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Message from the President

It feels like winter is finally upon us with the white mineral (snow) falling from the sky that last few days. I guess I will need to go south to have more hiking and rock collecting days.
At our October Annual Membership Meeting, we held elections for our 2022-23 Board of Directors. The following is the list of Board members for this next year. We want to thank Megan Maurillo, Keri Hatley, Keri Hemphill Bliss and Heather Bates for their volunteer service on the Board this past year.

Officers
President: David Gonzales
Vice President: Toby Mourning
Secretary: Carlos Mañón
Treasurer: Jama Crawford

Directors
Mary Katherine Benson
Nancy Holman
John Laggart

Carl Lindeman
Jennifer Nisco
Cindy Pugsley

Also, we want to recognize the contributions that Melanie McKinney-Gonzales made to our Club this past year as our first Director. She will be stepping down at the end of November and our club will return to an all-volunteer run organization!

To that end, any member wishing to be involved, we have standing committees that are always welcoming new ideas and energy:
Shop Maintenance
Marketing
Gem Show
Technology

Please get in touch with any current officer or email me for more information.

Some of you may already be familiar with ColoradoGives.org, a "one-stop site for Colorado non-profits!" We have registered the Four Corners Gem and Mineral Club with this well-known group to help us grow!

Check out our profile and share it with others - any donations made through this site **between now and December 6th** are eligible for $1.6 million Colorado Gives Day Incentive Fund! All participating Colorado Gives Day nonprofits earn a percentage of the fund, so **the more we raise, the more we get**!

As always, your contribution is 100% tax deductible and 200% appreciated :)

Have you seen our members sporting these NEW club shirts with our NEW logo on them? Small, Medium and Large (these run true to size, folks, and don't shrink!) shirts will next be available for purchase at our Annual Holiday Party on December 5th.

$10 each!

(price goes up to $15 at the 2023 Gem Show)

Come to our party and pick one (or more than one) up!

2023 Gem and Mineral Show!

Although our Gem and Mineral Show is not until July, it is time to start the process

again. Cindy Pugsley has graciously agreed to direct the show again and Adam Parker and Bret Pugsley have offered assistance. If you can contribute to the process, please contact Cindy at cindypugsley@sbcglobal.net. Also, we are accepting donations for the Silent Auction.

Upcoming Classes and Board Meeting in November:

We have a number of classes offered in November. If you want more information about the course or want to enroll in the classes, please go to our Club Calendar.

November 8th, 4-6 pm at the Club, Board of Directors meeting - all are welcome to attend, only Board members vote.
November 12 and 13, Silver Bracelet with Stone by Jama Crawford.
November 19, Stack Rings Silversmithing by Chayse Romero.
November 20, Mountain Spinner Ring by Chayse Romero.
November 26 and 27, Lost Wax Casting by Charlotte Lenssen

SneakPeek into December:
Classes will include simple solder earrings with Jama, lost wax casting with Jaymus and a cabochon class with Joel!

If you want to know more, visit the Club's calendar at www.durangorocks.org/events.html.

Open Shop Hours

Tuesday 1-4 pm

Tuesday 6:30-9 pm

Wednesday 9am-noon

Wednesday 1-4 pm

Thursday 1-4 pm

Thursday 6:30-9 pm

First & Third Saturdays 10am-2pm

Open Shop Punch Card

If you like using open shop, remember we have a punch card for multiple use. Prepurchase 10 visits for $45 - a $5 savings - and don't worry about having your "shop fee" when you come in!

Four Corners Focus

Thank you to club member, Charlotte Lenssen, for writing about some of her favorite hikes around our beautiful area! She got these hikes in and took the photos earlier this fall, so some of the areas won't look the same right now - but keep these beautiful hikes in mind for warm fall days and next spring and summer!

Read about and see pictures from Charlotte's adventures on the Four Corners Focus page of our website!

