, Pilot Mining, Bricks-4-Kidz and more as we enjoy a fun, and educational for the whole family! All included with paid museum admission."

Continued on page 6

GARNIERITE: NICKEL ORE WITH A VARIED COMPOSITION (Part 3)

Mike Nelson csrockguy@yahoo.com

As mentioned in previous CSMS Newsletters (October on millerite/polydymite and November on siegenite), nickel (metal) is produced either from sulfide minerals or from laterite deposits. These minor nickel sulfides noted above piqued my interest in nickel minerals so I journeyed down to my favorite rock and mineral store, Ackley's in Colorado Springs. I actually was looking for a sample of pentlandite, the most common nickel sulfide, and was unable to find such. I wanted a sample of this sulfide since several years ago I was with my family traveling and camping across eastern and central Canada and so detoured through the city of Sudbury. Why Sudbury? Well, I wanted to see the famous nickel mines and smelter, and also Sudbury is situated in the second largest impact crater known on Earth (Fig. 1). The meteor struck what is now part of Ontario, Canada, about 1.85 Ga (Precambrian: Proterozoic). Many millions of years have elapsed since the 6-10 mile (diameter) fireball impact and the area has been subject to numerous deformational and orogenic events, and weathering. Therefore, it is difficult for geologists to define the original size of the crater; however, it was much larger than the present size of about 40 mi x 20 mi. Debris from the impact may have been scattered across the globe but is probably unrecognizable or destroyed after such a long period of time.

Fig. 1. Sudbury Structure created by an impact event ~1.85 Ga. Photo from USA Space Shuttle Challenger in 1984/85. Public Domain photo.

At one time geologists speculated that the large nickel deposits at Sudbury were part of the meteorite (as in iron-nickel meteorite). However, that is an erroneous conclusion (although it sometimes still is floated around). The Sudbury nickel is found in a typical pyrrhotite-pentlandite massive sulfide ore that is of mantle origin associated with an intrusive event. The impact force of the meteorite caused wholesale melting of the mantle, triggered the huge intrusion, and emplaced the nickel deposit (Stefano, 2014, personal correspondence). How much nickel? Canickel Mining Limited (2014) estimated that over US $120 billion worth of nickel, copper and Platinum Group Minerals have been produced from the region over the past 100 years!

Fig. 2. Superstack at Sudbury. Public Domain photo.

Sudbury's other claim to fame (probably a claim to shame) was the tremendous pollution of the area by the mine and smelter. The landscape reminded me of what I imagined the lunar landscape looked like. Even my children wanted a bottled (out of area) drink. Virtually nothing was alive except people and all the vegetation seemed dead or dying. Keller (2014) noted that in the 1960s and 70s "air pollution from the nickel smelter was so bad it literally blackened the earth: acid rain, along with mining operations, stripped the land of vegetation, leaving 100,000 hectares of barren or semi-barren moonscape. The water was exceptionally bad. More than 20,000 lakes in Ontario were acidified to the point of ecosystem damage, 7,000 of them within Sudbury's immediate vicinity. Lakes within the city and beyond were some of the most acidified, metal-contaminated lakes in the world."

Continued on page 4

I remember taking numerous slide photos to show my intro geology classes about the effects of nickel smelting and mining running amuck. The good news is that the community and mining operations took reclamation seriously and today the remediation is quite noticeable---things are looking much better. However, part of this remediation included building the Inco Superstack (~1250 feet) to disperse SO_2 gases and other byproducts of the smelting process away from the city of Sudbury (Fig. 2). The Superstack placed the gases high in the air where they blew right past the city of Sudbury. While the Superstack lowered the ground-level pollution in the city, it has dispersed sulfur and nitrogen gases over a much larger area. In fact, environmentalists estimate that the Superstack accounts for ~20% of all of the arsenic emitted in North America, ~13% of the lead and ~30% of the nickel. So, mining and smelting of nickel is one of those conundrums. Sort of dammed if you mine and dammed if you don't. Countries need the nickel in ever increasing quantities; however, environmental damage may be extensive. I certainly don't have the answer!

OK, back to the minerals. Although pentlandite was unavailable at Ackley's, the proprietors did have several samples of a nickel "mineral" called garnierite, a substance completely unfamiliar to me (Figs. 3 & 4). "Well, pack it up and I will do some reading!"

