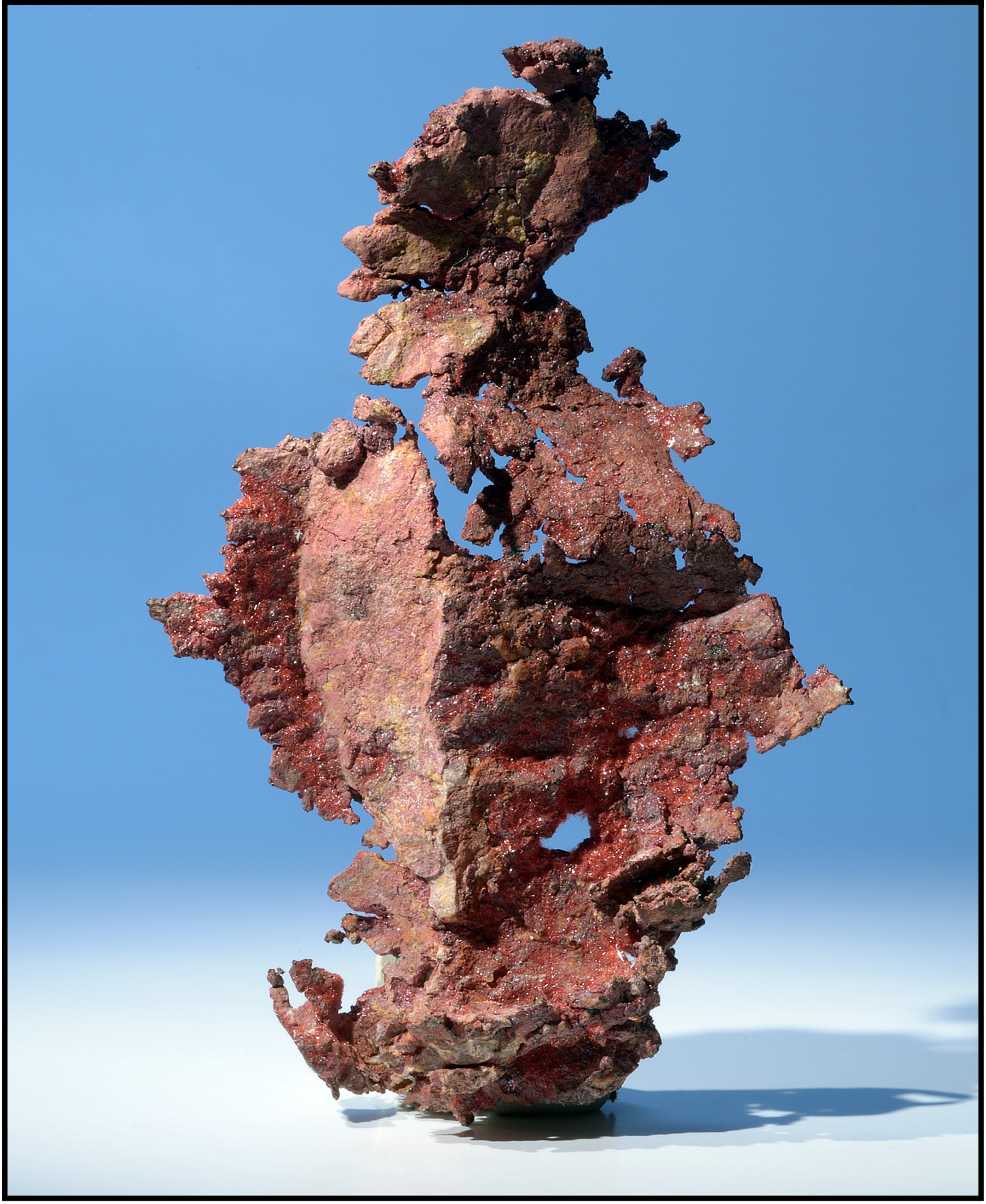
DAISY MOUNTAIN ROCKCHIPS

The purpose of Daisy Mountain Rock & Mineral Club is to promote and further an interest in geology, mineralogy, and lapidary arts, through education, field experiences, public service, and friendship.

VOLUME 4, ISSUE 8 **SEPTEMBER 2019**



COPPER MINING: OXIDE & SULFIDE ORES
PART I: OXIDE ORES

By Susan Celestian

September's speaker sparked some questions from club members, and October's speaker is going to address the history of copper mining. SO….. I decided to adapt my club talk, from April 2019, into a two-part series for the newsletter. There are two types of copper ores: oxide and sulfide, and they are processed in different ways. Since oxide ores are closest to the surface, I will start with them, in Part I. Part II, will be Sulfide Ores.

PORPHYRY COPPER DEPOSITS

We'll start with the formation of copper ores, that are frequently a type called *porphyry copper deposits*.[1] Porphyry ore deposits are associated with subduction volcanism (places where one tectonic plate is diving down under another), deep magma bodies, and mountain-building. As magma bodies cool and crystallize, the components of magma that are not utilized in normal rock building, are shunted aside and accumulate, as mineralized *hydrothermal solutions* (basically hot water). These diverse components are such materials as: water, gases, excess atoms (such as sulfur, sodium, calcium, potassium, silica), metallic ions, rare-earth elements….. Hydrothermal fluids will gravitate upward and away from the magma, and conditions will cause them to be injected into rocks kilometers above the magma body, nearer the Earth's surface (See Figure 1). There they are injected into whatever rocks they encounter. The result is widely disseminated primary copper sulfide minerals (example: chalcopyrite).

The host rocks may be igneous, metamorphic or sedimentary rocks, but the name '*porphyry copper*' derives from the association of porphyritic intrusive dikes (igneous rocks that cooled at depth, and with two distinct crystal sizes).

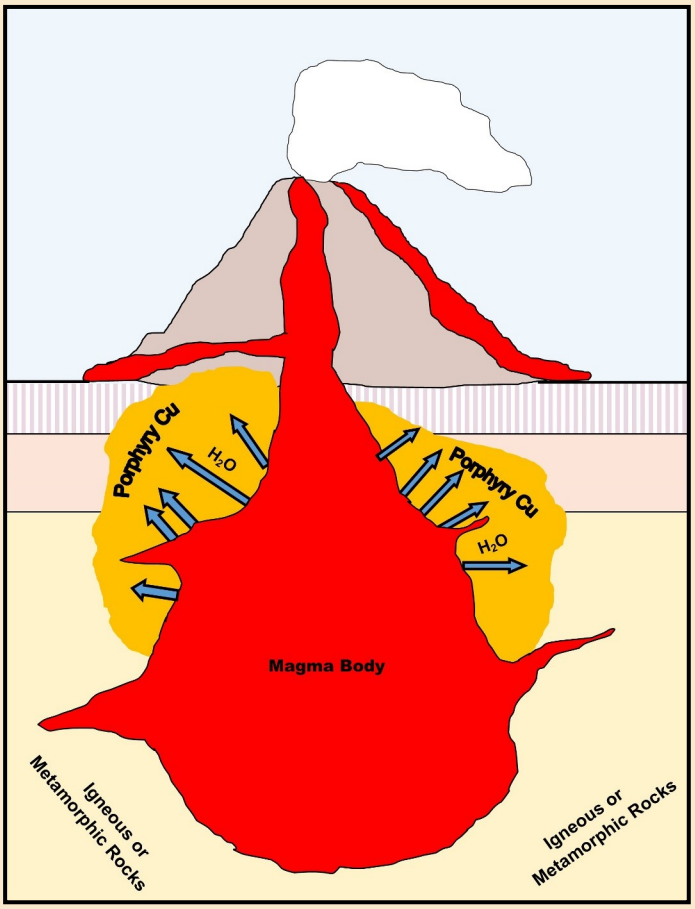


FIGURE 1 Formation of a Porphyry Copper Deposit Hot mineralized fluids, associated with deep-seated magma bodies, may be injected into remote rocks around and above the magma, where they leave behind copper minerals, widely disseminated throughout the host rocks.
Graphic by Susan Celestian

[1] *Nearly all of Arizona's copper deposits are porphyry copper deposits. An exception is the ore mined at Jerome, which formed when mineral-rich springs associated with submarine volcanoes (like modern "black smokers"), reacted with cold seawater, initiating the precipitation of metal particles, that accumulated into metal-rich muds, that were subsequently metamorphosed during the Precambrian.*

Oxide Ores continued on page 8…..

