

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.

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Very Rare: Werewulfenite (on Molybdenite)

© 2019 Laurie Manifold, DMRMC member
(reproduction denied without artist's permission)

COPPER MINING: OXIDE & SULFIDE ORES

PART II: SULFIDE ORES

By Susan Celestian

MINING OF SULFIDE ORES

Sulfide ores may be mined as are oxide ores -- by traditional underground mining (involving shafts and adits), with ore cars bringing ore to the surface; and, more often, by open pit methods. A third method that is increasingly used is block caving.

BLOCK CAVING

Since many sulfide ore bodies are deep, massive, and projected to be viable for extended periods, increasingly block caving is the method used to remove the rock. The advantages of block caving are¹:

- ▶ 1/10 the cost of conventional methods
 - ▶ No backfilling
- ▶ Reduced waste rock, and correspondent reduction of surface footprint for waste dumps
- ▶ Reduced surface disturbance, as compared to open pit mining (discussed further on page 12)
- ▶ Potentially high production and recovery rates

Block caving involves the subsurface breakup and removal of ore rock, using gravity as the primary force. As rock is removed, a space forms, and gravity pulls on the rock above, to fill that space. The pull of gravity and the weight of the rock also results of fracturing, that further encourages rock to shift downward (reducing the need for blasting).

See <https://www.youtube.com/watch?v=a-pWzUb6How>
<https://www.youtube.com/watch?v=n21gHDPFFK8>
<https://www.youtube.com/watch?v=5woCaxXB7Jk>

The disadvantages of block caving are²:

- ▶ High development cost (For example, at the Resolution Mine, Rio Tinto/BHP will spend \$2 BILLION by 2020 just for development, expect \$6 BILLION total cost for development)
- ▶ Extensive development activity required (related to cost, but lots of subsurface preparation -- and often at great depth (Resolution Mine is over 7000' deep!))
 - ▶ Land surface subsidence (See Figure 3)
 - ▶ Low selectivity & flexibility

Sulfide Ores continued on page 11.....



Chalcopyrite, Locality unknown. Note that the fresh surface is a golden brassy color, and the iridescent colors are a natural tarnish.

Photo by Stan Celestian

Dues are due now

**PLEASE PAY CYNTHIA SOON.
 SHE NEEDS THE DUES BEFORE
 DECEMBER 1ST, SO SHE CAN PAY
 THE FEDERATION DUES ON TIME.
 YOU CAN FIND THE DUES
 SCHEDULE ON PAGE 5.**

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¹<https://www.geoengineer.org/news/block-caving-a-new-mining-method-arises>

²https://www.researchgate.net/figure/Block-caving-advantages-and-disadvantages_tbl11_220036520

October 1, 2019

Board of Trustees Meeting Minutes

- In attendance: Claudia M., Cynthia B., Deanne G., Don R., Ed. W., Howard R. (via phone), Rebecca S., Stan C., Susan C., Tammy E., Tiffany P. and William F.
- Cynthia B. discussed our finances
 - UV light was bought this month
 - Club still in great standing
 - Club dues would be helpful to receive early
 - Dues can be paid for on GroupWorks
- Claudia M. discussed our scholarship award
 - Deer Valley District page has a list of scholarships available to student body
 - Most students from Boulder are not good applicants
 - 43% go to community college
 - Only 39% go to 4-year school
 - ◇ We want to open to whole district because of this
 - We will open up scholarship to Boulder Creek, Sandra Day O'Conner, and Barry Goldwater within the district for now
 - 2 x \$1,500 scholarships if applicants available
- Claudia M. redid application for members
 - Photo could be used publicly, stated now in member paperwork
- Raise for speaker was talked about
 - Patti Polk, highly revered, cost more than approved
 - Raise approved for now
- Volunteers are still needed for:
 - Show marketing volunteer
 - Show food marketer
 - Education (assist Bill S.)
 - Social media (website updating, photos)
 - Food brought for meetings
- Show & Tell is instated
 - After break
 - Bring your rock hounded specimens and show off!
 - Get extra raffle tickets for doing so

Respectfully submitted by Rebecca Slosarik



October 1, 2019

General Club Meeting Minutes

- Thanks to our guest speaker, Herb J., previous co-founder for always doing an outstanding job
 - He discussed copper mining this time
- Robin S. led the raffle, helped by Deanne G. and Tammy E.
- Cynthia B. read the financial report, we are in good standing
 - Rocky Mountain federation dues coming up, please give your dues to Tiffany P. or do so online
- Stan C. did an amazing show & tell
 - Was of the last field trip up to Paleo site
 - If you would like to present, bring in specimens from your own rock hounding experiences, or club field trips
- Bill F. discussed upcoming field trip
 - October trip to Bronzesmith site
 - Email was sent out with details
- Educational committee was announced
 - Bill S. and Claudia M. need volunteers
 - Diamond Canyon S.T.E.A.M. night
 - ◇ Volunteers needed, bring specimens
 - Anthem elementary S.T.E.M. night
 - New River S.T.E.M. night
 - Canyon Springs S.T.E.M. night
 - Will have email with updates when available
 - ◇ Should be held around January
- New T-shirt sales discussed
 - Artists needed
 - Make a sketch for new logo
 - Be on committee for T-shirts, if you are available
- Doug D. gave information about the North Mountain Visitor Center
 - Lapidary classes, silversmithing, and many more available
 - Information always accessible on newsletter
 - Come in and create your own pieces
 - Museum in Phoenix will need volunteers again
 - Items need relocating
- Committee chairs up for re-election next month
 - Open election
 - Run for any position

Respectfully submitted by Rebecca Slosarik

FIELD TRIP CAMP VERDE PSEUDOMORPHS OCTOBER 13, 2019

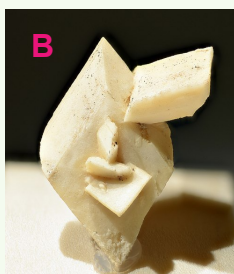
An enthusiastic group made the trek north to the Camp Verde area, and collected calcite and aragonite pseudomorphs after glauberite. Stan & I were unable to make the trip, but I thought you might like some geological background on the site.