As I noted above, laterite deposits are the major source of nickel in today's world, and garnierite is a lateritic nickel "mineral." Laterites usually develop within 20 degrees latitude of the equator in a tropical environment where chemical weathering is most intense. The most soluble elements of the country rock dissolve away leaving behind the less-soluble minerals that are progressively redistributed throughout a series in a more-to less-weathering profile. Certain less soluble minerals often form a concentrated deposit within the profile (Samama, 1986). These concentrated elements/minerals vary in composition depending upon the makeup of the weathered country rock. Often, nickel and cobalt lateritic deposits are formed from weathering of serpentinite, dunite, peridotite and other ultrabasic rocks (low silica, low potassium, dark colored high iron and magnesium content) that are nickel- and cobalt- enriched. With extensive weathering the more soluble calcium, silicon and magnesium are removed from the profile while elements like manganese, copper, nickel, iron, zinc, aluminum, titanium and some rare earth elements are concentrated (Brand and others, 1998).

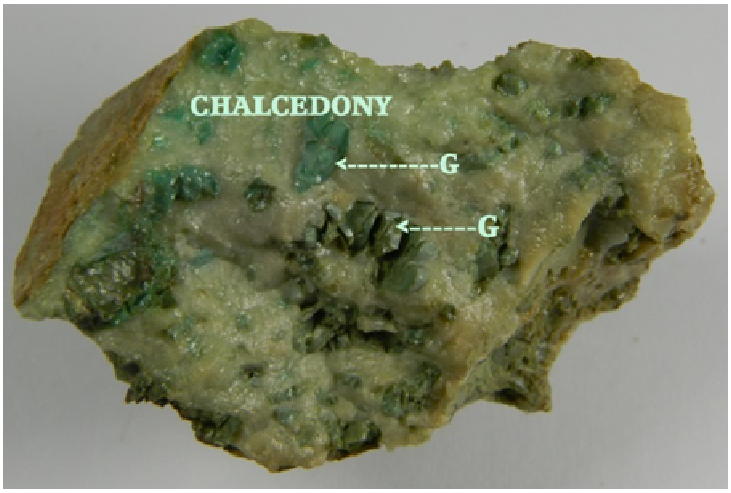

Fig. 3. Garnierite: chalcedony infused with nickel (chrysoprase?) and small nodules of concentrated nickel.

The weathering profile of these laterites is multifaceted and ranges in a continuum from the unweathered country rock through deeply weathered, but in place country rock, through magnesium- and nickel-rich silicates into clay layers and finally into various zones of iron oxide. Most of the concentrated cobalt is found in the iron oxide zones while the enriched nickel is deeper in the profile in the magnesium- and nickel-rich hydrous silicates. Nickel-enriched lateritic ores are well-known and productive in Western Australia, Cuba, New Caledonia, Greece and Russia (Marsh and Anderson, 2011). In the United States the Nickel Mountain Mine laterite deposit (Riddle District) in the Klamath Mountains of Oregon was a producing mine until 1998 with an average grade of perhaps 1.4 % nickel. Around 25 million tons of nickel was produced and at least that much of the metal remains. In addition, the smelter near the mine closed shortly after the mine was shuttered. However, as I understand it, there are numerous mining claims in the Riddle District extending from Oregon south into California.

The Riddle District laterites are the result, then, of intense weathering of ultramafic rocks. The question then becomes, at least to me, what is the source of these ultramafic rocks? The geology of this part of Oregon, and in

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fact much of the western U.S. Coast, is quite complex since for long periods of recent geological history this edge of the continent was active and colliding with oceanic terrane to the west (Fig. 5). Some of the oceanic terrane was subducted below the continental crust. However, other parts were accreted or "stuck to" the continent (Fig. 6). This latter terrane is mostly composed of oceanic ultramafic rocks and deep ocean sedimentary rocks. The weathering of these terranes in the Riddle District is something like Miocene in age. And, the laterite formation at Riddle is an anomaly since the equator was not within 20 degrees.