INSIDE THIS ISSUE

September 3, 2019
Board of Trustees Meeting Minutes

- In attendance: Clark L., Claudia M., Cynthia B., Don R., Ed. W., Rebecca S., Stan C., Susan C., Tammy E., Tiffany P. and William F.
- Cynthia B. discussed our finances
  - Sheet only shows through July because banks were not closed yet
  - Very little club activity July and August
  - Financials approved
- Stan C. discussed upcoming trips
  - Sep 22nd to Paleo site
  - Oct 17th to Bronzesmith tour
  - Nov 16th to Purple Passion mine
  - Nov to Sheep's crossing
  - Dec to Red Cloud Mine
    - We are open to weekday trips, but mostly will still have weekend ones
    - If anyone has suggestions, you are more than welcome to discuss
- Ed W. discussed scholarship for next year
  - Discussion was made to open scholarship to more schools
  - This year will be more important because $3000 will be given
  - Had issues finding proper applicants last year
  - Claudia will be following up on this issue
    - Any suggestions on application process, please send to Claudia M.
- March 20th, proposed date for next club show
  - Might only conflict with Albuquerque show
  - Sponsorship banners at show discussed to bring in more revenue
- We need more volunteers for committee help
  - Show marketing volunteer needed
  - Show food marketer needed
  - Education (assist Bill S.) help needed
  - Social media (website updating, photos) needed
  - Food brought for meetings

September 3, 2019
General Club Meeting Minutes

- Thanks to our guest speaker, Mac Camby, for his mineral exploration insight
- Robin S. led the raffle, helped by Clark L.
- Cynthia B. read the financial report, we are in good standing
- **Congratulations Nancy G. for 2019 award and honorable mention from the American Federation of Mineralogical Societies**
  - **Honorable mention for AFMS website contest**
  - **Certificate of Excellence for website**
    - Thank you so much for all your amazing help Nancy!
- Stan C. discussed field trips
  - November Purple Passion Mine trip will be first come first serve (35 max)
  - Do not forget to fill out field trip form if on the trip, this will help us improve trips in the future
- Claudia M. still has shirts for sale if anyone wants one
- Thank you to all the new members! We are all so happy and glad to see this club grow!

Respectfully submitted by Rebecca Slosarik

Words of Wisdom

from our very own

Bob Evans

FIELD TRIP
PAYSON PALEO SITE
SEPTEMBER 22, 2019

On Sunday, September 22, Stan Celestian led a trip to the Paleo Site, about 15 miles east of Payson on Route 260. This is a site that was set aside by the AZDOT, for fossil collecting, after they buried the historically favorite site (basically across the road, and now under TONS of dirt/gravel). There is a nice parking lot there also.

Fossils of the Pennsylvanian-age Naco Formation are abundant here -- 8+ genera of brachiopods; multiple less common genera of bivalves and gastropods; massive, branching & lacy bryozoa; 3+ genera of crinoids; rarer sponge *Chaetetes*, horn corals, conularid, shark teeth, fusulinids.

The trip was very well attended by 20+ members, on a beautiful 80 degree day. After collecting fossils, some members drove further down the road to a site for peach and zebra cherts. Most of us made it to the Payson Mineral Show -- a nice small Arizona show.

View of the collecting area *Photo by Joseph Gecho*

Photos by Joseph Gecho

Payson continued on page 5….

….Payson continued from page 4

Photos by Joseph Gecho

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Keep Your Eyes on the Ground!

Payson continued on page 6….

September Speaker

Mac Camby, a field geologist for 20 years for Freeport-McMoRan, was the speaker at the September meeting.

Freeport-McMoRan is a major player in Arizona's copper industry, and Camby introduced us to the Safford Mine, in the Lone Star District, in operation since 2007. It is a very large porphyry copper deposit, currently mining the more near-surface oxide ores, but with a huge sulfide deposit below. Exploration cores have revealed ores of 0.40+% copper (in contrast the Morenci Mine is processing 0.16% copper)

The remainder of his talk took us to five Soviet Russia mine localities he visited in 1998. Mining is very important in Russia and geoscientists are often awarded medals, and even revered in statues. There are 250,000 geoscientists in the country.

Area One: Norilsk, way up north, and accessible by ice breaker. The ore is 4-8% copper! Additionally, nickel, platinum, and palladium are recovered. According to Camby, these were emplaced as a sulfide metal melt. Sperrylite (a platinum arsenide) is a notable specimen mineral that comes from here.

Area Two: Zhezkazgan, Kazakhstan, another copper deposit, and one where a geologist is immortalized in a statue. Great dioptase (subject of August's newsletter) comes from here.

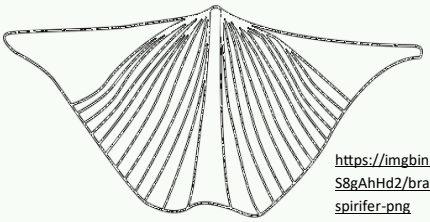
Area Three: Dalnegorsk, an area famous for many fine mineral specimens, including purple charoite and big fluorites.

Area Four: Konsyor, a source of platinum group metals, emplaced within a cylindrical mass of molten rock. Rare gold and platinum crystals are some of Konsyor's claim to fame.

Area Five: Kamchatka and Kurlisk Peninsulas, areas of active volcanism. Small copper porphyry deposits are mined. Additionally, within a 900°C fumarole, metallic rhenate was discovered -- at a volcano in the Kurlisk area off the tip of the Kamchatka Peninsula. The terrain makes field geology difficult, and geologists navigate in helicopters or tracked ATV's.

….Payson continued from page 5

A view of the ground at the Paleo Site. **A** - the front and back view of the brachiopod, Composita subtilita. **B** - a single columnal of a crinoid stem. (Crinoids have a flowery head attached to a stem, and the stems are composed of life-saver-like columnnals -- each one composed of a single calcite crystal.)
Photo by Susan Celestian



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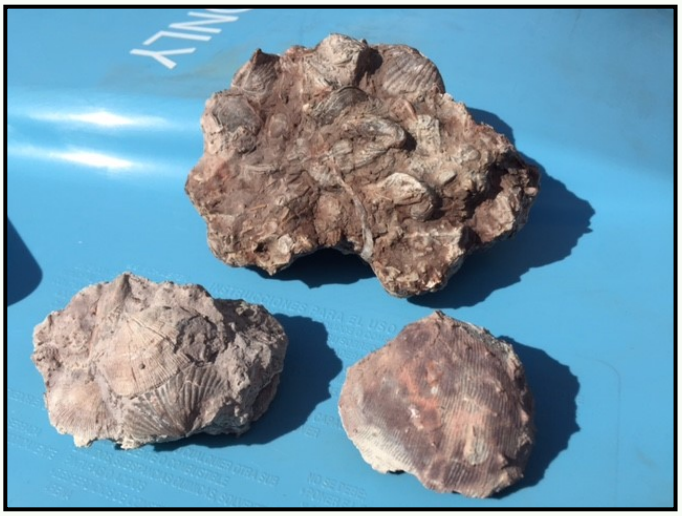


Some of the fossils Dave Haneline collected -- a couple plates with a diverse mix of brachiopods, bryozoa, and crinoid fossils. The fossil on the lower right is a productid brachiopod: *Antiquatonia portlockiana.* *Photo by Dave Haneline*

A selection of crinoid plates and stem fragments, collected by Bill Powell. The pieces on the far left appear to be fragments of crinoid arms. *Photo is based on those posted by Bill Powell, on the club website.*

http://www.homemade-preschool.com/zoo-clipart.html

Zebra chert collected & photographed by Bill Powell. (As posted on the club website)

Payson continued on page 7….