Between 13 and 2 million years ago, the Verde Valley subsided between the Verde Fault to the west and the Mogollon Fault to the east. Altogether the displacement along the faults was about 6100 feet. Today the valley is 30 miles long, 25 miles wide and 2000+ feet deep.

Between 9-10 and 2.5 million years ago (Mid Miocene to Early Pleistocene), the ancestral Verde River became obstructed, most likely by disruption due to the subsidence of the valley, but might also have been occasionally due to damming by repeated lava flows. This resulted in water ponding to form a shallow, seasonal lake (or series of lakes), probably about 10-20 feet deep, and adjacent marshes. The lake shrank and swelled with decreases and increases in precipitation and temperature. Within this lake, sediments — mudstones, limestone, sandstones, diatomites, evaporates — and some volcanics were deposited. Together they are known as the Verde Formation, which is at least 3125 feet thick. (The Verde Valley was initially filled to about 5000 feet above sea level, and in fact House Mountain was probably completely buried by the accumulated sediments. Currently, it has been excavated to about 3000 feet above sea level and House Mt has been freed of its burden.)

When the lake began to shrink, the last vestiges persisted in the vicinity of what is now Camp Verde. There the salinity became extreme, and various salts were deposited in the lake muds. The first mineral to form was Glauberite. It is very soluble, and so generally does not persist; but dissolves, leaving voids (casts) the shape of the crystal in the mud. These voids are then filled in by other minerals that form in an evaporating body of water — Aragonite, Calcite and Gypsum.

These form pseudomorphs (*pseudo*—false; *morph*—form). In other words, the crystal form of Glauberite is occupied by these other minerals. So there is Aragonite after Glauberite (A), Calcite after Glauberite (B) and Gypsum after Glauberite (C) in the Verde Formation.



Photos by Stan Celestian



Another explanation for the pseudomorphs may be that rather than filling in voids, the various minerals replaced the Glauberite molecule by molecule.

At the very highest salinities, toward the end of the lake's existence, Halite (table salt) was deposited. This Halite was mined by Native Americans at the old Salt Mine near Camp Verde, and not far from the collecting sites. It is one of the oldest known mines in the U.S — perhaps as old as 2000 years.

Depiction of the Verde Lake and the animals that gathered around it. Few fossils have been found, but some footprints (elephant, camel, horse), small snails, algal filaments have been found.

Photo (by Stan Celestian) of mural on display at Montezuma's Castle



....Camp Verde continued from page 4



On the left, members have arrived at the parking area above the arroyo, where the pseudomorph-bearing strata are exposed. On the right, is a view within the arroyo. The walls are unconsolidated silts and clays of the Pleistocene Verde Formation. Crystals are very easily dug out -- or have been released by erosion/weathering, and easily picked up off the floor of the arroyo.

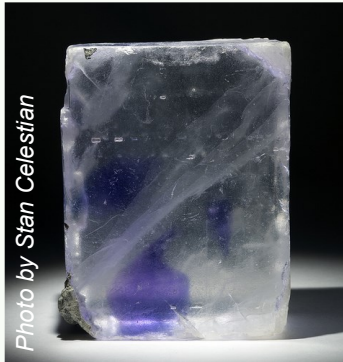
Photos by Deanne Gosse (as posted on the club's Facebook page.)



Club member Bill Powell shared these photos of the pseudomorphs he collected. The upper left and middle left are calcite after glauberite; the lower left and two righthand photos are aragonite after glauberite. The latter are often a bit irregular, with slender amber-colored crystals of aragonite.

Photos by Bill Powell

....Camp Verde continued from page 4



Halite collected at the old Salt Mine on Salt Mine Road, outside Camp Verde and just across the ridge from the field trip collecting site.

Ancient native American tribes collected this salt, and the salt mine was the center of commercial mining in the 1920s and early 1930s; however, larger and purer deposits elsewhere forced closure.

Elsewhere in the Verde Valley, Gypsum is commercially mined. The mine is operated by the Phoenix Cement Co. Gypsum retards drying in cement/concrete; some of the gypsum is used as an agricultural additive.



View across the Verde Valley. The Verde River flows through the middle, flanked by cliffs of white, weakly to un-consolidated sediments of the Verde Formation. Photo by Stan Celestian

Camp Verde continued on page 6....

October Speaker

Our own Herb Jacobson, retired exploration geologist, spoke on the 10,000 year history of copper. The oldest known copper objects are beads in a Turkish necklace. The copper was extracted by piling malachite on a hill, building a fire to cook out the copper -- and the copper flowed downhill.



The oldest known copper in the USA is nuggets of native copper discovered in 5300 BC on Isle Royale, in Michigan.

During the Dark Ages (1350 BC-476 AD) copper mining went on hiatus, except for the forging of armaments during the Crusades.

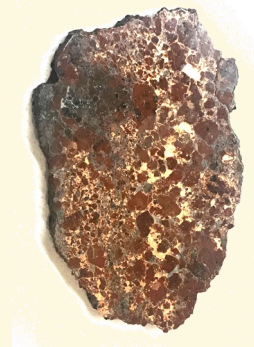
The Renaissance (1240-1700 AD) saw renewed activity in copper mining. This was accelerated with the arrival of the Industrial Revolution (1700-1950 AD), and the beginning of the electrical age.