Rock On: Thankful for Copper

We often do not give much thought to the impact that minerals and their elements have on our lives. There are numerous minerals that have changed and influenced human history. Salt, calcite, asbestos, gypsum, silver, gold, clay, iron, kaolin, graphite, and quartz are just a few. But, in this essay I focus on the copper-bearing minerals. Copper (Latin: *aes Cyprium*) and the myriad of copper-bearing minerals are notable not only because of the impact in the past, but the significance of copper for our future. To celebrate the holiday of Thanksgiving, I am paying tribute to copper.

Every day, we use products with copper in them: electrical motors and switches, cable and wire, computers, pipes for plumbing, coins, jewelry, antibacterial coatings and plating, bronze (copper + tin), brass (copper + zinc), and many other products. The period in history that honors copper is the European prehistorical Copper Age or Chalcolithic Age between the Stone Age (ended about 7,000 years before present) and the Bronze age (starting around 5,300 years before present). But I might argue that the true copper age is just on our horizon.

In antiquity, one of the most important locations for the mining of copper was the island of Cypress in the Mediterranean. In the world of metallic minerals, copper is relatively common and workable with simple tools and methods. In nature, native copper is found in many locations such as the Keweenawan Peninsula of Michigan and Cashin mine in western Colorado. Copper sulfide minerals are plenty: chalcopyrite, bornite, chalcocite, tetrahedrite-tennantite (gray copper), enargite, and my favorite, covellite. When these minerals are exposed at the surface they weather into wonderful patinas of red, blue, green and black defined by minerals such as cuprite and tenorite (copper oxides), azurite and malachite (copper carbonates), atacamite (copper chloride), chalcanthite and chalcocyanite (copper sulfates), spertiniite (copper hydroxide), and turquoise (copper phosphate). Another important copper mineral is chrysocolla (copper silicate).

Once copper ores are extracted from the Earth the copper must be separated, unless it is relatively pure native copper. In the past, copper-bearing ores were mined from the ground, crushed and smelted in charcoal furnaces above the melting point of copper (1,984° F) several times to remove impurities. These crude blocks of copper could then be further processed or traded. In more recent times the beneficiation of copper has been made more effective (but not energy efficient) via smelters and the process known as acid leaching where weak sulfuric acid is sprinkled on copper ores to remove the copper which is then extracted through electrowinning.

What makes copper metal so special? To have this conversation we need to consider its atomic structure. The copper atom is relatively heavy with an atomic weight of 63.546