….Payson continued from page 6

Another view of the productid brachiopod, *Antiquatonia portlockiana.* The strongly convex shape allowed the shell to "float" in the sediment. Additionally, note the stubs of spines in the upper photo. Those spines probably aided in keeping the shell from sinking into soft sediment, and undoubtedly made it uncomfortable to eat. *Photos by Stan Celestian*

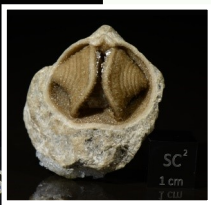
Brachiopod, *Anthracospirifer occiduus*. It is crushed -- maybe during preservation, maybe when bitten by a predator, prior to death. *Photo by Stan Celestian*

The above 3 photos are of various crinoid plates and stems collected by the Celestians. *Photos by Stan Celestian*

Some of the fossil finds of Stan & Sue:

Both of these photos are of bryozoans -- tiny creatures that have a lifestyle similar to corals. The top specimen is massive, the lower is lacy. *Photos by Stan Celestian*

Echinaria semipunctata, an internal mold. The shell is gone, but you can see parallel ridges on the upper image. *Photo by Stan Celestian*



This series of the brachiopod *Composita subtilita*, are very interesting because the shells have been eroded away a bit, revealing the *spiralia*, a pair of spiral internal structures that supported the filtering mechanisms (*lophophores*). The inset is of a different fossil, with spiralia very well exposed. *Photo by Stan Celestian*

This is very likely a burrow (maybe from a trilobite). As burrowing animals move through sediment, the ingested sediment is mixed with mucous, etc. This binds the grains, as they pass through the gut and out -- and the backfilled burrow becomes more resistant to weathering than the surrounding sediment. *Photo by Stan Celestian*

….Oxide Ores continued from page 2

ENRICHMENT

The first ores encountered are typically oxide ores -- secondary minerals, produced by weathering near the Earth's surface. The original ore mineral is generally chalcopyrite -- a mineral that is 35% copper, by weight -- however, it is disseminated. Whether sulfide or oxide ore, the copper minerals are so "few and far between" that in Arizona the ore rock is usually less than 1% copper -- typically around 0.6% (a ton of 0.6% mineralized rock will yield 12 pounds of copper). Sulfide copper ores demand more processing and are typically deeper, while oxide ores are easier to process, and are closer to the surface.

Groundwater and meteoric water will penetrate the primary sulfide-rich rocks found near to the Earth's surface. Weak acids form and interact with the chalcopyrite (or other sulfides), causing them to break down. New -- secondary -- minerals form, that are actually higher in copper -- although still fairly widely disseminated in low-grade ores. The uppermost new ore minerals have oxygen in their chemical make-up -- hence the term *oxide ore* (Figures 3-4).

And this process is called *Supergene Enrichment*. I know you have seen this before, but Figure 2 illustrates the result of this process.

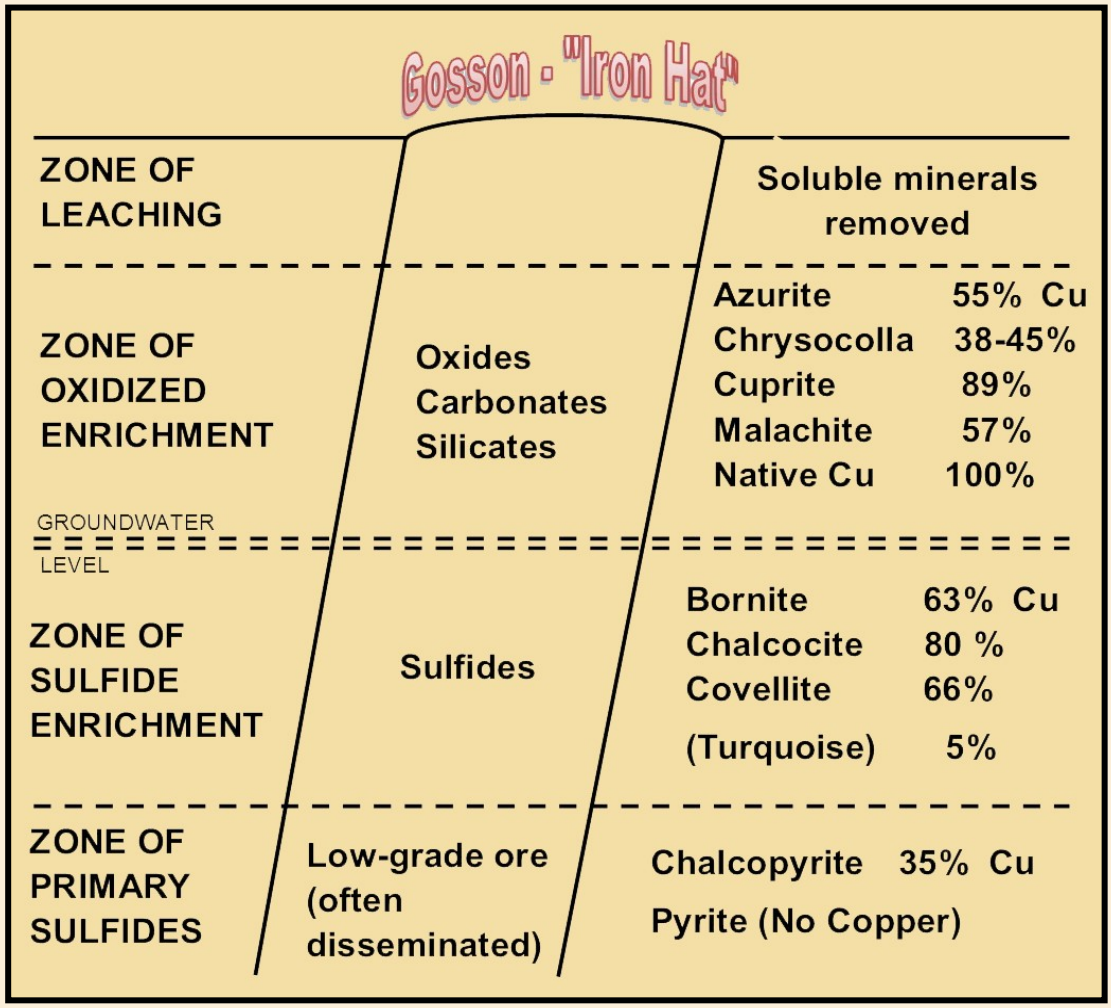


FIGURE 2 Supergene Enrichment The primary minerals emplaced by hydrothermal processes are the sulfides, particularly chalcopyrite. These minerals are then altered by weathering and associated processes to produce new secondary minerals, that are higher in copper than the original sulfides. *Graphic by Susan Celestian*