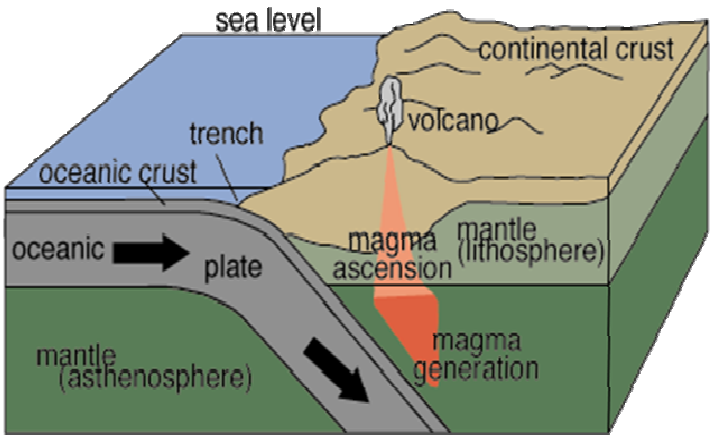

Fig. 5. Illustration (from USGS: http://www.sjvgeology.org/geology/tectonics.html) showing oceanic plate being subducted under continental crust.

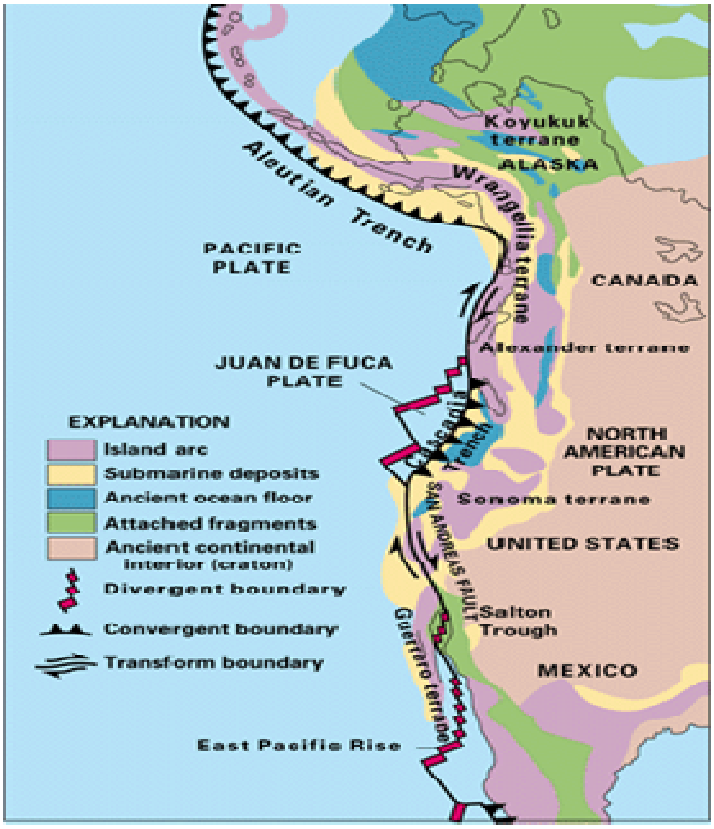

Fig. 6. Map showing accreted terrane (exotic terrane) in western North America. These silvers of land were once island arcs or pieces of oceanic crust that were "stuck" to the continent during collision with the proto North America. Map courtesy of USGS at: http://pubs.usgs.gov/gip/dynamic/Pangaea.html

Although some of the nickel at Nickel Mountain was enriched iron oxides most was contained in hydrous magnesium-and nickel-enriched silicate termed garnierite. At one time garnierite was considered to be a mineral but the official name has been discredited and garnierite now refers to a variety of green nickel ore with a varied composition and seemingly a quite complex chemical history.

The green color in garnierite varies, seeming with composition and depositional environment. Pecora and others (1949) believed light colored garnierite was due to the alteration of olivine-rich ultramafic rocks rich in clay minerals but poor in nickel. The light green to bright green garnierite resulted from the leaching of manganese oxide, magnesium, nickel and iron from the original dark green garnierite, rich in nickel, which was originally deposited by groundwater. With newer instrumentation available (*Extended X-ray Absorption Fine Structure*) Roqué-Rosell and others (2011) found that garnierite is actually a solid solution series between sepiolite, a complex, magnesium-rich clay mineral [$Mg_4(Si_6O_{15})(OH_2)$-$6H_2O$)] and falcondoite, the nickel rich analog of sepiolite [$Ni_3Mg(Si_6O_{15})(OH_2)$-$6H_2O$)] with samples analyzed showing between 3 and 77 percent falcondoite.

