



EARTHQUAKE

e-Newsletter about what's movin' and shakin' at the Earth Science Museum

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ESM Outreach Update:

By Mardy Zimmermann, Outreach and Education Coordinator

We have successfully finished our first year of Phase 2 of the ESM Outreach Program, emphasizing organizing our large inventory of rocks, minerals, and fossils and engaging in community activities and designing sets of materials that can be used for community support. ESM members have also been very active in workdays at the MMNREM building to get it ready for opening.

During this year ESM became the recipient of two donations of material one from Bill Yedowitz and another recent one from Dana Slaughter.

The recent one from Dana was so large that as I sorted through the rocks, fossils and minerals, storage became so problematic that I created an "ESM Tailings Pile" at our property in Apache Junction. While we no longer emphasized classroom presentations at schools, we did expand distributing the popular Classroom Kits to teachers directly, including communities outside of the Valley. This project will be emphasized as we move into the second year of Phase 2.

ESM Outreach and Education Program will provide sets of AZ Rocks and Fossils, and AZ Minerals to the Geological Society of America for their GeoTeachers July event in Flagstaff (See page 17). We will increase our efforts to reach teachers at the January A.L. Flagg Show giving them sets of the Classroom Kits, and bags of rocks, fossils, and minerals that can be used in classrooms. This effort

allows us to reach a wider group of earth science educators and to meet their individual needs.

Looking over the list of Phase 2 activities completed this year, a big "thanks" goes to Doug and Shirley, Lynne Wheeler, Lynne and Terry Dyer, and Harvey Jong who were instrumental in helping with our community outreach efforts.



Dana Slaughter donation



"ESM Tailings Pile"

Earth Science Special Interest Topic/Theme Kits

By Harvey Jong

The Earth Science Museum has started transitioning its outreach program from classroom-based instruction to event-based demonstrations and presentations. The development of kits involving special interest topics or themes represents a key element of this change. The kits will maintain the “hands-on/minds-on” characteristic of the earlier classroom program, but subject areas will go beyond the rather basic and dated concepts in the Arizona Science Standards. The intention is to provide students and the general public with the latest information on Earth science and show how it relates to stories in the news or to technologies that are part of everyday life. Science fairs, libraries, mineral shows, and outdoor expos are examples of the types of venues where the kits will be used.

A wide variety of kits are planned, and themes may include:

- Cu in Arizona – The Story of Arizona Copper Minerals
- Crystal Formation, Shapes, and Habits
- Rocks and Minerals of the Earth’s Mantle
- Geomagnetism and the Magnetic Properties of Minerals
- Minerals That Rock! – Major Rock-Forming Minerals
- Igneous is Bliss – What You Should Know About Intrusive and Extrusive Igneous Rocks

Cu in Arizona - the Story of Arizona Copper Minerals is the first kit that is being developed. The kit presents the narrative that Arizona is known as the “Copper State” because of its extensive ore deposits and amazing diversity of copper minerals. The idea for this kit started with a recent

donation from Sue and Stan Celestian (Thanks Sue and Stan!) which included some empty mineral sample boxes. The boxes are constructed with dividers that form 30 two inch by two inch compartments and presented a challenge (like the “Ice Bucket Challenge”) of filling each compartment with a specimen relating to a particular theme.

My garage has been taken over by minerals, and a thorough cleaning and organizing of these “mineral reserves” was long overdue. So, I thought I would take on the 30 specimen challenge while sorting and consolidating all the buckets and boxes of materials that I had accumulated over the years. This extra effort probably slowed down the cleaning process, but it also made the task a bit more fun and interesting. With several shelves and piles of stuff still to go, here’s what I put together and presented at the recent ESM Annual Meeting:



Preliminary Kit of Arizona Copper Minerals

The box includes 27 specimens representing 23 copper species and 15 localities. The samples are organized by different mineral classes (elements, oxides, sulfides, carbonates, halides, sulfates, arsenates, phosphates, silicates). I’m fairly certain that the remaining three compartments can be filled with additional copper minerals

that are lurking somewhere in the lower layers of my garage deposit.