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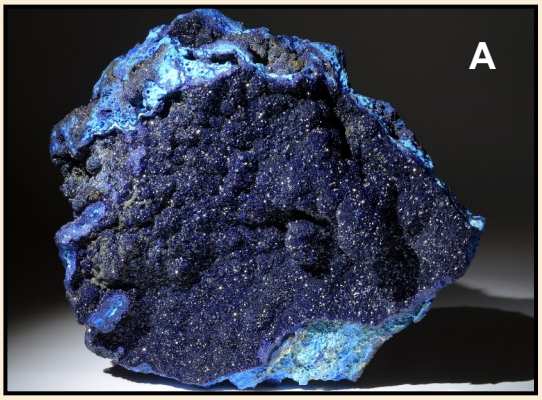
….Oxide Ores continued from page 8

FIGURE 3 Oxide Zone of the Johnson Camp Mine Secondary minerals produced in the oxide zone of a copper ore body, includes chrysocolla (copper silicate). The blue-green band in the photo is chrysocolla. *Photo by Susan Celestian*



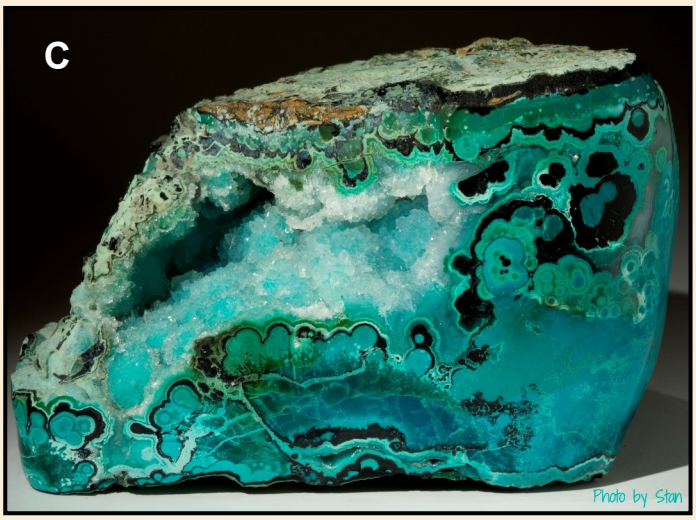


FIGURE 4 Oxide Zone Minerals Pictured are three of the target ore minerals in the oxide zone of a copper deposit. A - Azurite (copper carbonate), Bisbee, Cochise Co., AZ; B - Malachite (copper carbonate) from Locality: Lubambashi Mine, Shaba, Democratic Republic of Congo; C - Chrysocolla (copper silicate), & Malachite Ray Mine, Pinal Co., AZ *Photos by Stan Celestian*

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MINING OF OXIDE ORES

Before the advent of efficient heavy equipment, most copper mines began as underground mines; however these days the most common form of mining low-grade oxide, or sulfide, copper ores is open pit. Because of close proximity to the surface, and the necessity to move large quantities of material (for example, the Ray Mine moves 250,000 tons of rock -- ore & waste -- per day), this is the preferred mining method. See Figures 5-7.

FIGURE 5 Open Pit at the New Cornelia Mine in Ajo, Arizona According to *Wikipedia*, this small open pit mine is about 1.5 miles across at its widest, and 1100' deep. Each bench is on the order of 45' +/- tall. *Photo by Susan Celestian*

FIGURE 6 A & B Drilling Blast Holes at Bagdad A series of holes are drilled, then filled with ammonium nitrates and fuel oil (ANFO), .as explosive. The explosions will break up the rock on this bench, so it can be loaded into a truck, and hauled to the crusher. *Photos by Stan Celestian*

FIGURE 7 A & B Trucks Loaded with Ore at Bagdad Large shovels load trucks with crushed ore. You can see the blue of the oxide ore in the photo to the right. This ore will go to the Leach Pad. (These trucks probably hauled half of the common 370-400 tons of today's trucks. For example, today's Caterpillar 797, has six 13' diameter tires that cost over $42,000 apiece, each truck about $3.5-5.5 million. New trucks arrive at the mine in 12 semi-trucks, then assembled. When running, each truck holds 850-1800 gallons of fuel, depending on the options purchased.) *Photos by Stan Celestian*

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PROCESSING OF OXIDE ORES

Once the oxide ore is broken up, it is crushed and then hauled to a *leach pad*. This is big pile of copper-bearing rock, laid over either impermeable rock/clay layer or over a layer of impermeable material. Weak sulfuric acid (often a product of sulfide ore processing) is sprayed over the pile. The acid percolates through the rock pile, and as it flows down it leaches out the copper (and other metals). The copper-rich acid/water solution (*pregnant leach solution - PLS)* runs out of the bottom of the pile, is collected into streams and ponds, and is pumped to the *solvent extraction plant*, for the first step in the recovery process. See Figures 8-9. The entire recovery process is called *solvent extraction-electrowinning (SX-EW)*

Heap Leaching

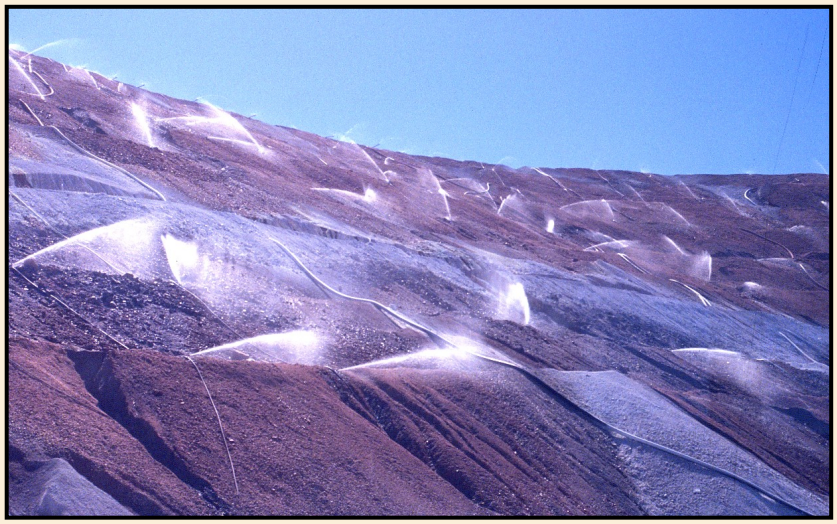

FIGURE 8 Leach Pad and Sulfuric Acid Spray This is a leach pad at the now-inactive San Manuel Mine. The acid leaches out the copper as it is gravity-driven to the base of the pad.

Photo by Susan Celestian

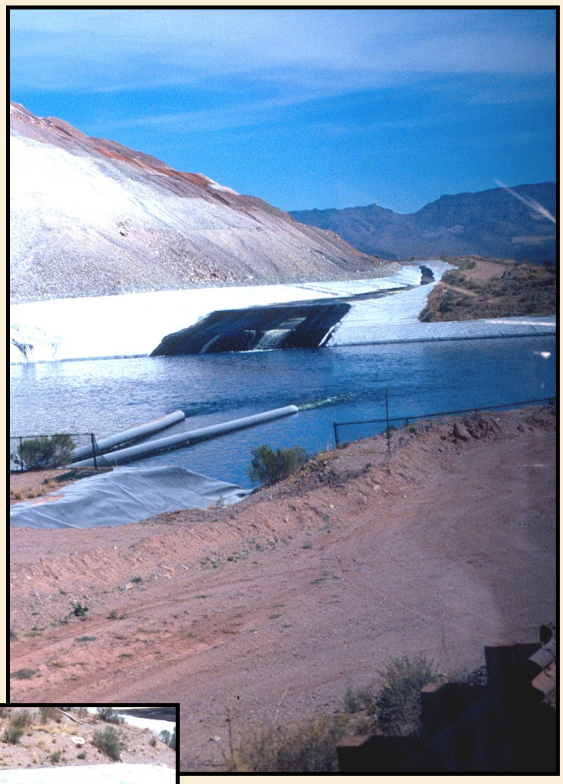

FIGURE 9 Accumulation of Leachate The Pregnant Leach Solution emerges at the base of the leach pad, and accumulates in streams and ponds, from which it is pumped to the solvent extraction plant, where the copper is recovered. Notice how blue is the copper-charged water.