Interesting factoid: The Statue of Liberty was built out of 80 tons of copper, sourced from Norway.

With the discovery of porphyry copper deposits in the U.S., South America, and elsewhere in the world, copper has become a metal upon which we increasingly rely. In 1990, global production was 8 million tons; in 2017 it was 20 million tons!



Bronze (copper alloyed with about 12% tin) Roman coin probably from around 23 BC Image courtesy of <https://imgbin.com/png/>



Copper acts as the cement in this conglomerate from the Upper Peninsula of Michigan.

....Bronzsmith continued from page 7

STEP 6: The very dry ceramic-coated casts are put into an autoclave, the wax is melted out, and then the shells are heated in an oven so they won't break when the molten bronze is poured into them. The vacant space (once occupied by wax) will fill with metal during the pour -- this is called Lost Wax Casting.

STEP 7: The Pour -- Molten bronze, at a temperature of 2150°F, is poured into the molds, and the sculpture is cast. The Bronzsmith gets their bronze from a smelter in Toronto. The crucible will hold 500 pounds of bronze, This is allowed to cool.



Bronzsmith continued on page 9....

....Bronzesmith continued from page 8

STEP 8: As cooling progresses, the ceramic coating will crack and start to break away. Any remaining will be removed with a hammer -- and subsequent sandblasting. Additionally, the once-wax and now-bronze sprues are cut off. And if there are multiple components to the sculpture, they are welded together. Seams and imperfections are ground away.



Once-wax, Now-bronze sprues

STEP 9: Any texturing needed is re-created. The sculpture is polished, and finally patina is applied. For example, rather than wait for natural (and perhaps uneven and splotchy) tarnishing to occur, sculptures are coated with liver of sulfur, to turn the item black or dark brown. Other patinas include solid colors (red, yellow, blue....), even the replication of the look of wood or stone. And finally, sealants are applied. In the following photos, ALL the texture and color is accomplished with patina, by some very talented artists.



Polished and ready for patina. Note the color of fresh bronze.



THE MANY FACES OF PATINA



Bronzesmith continued on page 10....

....Bronzsmith continued from page 9



"Thing" doorstop



This is the current status of Bill Nebeker's 14' tall *If Horses Could Talk*, sculpture

soon to reside in a roundabout in Prescott. A horse will be added behind the cowboy up on the rock. The horse will be eyeing the deer, that is hiding under the overhang on which the cowboy is sitting, as he scans the countryside for deer.



Dialogue, by Vladimir Kush. And it's only \$6500!

The Whimsical Metaphysical Realism of Vladimir Kush

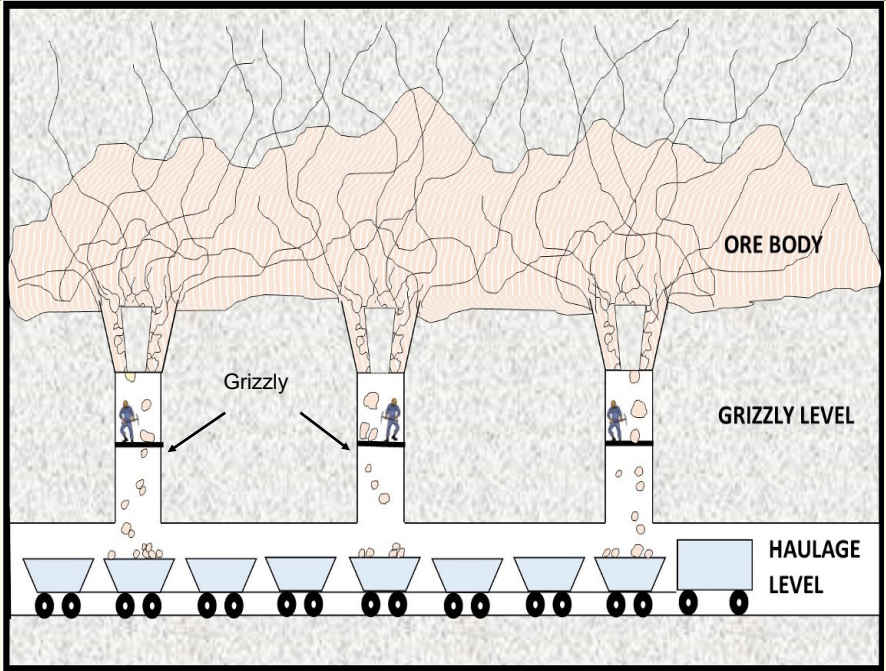


....Sulfide Ores continued from page 2

FIGURE 1 BLOCK CAVING METHOD A

This diagram illustrates the block caving mining method used at the now-closed San Manuel Mine in Arizona. Two levels are excavated below the ore body, and the ore body is blasted to fracture the rock, or natural fractures are relied upon.

Under the influence of gravity, rock collapses down pre-formed funnels, to the grizzly level. (The grizzly is a "sieve" formed of steel, like rail tracks, spaced to allow only small enough rock to pass through.) At San Manuel, a wooden gate could be opened or closed manually (by a miner standing near the grizzly) to allow rock to flow over the grizzly. (This looked real scary -- millions of tons of rock held back by a gate!) All rock chunks, too large to pass through, are broken up by a miner swinging a 20-pound



sledge hammer --- all day!

Rock falls through the grizzly to the haulage level, where it lands in a train of ore carts, and is hauled to the surface, for crushing (as at San Manuel), or it is crushed below ground, and then hauled to the surface.