The current set of specimens represents just a starting point for the *Cu in Arizona* kit. The samples are more appropriate for display purposes and for more advanced students, particularly those studying chemistry. Subsets of larger specimens will be assembled to allow students to do some hands-on comparison of different copper minerals. A booklet will be prepared to provide detailed information on the mineralogy of copper.

Finally, a special deck of playing cards will be created to highlight different copper minerals and their chemistry.

(Note: Have you been putting off cleaning out the garage or the backyard tailings pile? Perhaps, it's time to face the minerals/music; do some tidying up; and try the 30 specimen theme challenge. Who knows what you might rediscover? Please let us know if you decide to "clean for a theme" and what you come up with for your box of 30 samples, especially if you have suggestions or donations for future kits.)

List of Minerals in the Preliminary Cu in AZ Kit

First Row (left to right)

Elements

1. Native Copper
Ray mine, Dripping Spring Mts, Pinal County

2. Dendritic Native Copper
Ray mine, Dripping Spring Mts, Pinal County

Oxides

3. Cuprite
Copper Queen mine, Bisbee, Cochise County

4. Cuprite
Ray mine, Dripping Spring Mts, Pinal County

Sulfides

5. Chalcocite
Johnson Camp, Little Dragoon Mts, Cochise County

6. Chalcopyrite
Johnson Camp, Little Dragoon Mts, Cochise County

Second Row (left to right)

Sulfides

7. Bornite
Lavender Pit, Bisbee, Cochise County

8. Covellite
(79 mine, Hayden, Gila County)?

Carbonates

9. Azurite
Morenci, Greenlee County

10. Azurite/Malachite Nodules
Blueball mine, Globe, Gila County

11. Malachite
Bisbee, Cochise County

12. Malachite
Johnson Camp, Little Dragoon Mts, Cochise County

Third Row (left to right)

Carbonates

13. Aurichalcite
79 mine, Hayden, Gila County

14. Rosasite
79 mine, Hayden, Gila County

15. Caledonite/Diaboleite
Rowley mine, Theba, Maricopa County

Halides

16. Eriochoalcite
Arsarco Sacaton mine, Casa Grande, Pinal County

Sulfates

- 17. Cyanotrichite
Grand View mine, Grand Canyon,
Coconino County
- 18. Chalcoalumite
Grand View mine, Grand Canyon,
Coconino County

Fourth Row (left to right)

Sulfates

- 19. Brochantite
Bisbee, Cochise County
- 20. Linarite
Grand Reef mine, Klondyke, Graham
County
- 21. Ramsbeckite
79 mine, Hayden, Gila County

Arsenates

- 22. Conichalcite
Bagdad, Yavapai County

Phosphates

- 23. Turquoise
Sleeping Beauty mine, Miami, Gila County
- 24. Turquoise and Pyrite
Morenci, Greenlee County

Fifth Row (left to right)

Silicates

- 25. Chrysocolla
Ray mine, Dripping Spring Mts, Pinal
County
- 26. Ajoite
New Cornelia mine, Ajo, Pima County
- 27. Shattuckite
New Cornelia mine, Ajo, Pima County

COPPER IN ARIZONA

A Q P V F U Q E K D R E U Q R C E B C C
M U F M Z P T W I G T B N S S T V D H H
Q G R S I I Q A N I G V W Z I Q N N A A
T F P I R K B K K P J G N M X C R X L L
R A E A C O H C O M J A U S K U O Y C C
O E N I L H E E T I L L E V O C I S O O
Y I P E F B A R O S A S I T E P G M C P
L C I P S P O L Z O Z I M E T G L A I Y
K T S M O E T I C L A H C O I R E L T R
E J A D G C P L S I E T I O J A N L E I
E R K P Q B A X V Y T J R Y T U C O Z T
Y T N C P H R Y F I G E Z E L D Z C C E
C N I P C Y A N O T R I C H I T E O B S
J A R T S H A T T U C K I T E P N S O I
B B L M N T E F H A R A D U J I A Y R O
A C J E W A M T L K K R J M C E R R N U
S Z O S D D H Q I E X L Y H R L E H I Q
A R U X S O Y C W H U Z A R C B E C T R
X U L R F M N E O B C L J U Q G M E E U
Z E D G I A M I F R C A P L O W J G H T
H N R R J T S Z T I B R L F V P A P K Q
Q Q Y G J Y E R T E I N N A C V O D C K
D Q A J H N W E V T I E P T M I F U S J
V Z Y K R U U J E P X D I X P J A Y G H
R R I S Y Q K S F E U S E Y X J L N H C