In my advanced years I am often confused, so, I remain somewhat confused about garnierite. The notation above indicates the garnierite is a mixture of falcondoite and sepiolite. OK, I certainly can buy that explanation. However, if I go to my favorite mineral website (MinDat.com), garnierite is listed as synonym of nepoulite, willemseite, and pimelite of which only the latter is found in Oregon; all are complex magnesium-nickel silicates. I have seen other references that indicate some garnierite is chrysoprase, a nickel-enriched chalcedony. The best that I can do is quote the "official" explanation from MinDat: "[Garnierite is the] generic name for a green nickel ore which has formed as a result of lateritic weathering of ultramafic rocks (serpentinite, dunite, peridotite). [It is] mostly a mixture of various Ni- and Ni-bearing magnesium layer silicates. [Garnierite] occurs in many nickel laterite deposits in the world."

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I also note, without comment, that RNR is proposing a new nickel mine near Rough and Ready Creek (Riddle District) and many people are frightened that, if successful, the mine will create significant environmental damage (www.roughandreadycreek.org). They point to the mess left at the Nickel Mountain Mine more than two decades after closure (Fig. 7). Several groups have therefore requested that watersheds of Rough and ready creek and Baldface Creek be withdrawn from the 1872 Mining Law.

Fig. 7. Google Earth© image of the Nickel Mountain Mine more than two decades after closure. Progress on remediation appears slow, or even lacking.

I'll tell you what---I learn so much every day of my life and for this I give credit and thanks to my early childhood teachers, and to my parents. Although both paraphrased the following quote, it was a mantra they instilled in their children: *You can teach a student a lesson for a day; but if you can teach him to learn by creating curiosity, he will continue the learning process as long as he lives.* ~Clay P. Bedford

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Brand, N.W., Butt, C.R.M., and Elias, M., 1998, Nickel Laterites: Classification and Features: AGSO Journal of Australian Geology and Geophysics, v. 17, no. 4.

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Marsh, E. and E. Anderson, 2011, Ni-Co laterites: A Deposit Model: USGS Open-File Report-1259.

Pecora, W.T., Hobbs, S.W. and Murata, J.K., 1949, Variations in Garnierite from the Nickel Deposit near Riddle, Oregon: Economic Geology v. 44.

Roqué-Rosell, J., Villanova-de-Benavent, C., Proenza, J.A., Tauler, E. and Galí,S., 2011, Distribution and Speciation of Ni in Sepiolite-Falcondoite-type "Garnierite" by EXAFS: Macla, v. 15.

Samama, J., 1986, Ore Fields and Continental Weathering: New York, Van Nostrand Reinhold Co., 326p.

Other Events of Interest to CSMS Members—Continued

Thurs., Feb. 12, 6:00 p.m. to 8:00 p.m.—Heritage Lecture and Exhibit Opening: Molybdenum and the History of the Climax Mine, (go to http://www.wmmi.org for additional information.) Western Museum of Mining and Industry, 225 North Gate Blvd, Colorado Springs, CO. "The **Climax Mine**, located in Climax, Colorado is a major molybdenum mine in Lake and Summit counties. At its highest output, the Climax mine was the largest molybdenum mine in the world, and for many years it supplied three-fourths of the world's supply of molybdenum." Please RSVP on the WMMI website to attend this seminar and learn more about molybdenum, it's discovery and uses.

PEBBLE PUPS CORNER

Guide to Minerals: Beryl

By Steven Marquez

The Greek name for beryl is *beryllos,* which means precious blue-green color or seawater stone (Chesterman, 1990). Beryl forms in pegmatites and some metamorphic rocks. Gem quality beryl is known by these colors and names: **green** beryl is emerald, from the presence of chromium and vanadium; **light blue** beryl is known as aquamarine, colored by manganese; **pink to light purple** beryl is called morganite; **yellow beryl** is called golden beryl; **colorless beryl** is known as goshenite (Hall, 2002).

The gem fields of Mount Antero, Chaffee County, Colorado (USA) produce excellent aquamarine specimens. Beryl specimens can also be found in Park County, Colorado. Beryl is the source of beryllium, a light metal used for many things such as: x-ray tubes, missiles, and space vehicles (Chesterman, 1990).