As rock is removed, the support for the land surface diminishes, fractures extending into the country rock ease the continued fall of rock, and gradual surface subsidence will occur -- even after mining has ceased.

Illustration by Susan Celestian

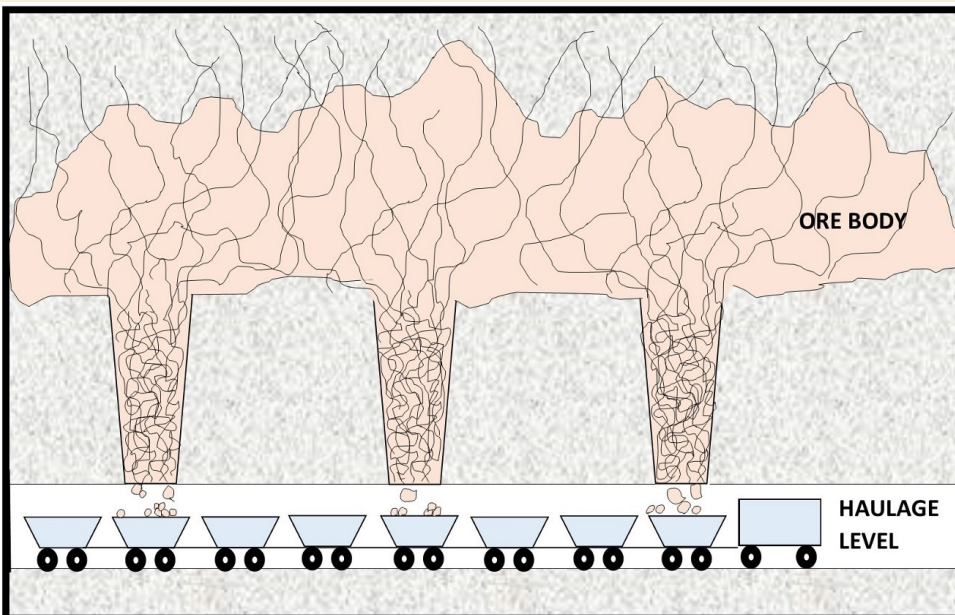


FIGURE 2 BLOCK CAVING METHOD B

Not dissimilar from the configuration in Figure 1, this is the permutation being proposed for the new Resolution Mine in Pinal County. This ore body (1.47% Cu) lies over 0.8 miles below the surface.

The haulage tunnel is created below the ore body. Blasting creates funnels leading from the ore body to the haulage level, where loaders transport the rock to trains, which will carry ore to subsurface crushers to reduce the size of the rock. From the crushers, conveyors transports the rock to the surface for further processing.

As rock is removed from the system, space is created, and gravity will cause the rock above to fracture and fall into the space. In this way, little blasting will be necessary to maintain the continual influx of rock into the funnels.

Of course, as in Figure 1, the removal of rock in the subsurface will result in slow and gradual subsidence at the surface. In the case of the Resolution Mine, that is projected to be at least 1000 feet. See Figure 3.

Illustration by Susan Celestian

....Sulfide Ores continued from page 11



FIGURE 3 LAND SUBSIDENCE DUE TO MINING This is a picture of subsidence scarps developed over the now-closed San Manuel, in Pinal Co., Arizona.
Photo by Stan Celestian

PROCESSING OF SULFIDE ORES

Compared to the processing of oxide ores, the processing of sulfide ores is more complex -- there are more steps.

- ▶ **CRUSHING:** Through a series of crushers, the ore is crushed and milled to a very fine size. Just as with oxide ores, the newly gathered ore rock is run through the primary crusher, that reduces the rock size to 8" or less. This may be sited in the pit, underground (as in block caving), or at an alternate site on the surface. See Figures 3-7.

On to Dryers (page 14)...

....Sulfide Ores continued from page 12



FIGURE 3 DUMPING FRESH ORE INTO PRIMARY CRUSHER At the now-closed New Cornelia Mine (in Ajo, Pima Co., Arizona), side-dumping cars of the ore train dump fresh ore into the primary crusher.

Photo by Susan Celestian

FIGURE 4 PRIMARY CRUSHER AT NEW CORNELIA MINE The crusher is a cone, with a huge concrete pestle, that rotates/gyrates and breaks up rock to 8" or less in diameter.

Photo by Susan Celestian



FIGURE 5 ORE IN THE PRIMARY CRUSHER This is a view of the loaded primary crusher in the Bagdad Mine (Bagdad, Yavapai Co., Arizona). From here, the ore is transported via conveyor belt to the ball or rod mills.

Photo by Susan Celestian



....Sulfide Ores continued from page 13



FIGURE 6 MILLS On the left is a ball mill at the Bagdad Mine (Yavapai Co., Arizona) and on the right is a bank of ball mills at the New Cornelia Mine (Ajo, Pima Co., Arizona). After crude crushing, ore rock is sent to the mill and secondary crushers, to be ground to a very fine size. Mills come in three kinds: SAG, ball, and rod.

- ◆ SAG (Semi-Autogenous Grinding) mills are generally second-stage tumblers, designed to reduce the rocks from the primary crusher, into smaller rocks, which will go on to further grinding. The big tumblers hold large (8" diameter) steel balls, large rocks, and water. The balls and big rocks pound and crush the rock smaller particles. Once the balls wear down to a couple inches in diameter, the balls are replaced. See Figure 7.
- ◆ Ball mills are also big tumblers holding large (8" diameter) iron balls and water, but they are charged with more balls than are SAG mills. These pound and crush the rock to ever finer particles, until it is about sand-sized. Once the balls wear down to a couple inches in diameter, the balls are replaced.
- ◆ Rod mills are also big tumblers, but they hold long rods and water. They serve the same function of ball mills. Some mills hold a combination of balls and rods.