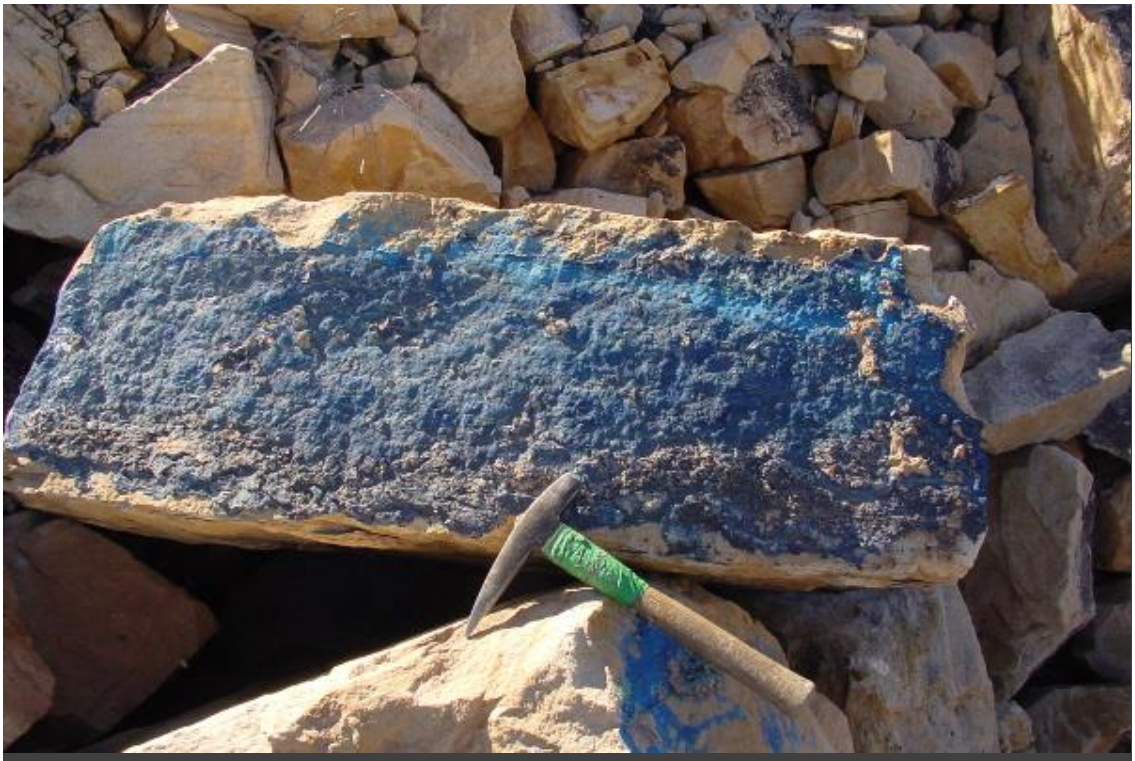
amu. In copper metal the atoms snuggle together in an organized fashion called cubic face-centered cubic structure. In this organization each copper atom is surrounded by twelve neighbors in a cubic organization (a unit cell with 8 atoms at the corners and 6 in each face of the cube) which share their valence electron fields. This means that rather than exchanging or sharing electrons between atoms, the atoms are housed in a “cloud” of electrons (an atomic commune). This is nature’s magic because when this happens it allows the copper to be pounded into sheets (malleable), drawn into wires (ductile), and worked by simple tools. This atomic magic also gives copper the ability to transfer an electrical charge, and transfer heat quickly and effectively. Cutting and cold hammering native copper can be used to craft copper, but the copper becomes brittle and cracks. In order to make it more workable it must be melted in ceramic or metal vessels and then poured into a mold, sheets and other products.

Copper, silver, and gold are native metals and because of their similar atomic structures they alloyed in nature or through metalsmithing. “Shakudo” is a Japanese term for an alloy of copper with 4-10% gold which is used as a decorative metal. “Tumbaga” is the term used for a non-specific alloy of gold and copper given by the Spanish to metals found in widespread use in pre-Columbian Mesoamerica. Tumbaga has a significantly lower melting point than gold or copper, and though harder than copper it maintains malleability after pounding. Tumbaga can be treated with a simple acid (e.g., citric acid) to dissolve copper off the surface. What remains is a shiny layer of nearly pure gold on top of a harder, more durable copper-gold alloy sheet. This process is referred to as depletion gilding. Sterling is the best-known copper and silver alloy which contains about 7.5% copper. Jewelry Cu-Ag alloys typically contain 10% to 15% copper. The problem with most copper and silver alloys is that they typically tarnish into a black patina when exposed to the atmosphere. Of course, copper can also be alloyed with tin (bronze), zinc (brass), aluminum (aluminum bronze), and nickel (cupronickel).

In the past, copper found a niche for weapons (think Romans), adornment, coinage and an array of industrial applications which continues today. But today copper is even more critical and perhaps even strategic. As we move to conversations about electrical cars and more electrical devices the demand for copper will increase. A fact sheet published by the Copper Development Association Inc. reports that a conventional car uses 18 to 49 pounds of copper whereas a battery electric vehicle (BEV) requires 183 pounds of copper. The report goes on to note that with the current vision for new electrical technologies (mostly electric cars and charging stations) we will need to increase copper production by 1,700 kilotons by 2027. Thus, making elective vehicles will require more extraction. So, the next time you turn on a light switch, start your car, run water, use pennies, wear sterling or Tumbaga, or craft a piece of jewelry from turquoise, raise a toast to copper minerals, which have truly changed (and will change) human history.