FACTS ON FILE:

Chemical formula: $Be_3Al_2Si_6O_{18}$

Composition: Beryllium aluminum silicate

Color: Green, blue, greenish-blue, yellow, red, pink, white, and colorless

Luster: Vitreous

Streak: Colorless

Hardness: 7.5-8

Crystals: Hexagonal

Transparency: Transparent to translucent

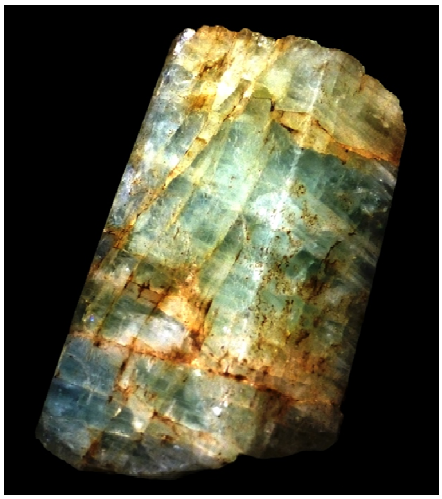
Specific gravity: 2.7-2.9

Cleavage: Indistinct

Fracture: Uneven to conchoidal

A Beryl Haiku:

Blue like an ocean
Yellow like the sun that shines
Green like a forest



This beryl specimen is an aquamarine collected from Park County, Colorado. The specimen is 2.5 cm long, 1 cm across. A Steven Marquez specimen. Photo © Steven Marquez.

References Cited

Chesterman, C. W. (1990). *The Audubon Society Field Guide to North American Rocks and Minerals.* New York: Alfred A. Knopf.

Hall, C. (2002). *Smithsonian Handbooks: Gemstones.* New York: Dorling Kindersley.

About the author:

Steven Marquez is an Earth Science Scholar with the Colorado Springs Mineralogical Society (Colorado, USA). He is a volunteer in the mineral section of the Cripple Creek District Museum. Steven enjoys studying minerals and field work. He is in the 8th grade.

January Reminders

Pick & Pack—The Pick & Pack will not be published in January. The Pick & Pack is published 10 times a year, February through July and September through December. The first issue of Volume 55 will be delivered to your email in February 2015. See you in 2015 for more great articles, news from our Pebble Pubs and Juniors, and more exciting field trips and activities!

General Assembly / New Officer Installation Dinner—The January 2015, General Assembly and Officer Installation Dinner will be held at the Golden Corral at 5410 E. Woodmen Road on Thursday, January 15th, at 5:30 p.m. The standard cost for the meal is $13.68 (includes room charge) + 15% tip + tax. The cost for seniors is $12.48 (includes room charge) + 15% tip + tax. Please mark your calendars.

Annual Membership Dues—The Annual Membership Dues are due in January. Pay your 2015 dues by January 31st and receive a $5.00 discount! Please submit a membership form with your payment. Membership forms can be found on our website at www.csms.us.

2014 CSMS Officers

Mark Lemesany, President

Jean Miller, Vice President

Sharon Holte, Secretary

Ann Proctor, Treasurer

Lisa Kinder, Editor

Ariel Dickens, Membership Secretary

Susan Freeman, Member-at-Large

Frank Rosenberg, Member-at-Large

Roger Pittman, Past President

2014 CSMS Chairpersons

Kim & Bodie Packham, Show Chairs

TBD, Field Trip Director

TBD, Science Fair Chair

Frank & Ellie Rosenberg, Librarians

Camera Club Chair is Vacant

Georgia Woodworth, Social Committee Chair

Ann Proctor, Store Keeper

Gary del Valle, Webmaster

Sub-Group Responsibilities for Refreshments for General Assembly Meetings		
Feb. Fossil	Mar. Jewelry	Apr. Lapidary
May Micromount	June Board	July Crystal
Aug. Picnic	Sept. Faceting	Oct. Fossil
Nov. Jewelry	Dec. Christmas Party	

Secretary's Spot by Sharon Holte

Minutes of the Colorado Springs Mineralogical Society General Meeting, November 20, 2014

Called to order: 7:04 p.m. By Mark Lemesany - President / Followed by Pledge of Allegiance.

Program for evening: Steven Veatch and three of his Earth Science Scholars: Sean Kosman: "Artifacts from the Roman Empire"; Jenna Marie Salvert: "Smithsonite, Zn C O 3, Zink Carbonate; Blake Rehr: "Pikes Peak Area Paleontology Update".