Photos by Susan and Stan Celestian

Lest we forget --After crushing: On to Dryers (page 14)...

- ▶ **Drying:** After ore is ground to sand-sized particles, it is sent to dryers, where water is reclaimed for re-use. See Figure 8.

And on to Flotation (page 15).....

FIGURE 8 DRYER This big rotating dryer (at Bagdad Mine, Yavapai Co., Arizona) sucks the water out of the finely crushed ore. More recently dryers are large tube-like "ovens". From here, ores go to flotation. *Photo by Susan Celestian*



FIGURE 7 RUSTY WORNOUT MILL BALLS at the San Manuel Mine. *Photo by Stan Celestian*

....Sulfide Ores continued from page 14

► **FLOTATION:** A slurry from the mill is mixed with reagents and sent to the flotation tanks, where air bubbles through the mixture. Copper clings to the bubbles and the copper-rich froth – now called concentrate (30% copper) – is collected and then sent to dryers. Concentrates (or cons) are bagged up for transport to a smelter. In some mines, other elements - such as molybdenum - also separates out in the flotation froth. A different flotation chemistry will be used to separate copper and molybdenum (moly).

You may have seen trucks with big, white, square bags -- they probably hold either copper or molybdenum concentrates. See Figure 9.

Tailings: The material that doesn't float, sinks to the bottom of the tanks. This material is called *tailings*, or *tails*. Tailings are recovered and sent to a pond, where the particles settle out and the water is recovered for re-use. The tails are then moved to large on-site piles -- *tailing piles*. They may be quite large, and do pose a dust hazard, as they are generally barren of vegetation, and very fine-grained. See Figures 10-11.

On to Smelting (page 17).....

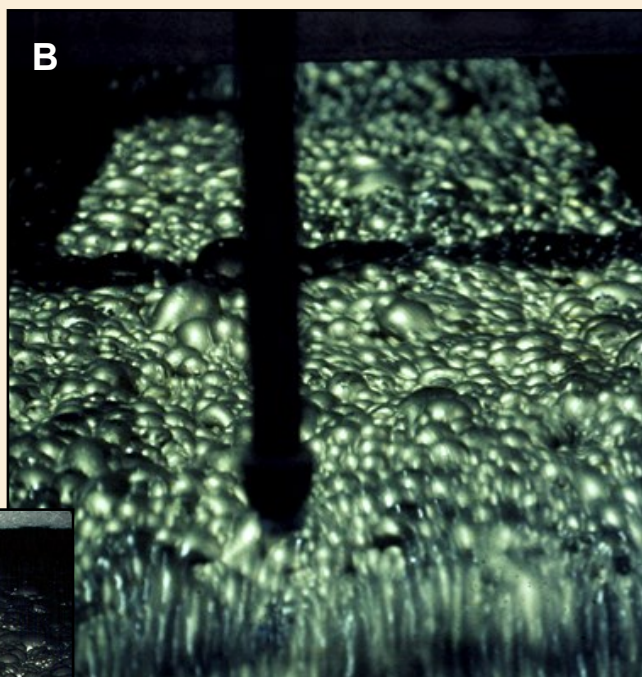


FIGURE 9 FLOTATION OF COPPER ORE The story goes that while hand washing the laundry, women in copper mining camps noticed that copper particles stuck to bubbles in the wash water. And that this observation led to the flotation process. See how coppery the bubbles look!

Photos by Sue and Stan Celestian

Sulfide Ores continued on page 16....

....Sulfide Ores continued from page 15



FIGURE 10 TAILINGS (SETTLING) POND AND TAILINGS This photo was taken at the now-closed New Cornelia Mine (Ajo, Pima Co., Arizona). In the foreground is the tailings pond, where tailings settle out of water, and the water is reclaimed. In the background, there is a gray, terraced, and eroded hill. This is where the tailings from the settling pond are dumped. *Photo by Stan Celestian*

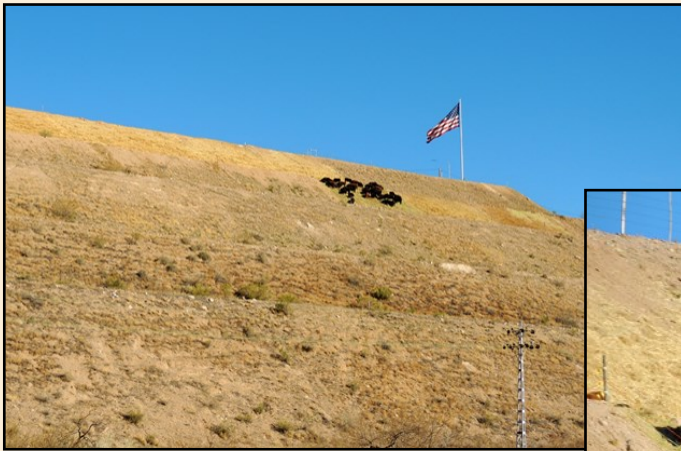


FIGURE 11 RECLAMATION OF TAILINGS PILE Tails are a source of small particle air pollution. At Miami, cows reside, eat, and poop on the piles – thereby encouraging grasses to take hold and stabilize the dust. *Photos by Susan Celestian*

As an aside, go also to https://www.fcx.com/sites/fcx/files/documents/fast_facts/Mining_Recl_NA_2014.pdf for additional information on mine site reclamation.