AJOITE
AZURITE
BROCHANTITE
CHALCOALUMITE
CHALCOPYRITE
CONICALCITE
COVELLITE
CYANOTRICHITE
ERIOCHALCITE
MALACHITE
ROSASITE
TURQUOISE

AURICALCITE
BORNITE
CALEDONITE
CHALCOCITE
CHRYSOCOLLA
COPPER
CUPRITE
DIABOLEITE
LINARITE
RAMSBECKITE
SHATTUCKITE

An enlarged version of this word search is located on page 18 if you would like to print it out.
ENJOY!



AZ Mining, Mineral & Natural Resources Educational Museum Update May 2018

<http://tinyurl.com/SupportMM-NREMuseum>

By Charlie Connell, Shirley Coté and Catie Carter
Photos by Charlie Connell and Catie Carter

On April 26th, Catie Carter, Curator and six mill men met with Jeff Warren and Herbert Wagner of the UA's Risk Management team to review safety procedures and operations of the outdoor equipment including the stamp mill, primary crusher, mucker, etc. Jeff and Herbert suggested special hearing and eye protection for the equipment operators. They also pointed out areas needing improvement around the museum yard for the safety of future visitors, staff and volunteers.

On April 30th, Catie Carter and 23 volunteers gathered to address some of the issues brought up at the April 26th UA Risk Management visit along with other planned activities.

First, a safety meeting was held and the planned activities were reviewed. The volunteers picked the work areas at which they wished to assist.



Volunteers during the safety meeting



Left to Right
Check Messersmith,
Jeff Warren, Herbert
Wagner, Bill
Yedowitz, Charlie
Connell, Jerry
Ohlund, Roger
Camplin, Rick
Herrem.



Roger Camplin congratulates Stuart Harrah (right) who was recognized and given his Millman Certificate.



Charlie going over the Volunteer Safety Briefing format.



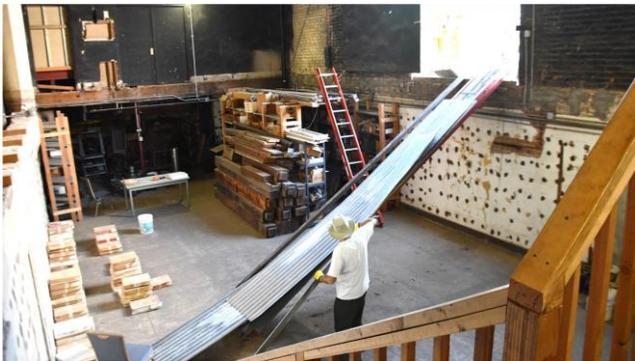
Rick dropping the stamps on the stamp mill



This is how the west side of the museum looked before the start of cleanup.

Museum West Side Cleanup Roger C. and about (10) workers proceeded to clean up the outside areas in the west yard.

Galvanized sheet Materials The group opened the large door leading to the Museum Pit and installed the large ladder to allow them to safely slide the 18" X 14' sheeting of galvanized siding into the pit.



They neatly stored the sheets out of the way under the large door access to the pit.

Removal of Steel and Rails Stuart H. brought his trailer and the group loaded all of the steel that was piled against the building into the trailer and took it to the Bone Yard.



Buckets of Minerals & Other Steel The group loaded all of the buckets of rocks & minerals that were on the slab behind the hoist house into Stuart's trailer. They also loaded a very large piece of steel that had been placed in front of the hoist house many years ago into the trailer. These materials were also taken to the Bone Yard and put with the rocks & minerals already there.



Incline Skip Troubleshoot Chuck M. and four other individuals worked on the problem with the skip being out of alignment in the final stages of dumping the skip into the ore bin on top of the stamp mill operator's deck.