New members and guests were introduced. Several guests also introduced themselves.

The break for refreshments was well appreciated by all!!

Last month's minutes were approved as reported in the Pick & Pack.

There was a brief ballot as we had three candidates for Member-at-Large: Michael Luce, Doreen Schmidt, Yam Yamilokoski.

Doreen Schmidt and Yam Yamilokoski were elected

All other candidates were approved as read:

President:	Mark Lemesany
Vice President:	Jean Miller
Secretary:	Melanie Glascoe
Treasurer:	Ann Proctor
Membership:	Ariel Dickens
Newsletter Editor:	Lisa Kinder

The usual drawing was held for several very nice minerals.

Adjourned at 8:50 p.m.

Classifieds

Denver Gem & Mineral Guild
Jewelry Gem & Mineral Show

February 27 - March 1, 2015
Friday: 10 a.m. - 6 p.m.
Saturday: 10 a.m. - 6 p.m.
Sunday: 10 a.m. - 5 p.m.

Jefferson County Fairgrounds
15200 W. 6th Ave. Golden CO

Free Parking & Free Admission

Educational and Entertaining

Gems, Minerals, Fossils, Geodes, Jewelry
Gem Cutting Demonstrations
Grab Bags and Door Prizes
Mineral Displays
Swap Area

For more information, visit the DGMG website at

http://denvergem.org/Shows.html

PICK&PACK

Our Staff...
Lisa Kinder—Editor
We encourage everyone to submit articles, photos, illustrations or observations. Share your experiences, your new finds, or simply your experience at our last field trip.

Handwrite it, type it, or email it. Format does not matter. All submissions are welcomed. The DEADLINE for items to be included in the next Pick & Pack, is the **21st of the month**

To submit an item:
For hardcopy photos or articles, mail to the address below or bring them to the General Meeting. All hardcopy photos remain the property of the submitter and will be returned. Electronic photos should be submitted at resolutions above 200 dpi in TIF, BMP, JPG, or PIC format. Articles are preferred in word. Editors will correct font

E-Mail to:
csmseditor@hotmail.com
Mail to:
Pick & Pack Editor
PO Box 2
Colorado Springs, CO 80901

The PICK&PACK is published ten (10) times per year;(no issues in January or August).

CSMS

T-Shirts, Badges, and Pins are available for sale.
If you celebrated a CSMS anniversary in 2013 or 2014, your year pin award
See Storekeeper, Ann Proctor

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CSMS is an incorporated nonprofit organization with these goals:

To promote and disseminate knowledge of the earth sciences, especially as they relate to mineralogy, lapidary, and fossils.

To encourage study, collection, and fashioning of minerals.

To accomplish the same through social meetings, lectures, programs, displays, shows, and field trips.

The Pick & Pack is published 10 times each year to assist and promote the above.

Joining the Colorado Springs Mineralogical Society (CSMS)

Meetings are held the **third (3rd) Thursday of each month**, except January & August, **7:00 p.m.** at the Colorado Springs Senior Center, 1514 North Hancock Ave., Colorado Springs, CO. **Visitors are always welcome**.

CSMS also offers Satellite Group meetings that allow more focused attention in specific areas of our members' interests. Our current Satellite Groups consist of the following: Crystal Study Group, Faceting Group, Fossil Group, Jewelry Group, Lapidary Group, Micromounts Group, and Pebble Pups/Juniors. For details on Satellite Group meetings, check out the calendars on page 2 and the web site.

Yearly dues include 10 issues of the *PICK&PACK*, all field trips (additional fees may be required on some field trips, and members are responsible for all transportation to and from), participation in all Satellite Groups (some groups may request additional fees to help cover resource costs), free admission to the *Western Museum of Mining & Industry*, a year of learning and enjoyment, plus a lifetime of memories.

Individuals—$30, Family—$40, Juniors—$15, Corporate—$100, ******Application is on the web site.

If you are interested in joining CSMS or would like more information, we encourage you to attend our next General Meeting or visit our web site: www.csms.us.

CSMS is a Member of: the following:

American Federation of Mineralogical Societies (AFMS) www.amfed.org

Rocky Mountain Federation of Mineralogical Societies (RMFMS) www.rmfms.org