Photos by Susan Celestian

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….Oxide Ores continued from page 11

SOLVENT EXTRACTION (SX)

In the *solvent extraction plant*, the PLS is mixed with an organic solution that contains a molecule that will grab (or release) a copper ion. The PLS is thus enriched to a high grade *electroyte solution* – 30 times the concentration with which it started (Figure 10-11).

As the solutions separate, the enriched solution floats below the now copper-less acid, and it can be separated and sent to the *electrowinning plant* (tank house for electroplating). See Figure 12.

Acid is added to the remaining fluids, and it is sent back to the leach pad sprinklers.

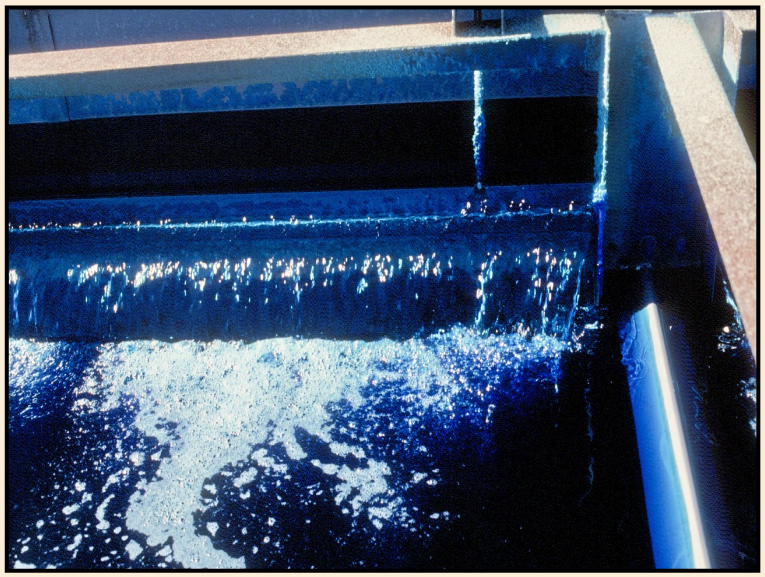

FIGURE 10 Solvent Extraction This deep beautiful blue solution (at the Bagdad Mine) has been treated, and the copper content increased. It can now be separated from the acid/depleted solution, and head to the electrowinning plant. *Photo by Stan Celestian*

FIGURE 11 Solvent Extraction Solutions: On the left is the depleted sulfide solution, and on the right is the enriched electrolytic solution -- now that is blue!. *Photo by Stan Celestian*

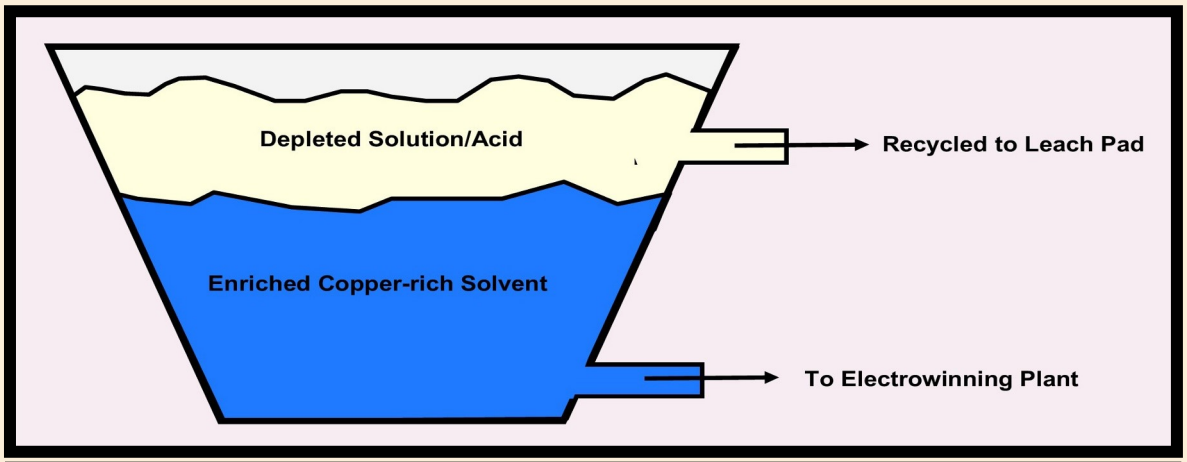

FIGURE 12 Separation of Enriched Solvent from Acid After solvent extraction, the enriched solvent goes to the electrowinning plant, and acid is added to the depleted acid solution before it is pumped back to the leach pad. *Graphic by Susan Celestian*

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….Oxide Ores continued from page 12

ELECTROWINNING (EW)

In the tank house, rows of thin copper *starter sheets* or stainless steel *blanks* are submerged into the enriched copper solution. These act as a base, upon which copper will be added. An electrical current is passed through the tanks, causing copper ions to precipitate upon the starter sheets or blanks. And in 5-10 days, 250-375 pounds of 99.99+% copper will have plated onto each sheet. Each plate is called a *cathode*. (Copper starter sheets become thicker; or copper plates onto each side of a stainless steel blank, and the copper cathodes are 'peeled' off, so the stainless steel blanks can be re-used. See Figures 13-17.

These cathodes need no further refinement, and can be sent directly to the rod mill, where the plates are melted, and the copper is extruded as a very thick wire or rod. See Figure 18-19. This product is ready to go to wire plants or other industrial manufacturers (such as pipe).

FIGURE 13 Preparing Copper Starter Sheets at Ray Mine In the photo on the left, are piles of starter sheets, awaiting preparation for the electrowinning tanks. On the right, an employee flattens out the copper sheets, and attaches hangers. *Photos by Stan Celestian*

FIGURE 14 Copper Starter Sheets at Bagdad Mine These copper starter sheets are hung and ready to be lowered into the tanks of copper-rich solution, for electrowinning. *Photos by Stan Celestian*

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….Oxide Ores continued from page 13