....Sulfide Ores continued from page 16

- ▶ **SMELTING:** Since the concentrates from flotation are only 30% copper, further processing is necessary to create a usable product.
 - ◆ The concentrates are sent to the **flash furnace**, where they are melted at 2300°F, in the presence of oxygen and silica flux. Here copper separates from most of the iron, silica, and other non-copper substances. The molten material is separated, and sulfur dioxide gas is captured and sent to the gas plant to make sulfuric acid for leaching (See Figures 12-13):
 - **matte** (bottom layer = > 50% copper, + some iron): this is higher in copper than the concentrates, but still far from the necessary 99.99% product that can be used to make wire, pipe, and other materials. Matte is drained off, and sent to the **converter furnace**.
 - **slag** (top layer = iron, silica, other): this is a glassy hi-iron material that is drained off and disposed of, by pouring it onto the slag heap. These days, some old slags are being reprocessed for use as abrasives and concrete aggregate.

Off to the converter furnace (page 18).....

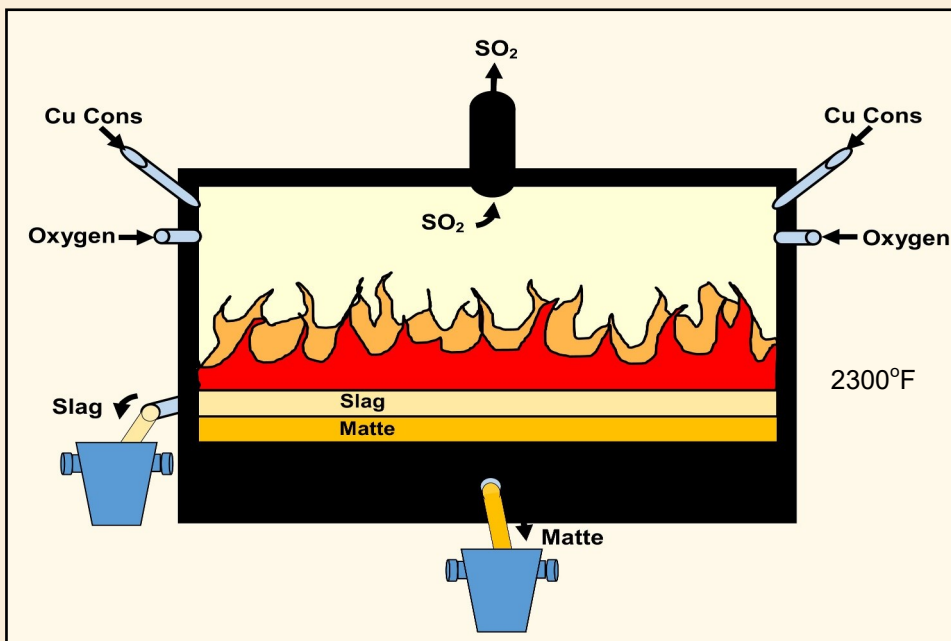


FIGURE 12 FLASH FURNACE

As copper concentrates are introduced into the very hot furnace, oxygen and silica flux are added, in order to fix the iron and excess minerals into a glassy slag, thus facilitating the separation of matte (30%-copper). Matte and slag are drained off -- the slag is disposed of, and the matte goes on to the converter furnace. Sulfur dioxide is vented and sent to the acid plant to create sulfuric acid for use in heap leaching. Illustration by Susan Celestian



FIGURE 13 ACID PLANT This is in Globe-Miami -- I believe that this is the acid plant. There, sulfur trioxide gas captured from the smelter, is processed into sulfuric acid, used in heap leaching of oxide ores.

The Hayden Smelter makes 2500 tons of sulfuric acid a day!

³<http://www.asarco.com/about-us/our-locations/asarco-mineral-discovery-center/making-copper/smelting/>

Sulfide Ores continued on page 18.....

....Sulfide Ores continued from page 17

- ◆ In the **converter**, air is blown in the melt (of matte copper), thereby further removing impurities like iron & sulfur (they combine with oxygen and are vented as gases). It is now called blister copper (98% pure).

On to the anode furnace and the pouring of anodes (pages 18-19).....

- ◆ In the **anode** furnace, air and natural gas are added (99% pure). See Figure 14-17.
 - Anodes are poured into molds, and then cooled (750-850 pounds each)

Because the copper is still not pure enough to be made into wire, pipes, or other product, it is **on to the refinery (page 20).....**

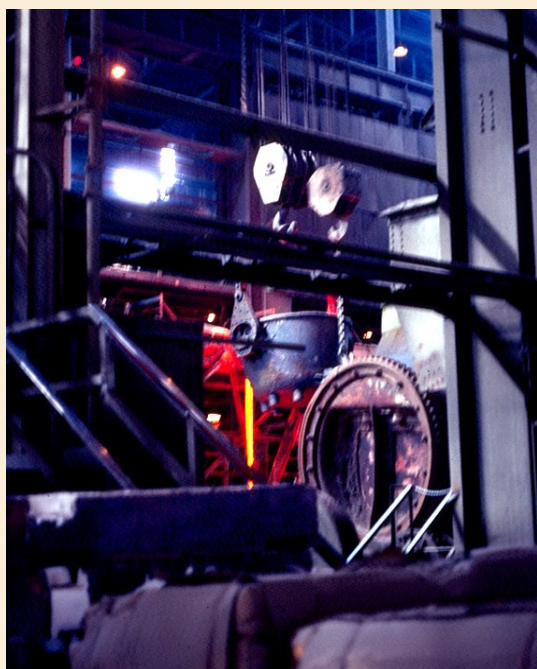


FIGURE 14 TRANSFER OF MOLTEN COPPER FROM CONVERTER FURNACE TO ANODE FURNACE

Look closely, and in the background you can see a big bucket pouring molten copper into the anode furnace in the smelter of the now-closed New Cornelia Mine, in Ajo, Pima Co., Arizona.