Troubleshoot Activity They worked on it for most of the morning and resolved the alignment issues. They made some adjustments that temporarily resolved the problem.

Permanent Fix The installation of some all-thread across the skip dump rails will stiffen the track and permanently resolve the misalignment issue.

Bone yard Work Bill Y. lead a hearty group of (6) workers to the Bone Yard to complete activities. They were supported by the group bringing iron and minerals to the Bone Yard.

Rock Holder Chain Link The group wired each of (6) rock holders with chain link fencing that will be used to store the amethyst that is presently in steel drums. They got the task completed and we have (8) more rock holders that need chain link fence installed in the holders. We will need to purchase another (3) rolls of chain link to complete the task.



Filling Rock Holders The team worked on removing the amethyst from the drums and placing it into the holders. There is a lot of waste material generated since the amethyst is packed in saw dust and this material needs to be disposed of.



Steel Drum Disposal The crew cut up about (6) steel drums. This will make them more compact and we can take them to the scrap metal recycler when they are all emptied. We have (24) more barrels of amethyst that needs to be placed into the rock holders.

Bone Yard Cleanup The group worked on raking the yard and removing a lot of bottles, cans, paper goods, and trash that was generated by the transients that are living along the fence. This is an ongoing issue with the generation of trash in that area.

Fence Railing Re-installation Charlie C. & Rick H. worked on this project. We did not intend to reinstall the fence today, but to determine how we will reinstall the fence and to take measurements on the length of 1" chain link fence needed to upgrade the fence to the UA Risk Managements recommendations.

Attachment Fix We will install the fence using 1 5/8" pipe that has been split down one side to allow the pipe to be compressed and keep the tension on the fence posts. We determined the pieces to be 3" long and insert them 2" into the pipe in the ground. We will then tack-weld those pipes to the base pipe. The fence posts will then be inserted over the 1" exposed insert. This will allow the fence posts to be removed in the future if needed.

Chain Link & Chain Connectors We measured the length of chain and came up with a need for 160' of chain to span half way between the top railing and the ground. The chain will be connected to the mid-point on the 36 posts with 2 1/2" eyebolts. We will need to purchase uncoated chain so that it can be painted black. We will need to purchase flat black paint to coat the 160' of chain. There is enough chain to span the space on the east side of the hoist house to keep visitors from going around the south side of the hoist house.

Meanwhile inside the museum, (5) volunteers set up tables and chairs for lunch, vacuumed and inventoried artifacts in the pit.



Loretta Meador vacuuming in the old copper gallery



Steel rails and other material were removed to the Bone Yard. Only a section of railroad ties and rail was left as it was too heavy to move by hand.

West Side Museum Cleanup Results



All the buckets of rocks were transferred to the Bone Yard.



The pile of galvanized sheet metal is now located in the pit.

Lunch We stopped work at about 12:30 and everyone retired to the museum to have some lunch after a hard morning's work. Lunch of sandwiches, fruit, chips, drinks and dessert was graciously provided by the University of Arizona.



Lunch offerings



Volunteers and guests gathered for lunch.

April 30th Volunteers and Guests: Chris Bright, Cynthia Buckner, George Busby, Roger Camplin, Charlie Connell, Shirley Cote, Ev Dixon, Judy Dixon, Doug Duffy, Ford Duran, Lynne Dyer, Terry Dyer, Judith Evans, Ray Grant, Cynthia Grant, Stuart Harrah, Patrick Hawley, Rick Herrem, Joanne Hesterman, Loretta Meador, Chuck Messersmith, Jerry Ohlund, Tom Osborn, David Tibbets, John Tibbets, Bill Yedowitz, Denny Zeutenhorst, and Dick Zimmermann.