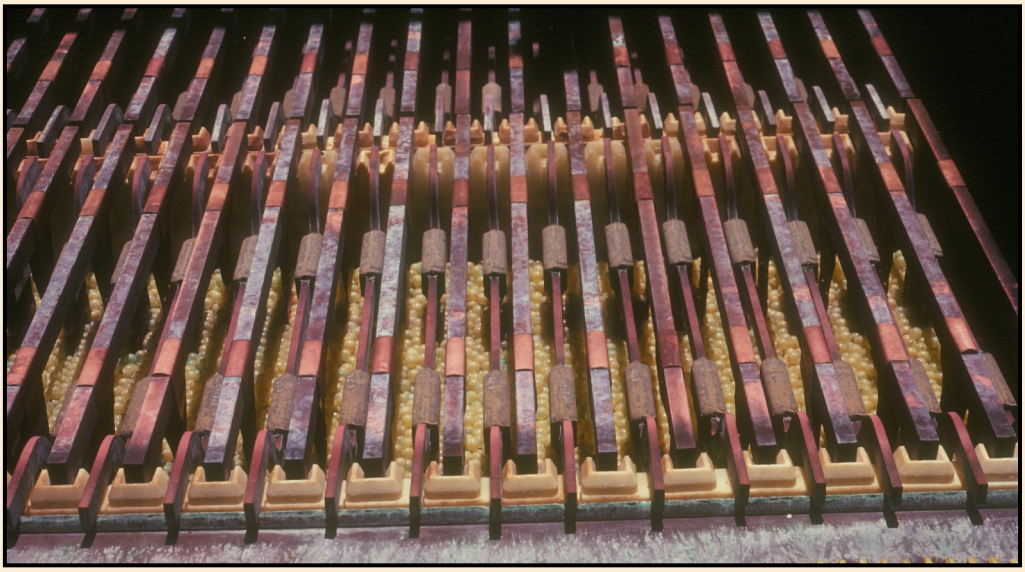
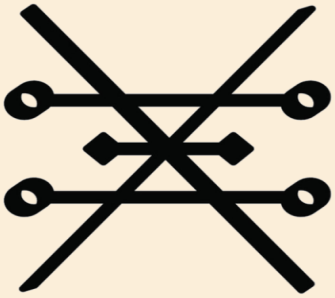


FIGURE 15 Electrowinning Tank In this view of the tanks at the Bagdad Mine, you can see the starter sheets immersed. Plastic spheres are there to keep down frothing and evaporation. *Photo by Susan Celestian*

FIGURE 16 Copper Cathodes Newly-pulled Out of the Electrowinning Tank
Photo by Stan Celestian

FIGURE 17 Copper Cathodes Bundles of 99.99+% copper cathodes at the Bagdad Mine. *Photo by Susan Celestian*



Copper

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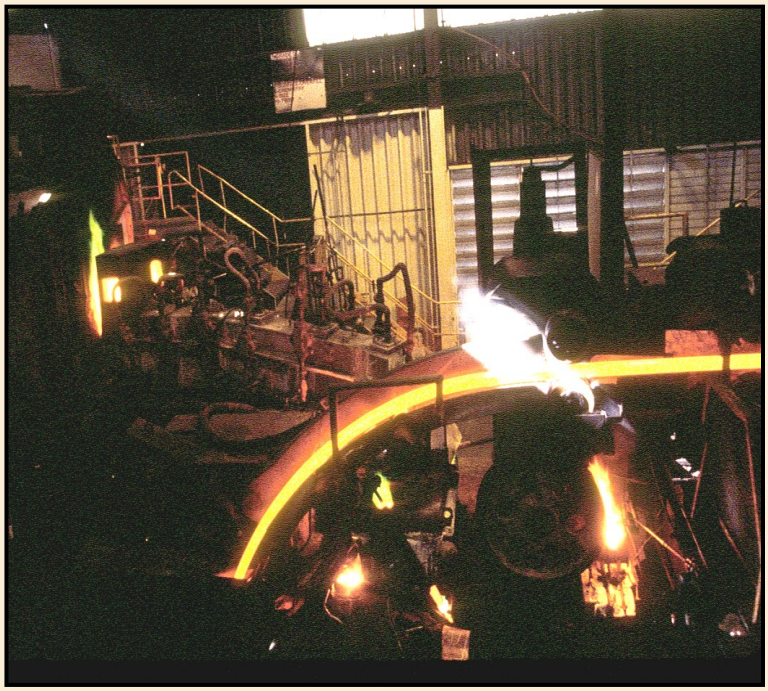
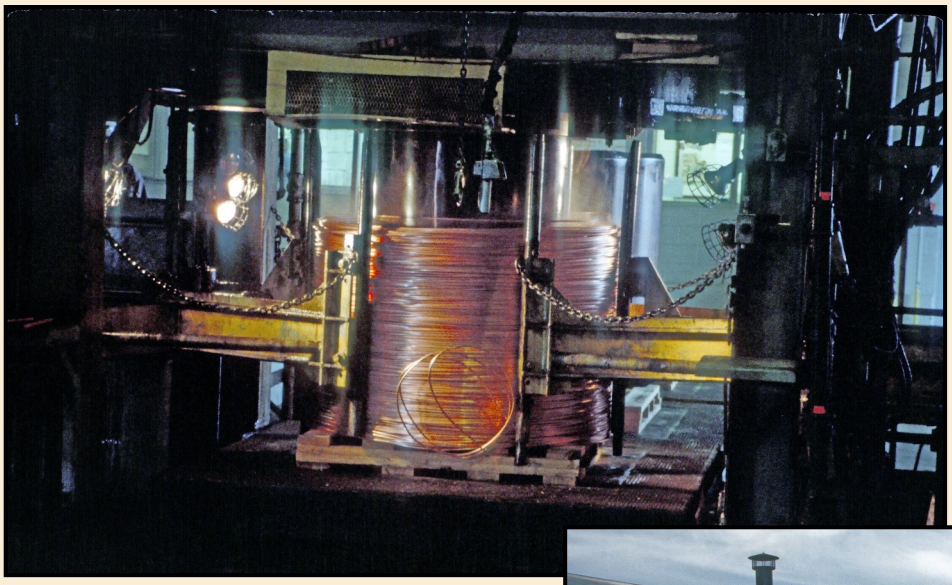


FIGURE 18 Copper Rod in the Making
These photos were taken at the now-closed BHP's San Manuel rod mill. Cathode copper is melted in a furnace, and molten copper is extruded into a thick "rod", that is thinned (see wheels in right-hand photo), until it is cooled and coiled (see Figure 19).

Photos by Stan Celestian



Atomic number **29**

Atomic mass **63.546**

CU

COPPER

FIGURE 19 Copper Rod, at BHP's San Manuel rod plant. In the upper photo, cooled rod is being coiled and wrapped for transportation. The lower photo shows wrapped coils stockpiled, awaiting a ride to an end-customer.

Photo by Stan Celestian

UPCOMING FIELD TRIPS

WHEN: Sunday, October 13, 2019
WHERE: Camp Verde area
WHAT: Aragonite/calcite/gypsum pseudomorphs after Glauberite
MEET: TBA
LEADER: Stan Celestian

WHEN: Sat/Sun, October 12-13, 2019
WHERE: Trona, California
WHAT: Hanksite/borax/tincalconite, trona
MEET: TBA
LEADER: Stan Celestian

CANCELLED

WHEN: Thursday, October 17, 2019
WHERE: Bronzesmith Fine Art Foundry & Gallery, 7331 E 2nd St, Prescott Valley, AZ
WHAT: Tour of foundry
MEET: The tour begins at 11:00
LEADER: Bill Freese

WHEN: Saturday, November 16 -- evening
WHERE: Purple Passion Mine
WHAT: Potluck & Fluorescent Minerals
MEET: TBA
LEADER: Ed Winbourne

WHEN: Sunday, November 24, 2019
WHERE: Sheep's Crossing area
WHAT: Purple agate
MEET: TBA
LEADER: Stan Celestian

WHEN: Fri/Sat, December 6-7, 2019
WHERE: Red Cloud Mine/Geronimo Mine
WHAT: Wulfenite/Vanadinite
MEET: At mine or 7:30 am on Friday at Martinez Lake (More details in separate email from Dave)
LEADER: Dave Haneline

DATES SUBJECT TO CHANGE

Stan and the field trip committee will be actively looking for productive spots for field trips. If you have any suggestions, you are encouraged to contact him at stancelestian@gmail.com

NEEDED: QUALITY MINERAL (or OTHER) DONATIONS WITH LABELS -- for monthly raffle prizes; and for raffle, door prizes, and sales tables at the annual show. If you have specimens to donate, please see Robin Shannon. The Daisy Mountain Rock and Mineral Club is a 501(c)(3) non-profit organization, and will gratefully acknowledge your donation with a Tax Deduction Letter. Thank You!