Photo by Susan Celestian



FIGURE 15 POURING COPPER ANODES

This is a view of the anode wheel in the smelter at the now-closed New Cornelia Mine, in Ajo, Pima Co., Arizona.

A - Molten copper pouring out of the anode furnace, into an anode mold on the casting wheel.

B - Water is sprayed on the anodes, to speed cooling of the molten copper.

C - After about 15 minutes on the wheel, anodes are picked up and dunked into a tank of water to complete cooling.

Photos by Susan Celestian

....Sulfide Ores continued from page 18

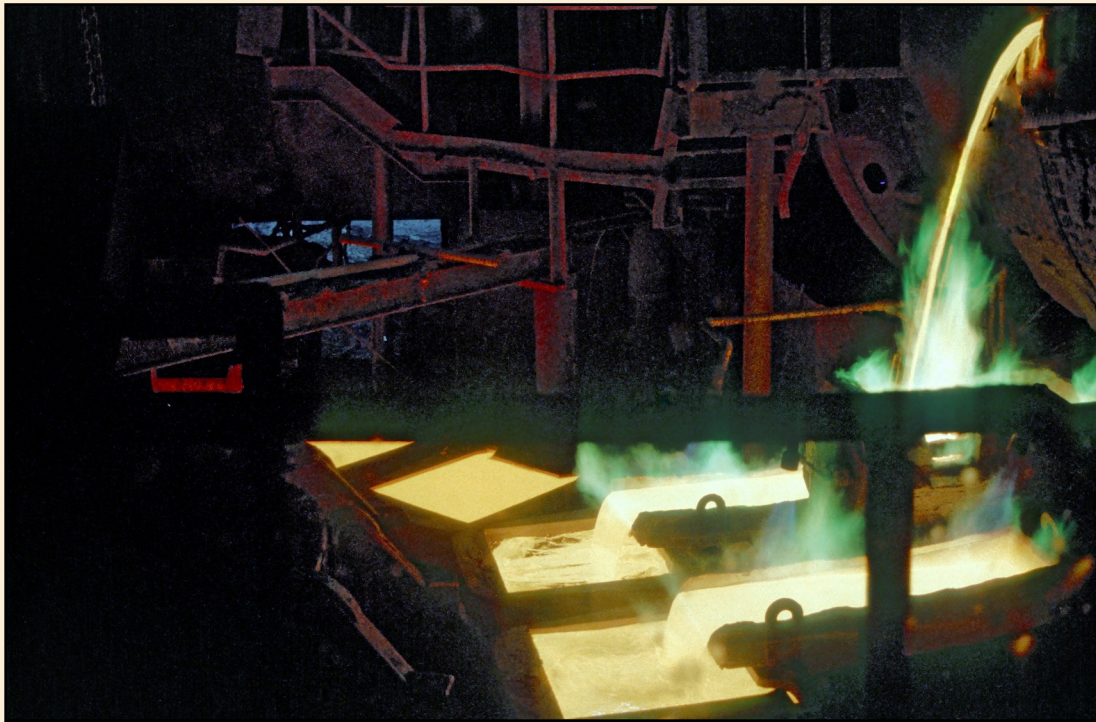


FIGURE 16 POURING ANODES This is the casting wheel at the now-closed San Manuel Mine, in Pinal Co., Arizona. The green flames denote the lack of oxygen, which was largely burned up in the anode furnace. *Photo by Stan Celestian*

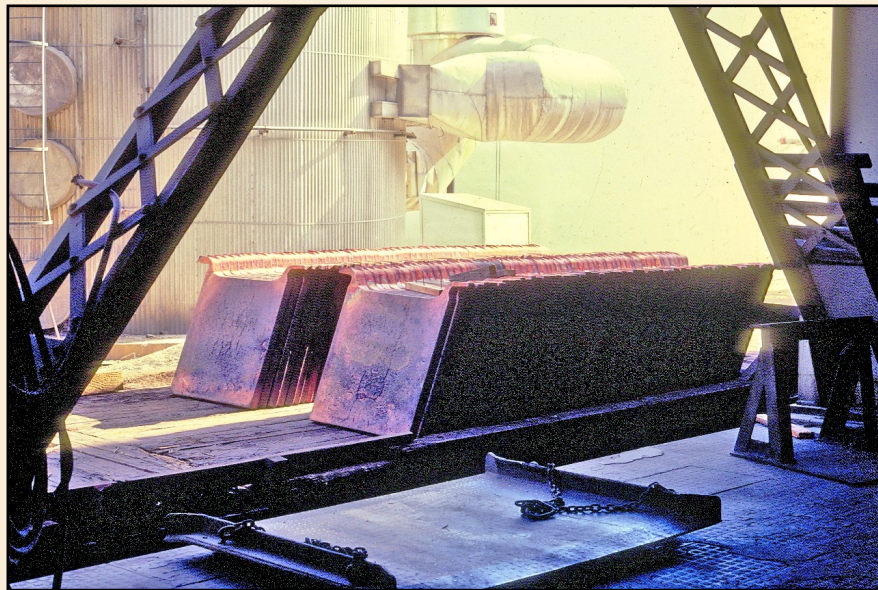


FIGURE 17 STACKS OF ANODES These anodes (at the New Cornelia Mine) are stacked and ready to be transported to a refinery, for further processing. You can sometimes see truckloads of anodes being transported on Arizona's highways. *Photo by Susan Celestian*

Sulfide Ores continued on page 20.....