FLAGG DISTINGUISHED SERVICE AWARD

Before the luncheon began, Flagg Mineral Foundation's Board members Bill Yedowitz and Dr. Ray Grant presented Charlie Connell the A. L. Flagg Distinguished Service Award. This award is presented to a member who exemplifies the ideals of Arthur L. Flagg who was never selfish with his time or knowledge. Charlie has spent many thousands of hours restoring mining equipment, especially stamp mills, at the MM&NRE museum (formerly the AZ Mining and Mineral museum), the Cave Creek museum, and Superstition Mountain museum and at many other locations around the southwest. Charlie is currently recreating a scaled down working model of the historic Golden Reef Mine Tramway at the Cave Creek museum. (See article on next page)



Charlie Connell receives the A. L. Flagg Distinguished Service Award from Bill Yedowitz and Dr. Ray Grant

If you wish to help at the next museum workday, please contact Charlie Connell at minercon@aol.com or Catie Carter at cscarter@email.arizona.edu.

Support the Museum

Senator Gail Griffin led the way in establishing an account for the museum at the University of Arizona Foundation which can be accessed at the following link:

<http://tinyurl.com/SupportMM-NREMuseum>



MMNRE MUSEUM ADVISORY COMMITTEE

By Catie Carter

On Thursday, May 17th we held the first official MMNRE Museum Advisory Committee meeting at the museum building. Around half the board has been officially appointed by the Governor and the other half is pending approval, but we were given the green light to begin meetings. The attendees who are appointed Advisory Committee members included Senator Gail Griffin, Representative Vince Leach, Brooks Jeffery, UA Research VP and head of the museum project, Steve Trussell, Director of the Arizona Mining Association and Arizona Rock Products, Mike Conway of AZGS filling in for State Geologist Phil Pearthree, and Debbie Johnson, Director of the Arizona Office of Tourism. In addition to the committee members, other attendees included Sabrina Vasquez and Darbi Jenkins of UA State Relations, Bob Smith, UA VP for Planning, Design and Operations, and I (Catie, to brief the members on the museum's history, the collection, and our volunteer activities).

During the almost two-hour meeting, we discussed the history and closing of the Mining and Mineral Museum, the Senate Bill directive to open a natural resource museum and establish an advisory council, the responsibilities of the council, the role of our volunteers and supporting groups, and priorities for discussion and planning going forward. The Advisory Council members determined that they would meet monthly to make regular progress. They also praised the volunteers for their countless hours of work over the last several months and encouraged us to plan a fall stamp mill event for the public.

Overall it was a successful meeting and we are lucky to have the council's support and enthusiasm. We'll keep you updated as they move forward and more members are appointed.



CAVE CREEK MUSEUM

GOLDEN REEF MINE TRAMWAY

By Charlie Connell and Shirley Coté
Photos by Charlie Connell

In early 2009, Charlie Connell noticed the Golden Reef Mine Tramway off in the distance while he was on a project to remove the Golden Reef 10-Stamp Mill with the intent to reconstruct the mill at the Cave Creek Museum. Seeing the tramway intrigued Charlie and he asked the mill donor what she knew about it. Charlie was told that the tramway is on BLM land and that there are only seven of the original thirteen tram towers remaining and these are in very poor condition as they were built in 1910.

On a later date, Charlie visited the tramway site and took pictures and measurements of the tram towers with the prospect of constructing new towers, to specifications, for a two tower working tramway exhibit at the Cave Creek Museum.



4,000 pounds of lumber was purchased to build the tram towers with fabrication of

two towers offsite and then transported to the museum grounds.



Tramway Towers Installation With the towers ready and stored on the grounds and the footings ready for the towers, the next activity was to install the towers on their bases. This was done by our local electric utility, Arizona Public Service.



APS uses a crane to lift the heavy towers for placement on their bases.



Both towers installed and bolted in place on the (10) footings.

Next step, string the cables between the towers along with a tram bucket.

For more information go to Charlie's blog at: <http://stampmillman.blogspot.com/>



Arizona Rocks 60

Text and photos by Ray Grant

The Arizona-Sonora Desert Museum has some other great geology exhibits along with Arizona's state dinosaur. In the early 1970s the Museum formed their Earth Sciences Department. They decided to use caves as the centerpiece for the geology exhibits. They built an amazing artificial cave that as you go through it, you would believe you are in a real cave. In the rooms in the cave are exhibits about caves, about fossils, about minerals and about the geological history of the region. Over the years the Desert Museum has accumulated a very extensive mineral collection, one of the best in Arizona. Only a small part of their collection is on exhibit. There is also a fossil dig, a mine dump where you can collect a mineral, and often docents with hands on displays such as mineral identification are waiting to talk to you. You can spend a day just learning geology but then there are all the plants and animals not to be missed.