NOTE FROM THE EDITORS

Have a geological interest? Been somewhere interesting? Have pictures from a club trip? Collected some great material? Send us pictures -- or write a short story (pictures would be great).

Deadline for the newsletter is the 22nd of the month.

Mail or Email submissions to:
Susan Celestian
6415 N 183rd Av
Waddell, AZ 85355
azrocklady@gmail.com

WIRE-WRAPPING CLASS

4:30-6:30 pm
Prior to the meeting

Bring: cab or stone, about quarter-sized or larger; 26 20 and 18 gauge copper-based dead soft wire; round nose pliers and wire cutter, beads (optional), little clamps, masking tape, E6000 jewelry glue.

Free, but donations are appreciated.
Questions? Contact Jennifer at
Jennifer@eliteshuttersandblinds.com

This is the project Jennifer has planned for October!

Visit http://rmfms.org/ for news about conventions, events, and associated clubs. If you are travelling, you might want to contact a club local to your destination. Maybe they have a field trip you could join, while in town.

UPCOMING AZ MINERAL SHOWS

September 27-29 - Clarkdale, AZ Mingus Gem & Mineral Club; Clark Memorial Clubhouse Auditorium, 19 N 19th St; Fri-Sat 9-5, Sun 10-4; Admission: Free.

October 11-13 - Buckeye, AZ West Valley Rock & Mineral Club, Helzarockin' Gem & Mineral Show; Buckeye Arena, 802 N 1st St; Fri-Sat 9-5, Sun 9-2; Admission: Adults $3, under 13 free. *See flyer on page 16.*

October 12-13 - Sierra Vista, AZ Huachuca Gem & Mineral Club; Cochise College, 901 N Columbo Av; Sat 9-5, Sun 10-4; Admission: free.

October 19-20 - Sedona, AZ Sedona Gem & Mineral Club; Sedona Red Rock High School, Hwy 89A & Upper Red Rock Loop Road; Sat 10-5, Sun 10-4; Admission: $3, children under 12 free.

November 16-17 - Apache Junction, AZ Apache Junction Rock & Gem Club; Skyline High School, 845 S Crismon Rd, Mesa; Sat 9-5, Sun 10-4; Admission: Adults $3, Students w/ID $1, under 12 free. *See flyer on page 16*.

January-February - Quartzsite, AZ For a complete list of shows, go to https://www.desertusa.com/cities/az/quartzsite.html#anchor832166

Desert Garden January 1-February 28
Pow Wow January 15-17
Tyson Wells January 3-12

January 3-5 - Mesa, AZ Flagg Mineral Foundation; Mesa Community College, 1833 W Southern Av; Fri-Sun 9-5; Admission: free. *See poster on page 17.*

January 10-12 - Globe, AZ Gila County Gem & Mineral Society; Gila County Fairgrounds, 900 Fairgrounds Rd.; Fri-Sat 9-5, Sun 10-4; Admission: Adults, single $3; Adults, couples $5; children & students free.

January 20-February 17 Go to http://www.tucsongemshows.net/coming.html for a complete list of Tucson gem, mineral & fossils shows.

February 13-16 - Tucson, AZ Tucson Gem & Mineral Society; Tucson Convention Center, 26 S Church Av; Thurs-Sat 10-6, Sun 10-5; Admission: Adult $13, 14 and under free w/paying adult. *See poster on page 18 -- discount coupon.*

If you are travelling, a good source of shows AND clubs is http://the-vug.com/educate-and-inform/mineral-shows/ or http://www.rockngem.com/ShowDatesFiles/ShowDatesDisplayAll.php? ShowState=AZ For out-of-the-country shows: http://www.mindat.org/shows.php?current=1

FACEBOOK

Visit and join the club page periodically. See what is happening, and boost our visibility on the web. Go to: The Daisy Mountain Rock and Mineral Club. It is set up so you can post photos of outings or related items.

WEBSITE

http://www.dmrmc.com/

If you have comments, contact Nancy Gallagher.

GROUPWORKS

As a DMRMC club member, your name should be available at https://app.groupworks.com/#/login, and you should receive an email linking you to registration. Create an account and receive reminders about club events, meetings, and important club information. You may post pictures and information -- all seen only by club members.

Upcoming Meeting Programs

Thanks to Ed Winbourne for scheduling the following speakers:

- October 1 Herb Jacobson -- *10,000 Years of Copper*
- November 5 Patti Polk -- *Agate*

Officers, Chairpersons, & Trustees

President: Ed Winbourne…..ewinbourne@gmail.com
Vice President: Stan Celestian…… stancelestian@gmail.com
Secretary: Rebecca Slosarik .. rslosarik1@gmail.com
Treasurer: Cynthia Buckner….Cbuckrun1@q.com
Publicity: Howard Roose...Hroose9366@msn.com
Membership: Tiffany Poetsch tnpoetsch@gmail.com
Editors: Susan & Stan Celestian…… azrocklady@gmail.com
Field Trip: Stan Celestian... stancelestian@gmail.com
Show Chair: Ed Winbourne
Trustees:

Cynthia V	Claudia M
Susan C	Tiffany P
Tammy E	Jim R
Bob E	Witt R
Jennifer G	Howard R
Don R	Bob S
	Rebecca S

Meetings are held the **1st Tuesday of the month** at **the Anthem Civic Building**, 3701 W Anthem Way, Anthem, AZ 85086. Business meeting at 6:30 pm. We **do not meet in July or August**.

DMRMCLUB@GMAIL.COM

Membership Dues:
First year $30, then $20.00 Adults per Person
First year $45, then $25.00 Family (2 people)

Meeting Dates for 2019

Jan 8, Feb 5, Mar 5, Apr 2, May 7, June 4, Sept 3, Oct 1, Nov 5, Dec 3

West Valley
Rock & Mineral Club

Buckeye's 8th Annual

HELZAROCKIN'
GEM & MINERAL SHOW

October 11 ★12 ★13 2019
9 a.m. - 5 p.m. Fri-Sat
9 a.m. - 2 p.m. Sun
Adults $3 kids under 13 free

Open Air Event
Buckeye Arena
802 N 1st Street (Miller Road)
Buckeye, Arizona

Rocks, Gems, Jewelry, Minerals,
Fossils, Beads, Slabs, Cabs,
Gold Panning & Scavenger Hunt

Snacks and Beverages Available

Information contact:

show@westvalleyrockandmineralclub.com

website: westvalleyrockandmineralclub.com

APACHE JUNCTION
ROCK & GEM CLUB, INC.