....Sulfide Ores continued from page 19

- Refinery: Refining copper improves its ductility and conductivity.

In the refinery, anodes are hung between starter sheets (15-pound, thin copper), in a solution of sulfuric acid and copper sulfate, in a process similar to electrowinning, discussed in the processing of oxide ores, September 2019.

An electric current passes through the tank, and copper is dissolved into solution from the anodes. The copper atoms are carried to the starter sheets (cathodes), where they are deposited, as 99.9% copper = electrolysis. Every 14 days, cathodes are about $\frac{3}{4}$ inch thick, weigh about 375 pounds, and can be removed. (Anodes spend 28 days in the refining tanks, after which they are removed, melted, and poured as new anodes.)

The impurities that fall to the bottom of the tank as slimes, can contain such valuable metals as: silver, gold, platinum, palladium, antimony, nickel sulfide, selenium, and tellurium. These are reclaimed via different processes.

On a closing note: Recycling of copper accounts for about 50% of the copper used in industry. According to Papp (2010), 770,000 metric tons of copper were recycled, at an estimated value of almost six billion dollars! So don't throw copper in the trash....



The Pinal County Gem & Mineral Museum has had many of these sets of storage drawers available for \$8 each. The photo shows 2 cabinets, one atop the other. They are about 18 inches wide and 8 or so inches tall. If you are interested, let Sue Celestian know, and she will connect you with the proper person, to check on availability and how to take possession.

Words of Wisdom

from our very own

Bob Evans



When I do squats are my knees supposed to make a sound like crushing aluminum cans?

UPCOMING FIELD TRIPS

WHEN: Saturday, November 16 -- evening

WHERE: Purple Passion Mine

WHAT: Potluck & Fluorescent Minerals

MEET: 3:45 at McDonalds in Wickenburg

LEADER: Bill Freese

OTHER: 4 WD, high clearance mandatory;
FEE - \$20 per 1/2 bucket

WHEN: Sunday, November 24, 2019

WHERE: Sheep's Crossing area

WHAT: Purple agate -- See a great picture of what you might find at <http://agateswithinclusions.com/arizona/>, and scroll down to Sheeps Bridge

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 stancelastian@gmail.com



Colors
of the
purple
passion



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 and 20 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

November's project -- Dreamcatchers



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

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 23.

November 30-Dec 1 - Wickenburg, AZ Wickenburg Gem & Mineral Society; Hassayampa Elementary School, 251 S Tegner St; Sat 9-5, Sun 10-4; Admission: Free. See poster on page 24. They are raffling off a 3-quart THUMBLERS TUMBLER ULTRA VIBE 10 IND.



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 25.

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 26 -- 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:

- ◆ November 5 Patti Polk -- *Agate*
She has written several books, and will have some for sale

Officers, Chairpersons, & Trustees

President: Ed Winbourne.....ewinbourne@gmail.com
Vice President: Stan Celestian.....
stancelastian@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... stancelastian@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.**

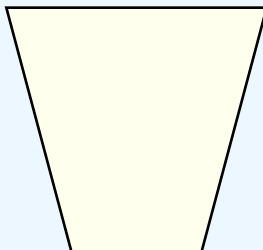
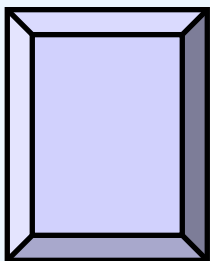
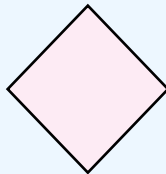
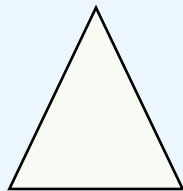
DMRMCLUB@GMAIL.COM

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

HAVE YOU BEEN SAVING UP YOUR PENNIES?? QUARTZSITE & TUCSON ARE COMING SOON!!!!



Tucson 2008



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!

Wickenburg Gem and Mineral Show Nov 30, Dec 1 2019



Free Admission

Jewelry

Fossils

Minerals

Gems



Over 40 Vendors

Best Rock Contest

Raffle

Door Prizes

Kid's Area

Silent Auction

Hassayampa Elementary School

251 South Tegner Street Wickenburg, AZ

9am - 5pm Saturday • 10am - 4pm Sunday

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 Franciscoan volcanic field, Coconino Co., Arizona, USA
Bill Yedowitz - PHOTO: Bill Yedowitz



Natrolite - Horseshoe Dam area, Maricopa Co., Arizona, USA
Bill Yedowitz - PHOTO: Bill Yedowitz

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



FREE ADMISSION FREE PARKING FREE SAMPLES FOR KIDS

Sunset Crater, San Franciscoan volcanic field, Coconino Co., Arizona, USA | PHOTO: Dawn Boushelle

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**

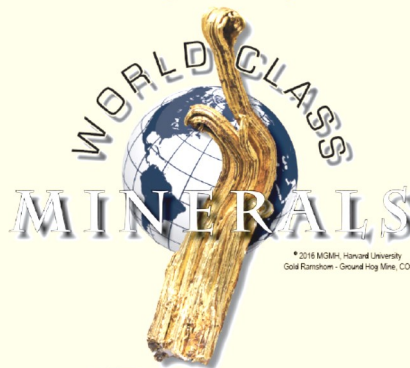


Scan code for information on our Tucson Gem and Mineral Show[®]



TUCSON GEM AND MINERAL SHOW[®]

Tucson Convention Center
February 13 - 16, 2020



\$200 OFF
ONE ADULT GENERAL ADMISSION

www.tgms.org

CHILDREN 14 AND UNDER FREE WITH A PAYING ADULT

This coupon cannot be used with any other discount