Covellite (CuS) from the Butte mining district, Montana. Photograph from Mindat: https://www.mindat.org/photo-997945.html

Bornite (Cu_5FeS^4) from the Dzhezkazgan mining district, Karaganda region, Kazakhstan. Photograph from Mindat: https://www.mindat.org/photo-233221.html



Block of sandstone with an azurite coating that formed as a replacement of copper sulfide minerals in a vein, Lisbon Valley copper mine. Photograph taken by D. Gonzales.

Block of sandstone coated with chalcanthite ($CuSO_4$ $5H_2O$) found at the Cashin mine in western Colorado. Jonathan Gonzales is the proud collector. Photograph taken by D. Gonzales.

Sheets of 99.999% copper produced at the Lisbon Valley copper mine. Photograph taken by D. Gonzales.

Sources of information:

https://www.mindat.org/element/Copper

https://www.911metallurgist.com/blog/acid-leaching-copper-ores

https://en.wikipedia.org/wiki/Tumbaga#

https://www.britannica.com/technology/silver-processing/The-metal-and-its-alloys

https://www.copper.org/publications/pub_list/pdf/A6191-ElectricVehicles-Factsheet.pdf

https://www.mindat.org

November Birthstone (Scorpio, October 23-November 21, November 22-December 21)

The November birthstones are citrine and topaz. Citrine also is given for the 13rd wedding anniversary and Imperial topaz is the gem for the 23rd wedding anniversary. Topaz and citrine have often been mistaken for one another since both can have a gorgeous golden color. Citrine is prized for its yellow and orange hues while topaz can display a range of colors that include colorless, light blue, yellow, orange, pink, violet, brown and red. My favorite color in topaz is the typical pinkish orange of the Imperial variety.

Citrine is a variety of quartz composed of silicon and oxygen whereas topaz is an aluminum-rich silicate mineral. They may possess similar colors but they have different atomic structures and thus distinct properties such as the hardness of 7 for citrine and 8 for topaz. One most attractive feature of topaz to me are the beautiful crystal forms in the orthorhombic system.

GIA notes that the word “topaz” may have originated from the Sanskrit word “tapas” which means “fire”. Mindat.org notes that this mineral was named after the Topasos Island in the Red Sea. Viewing a natural or cut piece of topaz certainly reveals this stunning feature. Topaz is thought to yield strength to the wearer, protect from magic spells, make a person calmer and apparently can endow you with long life, beauty and intelligence. One thought on the name, citrine, that it is derived from the French word citron (lemon). Citrine has been a cherished gemstone for thousands of years and is believed to calm the wearer. Just keep in mind, however, that most citrine sold today is created by heat treating of amethyst.

Below: Citrine: “A fantasy cut unleashes the fire within this 43.49 carat citrine. Photo: Priscilla Dyer. Courtesy: John Dyer & Co.” GIA


GIA.edu

Topaz crystal (3.7 cm tall), Maynard Claims, near Bixby, Thomas Range, Utah. International Gem Society, https://www.gemsociety.org/

Unheated citrine is mined in the northern Ural Mountains of Russia but other important occurrences are in Bolivia, Spain, Madagascar, Mexico, and Uruguay; most citrine (heat-

treated amethyst) comes from Brazil. In Bolivia, the purple hues of amethyst and the yellow-orange hues of citrine are found together in a gemstone called ametrine. Citrine forms in environments similar to other quartz varieties an is closely allied to hydrothermal solutions released by felsic magmas. It often forms in cavities where it creates geodes.

A 24.64 carat Ametrine from the Ahahí Mine, Bolivia, Photograph from Ametrine Value, Price, and Jewelry Information - International Gem Society

Minas Gerais, Brazil, is one of the most important sources for high-quality topaz, which has been mined there for more than two centuries. Northwestern Pakistan is known for producing pink topaz. Most topaz deposits form in high-alumina rhyolites and related rocks where fine crystals are often found in cavities and vugs in the rocks. It can also form in aluminum-rich granites and pegmatites. Erosion of these rocks can also generate alluvial (placer) deposits of topaz.

Some of the colors of topaz. Photograph from November Birthstones | Topaz & Citrine Birthstone Information | GIA