Gem & Mineral
Show

November 16, 2019
9am-5pm
November 17, 2019
10am-4pm

Skyline High School
845 S. Crismon Rd
Mesa, AZ 85208
North of Southern Ave on Crismon

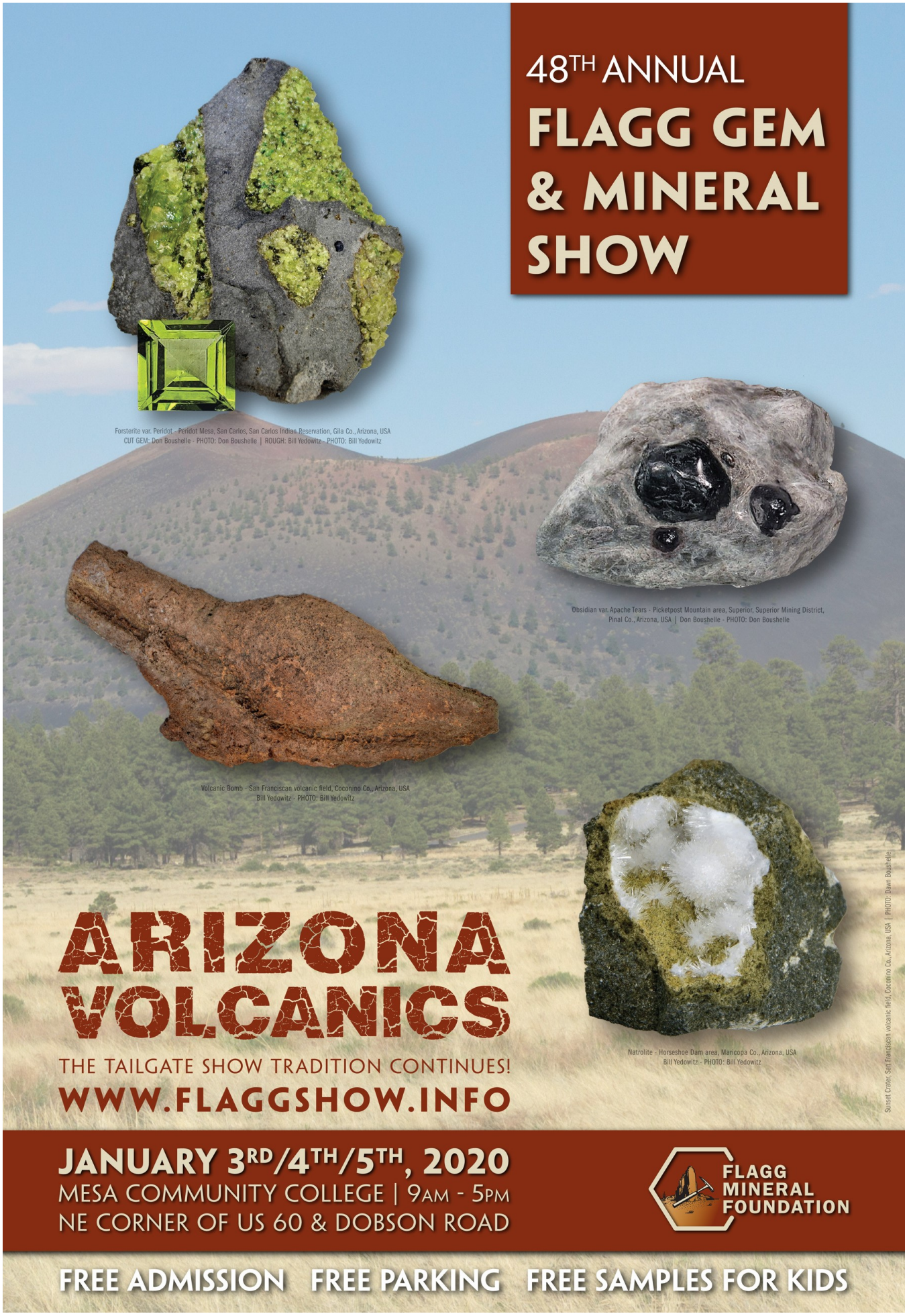
Admission: Adults $3.00
Students with ID $1.00
Children under 12 free

This show benefits our Scholarship Fund for local students.

We have rocks, gems, jewelry, fossils, minerals, jewelry supplies, rare and unusual crystals from vendors all over the state.

We have food service, raffles, and the best silent auction in the state plus lots of activities for all ages.

Fun for the whole family!


48TH ANNUAL
FLAGG GEM & MINERAL SHOW
Forsterite var. Peridot - Peridot Mesa, San Carlos, San Carlos Indian Reservation, Gila Co., Arizona, USA
CUT GEM: Don Boushelle - PHOTO: Don Boushelle | ROUGH: Bill Yedowitz - PHOTO: Bill Yedowitz
Obsidian var. Apache Tears - Picketpost Mountain area, Superior, Superior Mining District, Pinal Co., Arizona, USA | Don Boushelle - PHOTO: Don Boushelle
Volcanic Bomb - San Franciscan volcanic field, Coconino Co., Arizona, USA
Bill Yedowitz - PHOTO: Bill Yedowitz
Natrolite - Horseshoe Dam area, Maricopa Co., Arizona, USA
Bill Yedowitz - PHOTO: Bill Yedowitz
Sunset Crater, San Franciscan volcanic field, Coconino Co., Arizona, USA | PHOTO: Dawn Boushelle
ARIZONA VOLCANICS
THE TAILGATE SHOW TRADITION CONTINUES!
WWW.FLAGGSHOW.INFO
JANUARY 3RD/4TH/5TH, 2020
MESA COMMUNITY COLLEGE | 9AM - 5PM
NE CORNER OF US 60 & DOBSON ROAD
FLAGG MINERAL FOUNDATION
FREE ADMISSION FREE PARKING FREE SAMPLES FOR KIDS

THE 66TH ANNUAL TUCSON GEM AND MINERAL SHOW®

FEBRUARY 13-16, 2020

Tucson Convention Center
260 South Church Avenue • Tucson, Arizona 85701

Thursday: 10:00 a.m. - 6:00 p.m.
Friday: 10:00 a.m. - 6:00 p.m.
Saturday: 10:00 a.m. - 6:00 p.m.
Sunday: 10:00 a.m. - 5:00 p.m.

Tickets go on sale Thursday, January 17, 2020 at all TCC Ticket outlets or call the TCC Box Office at 520-791-4101, option 1 for more information.

Don't forget, you can buy your ticket at the door!

Admission is $13.00
($12.00 plus $1.00 facility tax) per adult.
Children 14 and under FREE with a paying adult

Friday, February 14, 2020 is Military (active & retired) and Senior Citizens Day (62 and older), receive $2.00 off the regularly priced ticket
(cannot be used with any other discount).

2-day tickets will be available for a cost of $22.00
(cannot be used with any other discount).

Clip the coupon for $2.00 OFF on one adult General Admission ticket
(cannot be used with any other discount).

FEATURING:

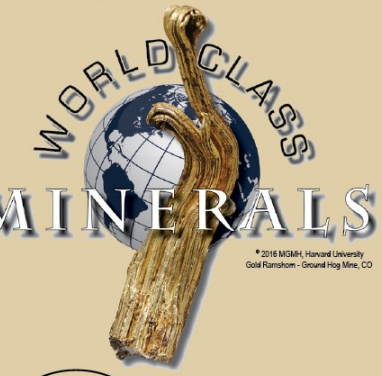
Honoring 50 years of Mineralogical Record
Retail Dealers | Exhibits
Junior Education Area
FREE Lectures | Symposiums
"Micro- Mineral" Room
Hourly Drawings at the Giveaway Booth
Saturday Night Banquet & Awards
Silent/Live Auctions

For more information: visit: www.tgms.org

TUCSON GEM & MINERAL SOCIETY

Scan code for information on our Tucson Gem and Mineral Show®

TUCSON GEM AND MINERAL SHOW®
Tucson Convention Center
February 13 - 16, 2020



TUCSON GEM & MINERAL SOCIETY
www.tgms.org

$2.00 OFF
ONE ADULT GENERAL ADMISSION

CHILDREN 14 AND UNDER FREE WITH A PAYING ADULT

This coupon cannot be used with any other discount