Exhibit of fossil mammals found in Arizona



Some of the minerals on exhibit



Part of the artificial cave



Pocket of gypsum crystals moved from a mine in Mexico



Docent with hands on mineral identification display

AZ Rock & Gem Shows



Coconino Lapidary Club 6th Annual Gem, Mineral & Jewelry Show

June 1-3, 2018

Fri. & Sat. 9-5; Sun. 9-4

Free Admission

Silver Saddle Outdoor Market
Hwy 89 N. & Silver Saddle Rd.
Flagstaff, AZ



White Mountain Gem & Mineral Club Annual Show

July 7-8, 2018

Sat. 9-6, Sun. 10-4

Admission \$2

Hon-Dah Casino & Resort
777 Hwy. 260
Pinetop, AZ



Prescott Gem & Mineral Club 15th Annual Prescott Gem & Mineral Show and Sale

August 3-5, 2018

Fri., Sat. 9-5, Sun. 9-4

Adults \$5, Seniors/Students \$4

Children under 12 free w/paid adult

Prescott Valley Event Center

1301 Main St.

Prescott Valley, AZ



Mingus Gem & Mineral Club Annual Show

September 7-9, 2018

Fri. 10-5, Sat. 9-5, Sun. 9-4

Admission \$3 adults, seniors and
students

Children free

Clemenceau Museum

1 North Willard Street

Cottonwood, AZ



West Valley Rock & Mineral Club Annual Show

October 12-14, 2018

Fri., Sat. 9-5, Sun. 9-2

Admission \$3, Children Free

Buckeye Arena

802 N. 1st St., Miller Road

Buckeye, AZ

<http://www.westvalleyrockandmineralclub.com/>



Huachuca Mineral and Gem Club Annual Show

October 13-14, 2018

Sat. 9-5, Sun. 10-4

Free Admission

Cochise College

901 N Colombo Ave.

Sierra Vista, AZ



Sedona Gem and Mineral Club Annual Show

October 20-21, 2018

Sat. 20-5, Sun. 10-4

Admission: Adults \$3

Children Free

Sedona Red Rock High School

995 Upper Red Rock Loop Rd.

Sedona, AZ

Rock & Gem Clubs



Apache Junction Rock & Gem Club

Meetings are on the 2nd Thursday
 Next Meeting: September 13, 2018, 6:30 pm
www.ajrockclub.com
 @ Club Lapidary Shop
 2151 W. Superstition Blvd., Apache Jct.



Daisy Mountain Rock & Mineral Club

Meetings are on the 1st Tuesday
 Next Meeting: June 5, 2018, 6:30 p.m.
www.dmrmc.com
 @ Anthem Civic Building
 3701 W. Anthem Way, Anthem



Maricopa Lapidary Society, Inc

Meetings are on the 1st Monday
 (unless a Holiday then 2nd Monday)
 Next Meeting: June 4, 2018, 7:00 pm
www.maricopalapidarysociety.com
 @ North Mountain Visitor Center
 12950 N. 7th St., Phoenix



Mineralogical Society of Arizona

Meetings are on the 2nd Thursday
 Next Meeting: June 14, 2018, 7:00 pm
www.msaz.org
 @ Franciscan Renewal Center,
 5802 E. Lincoln Dr., Scottsdale

Next Meeting



Pinal Gem & Mineral Society

Meetings are on the 3rd Wednesday
 Next Meeting: September 19, 2018, 7:00 pm
www.pinalgemandmineralsociety.org
 @ Artisan Village
 351 N. Arizona Blvd., Coolidge



West Valley Rock & Mineral Club

Meetings are on the 2nd Tuesday
 Next Meeting: June 12, 2018, 6:30 pm
www.westvalleyrockandmineralclub.com
 @ American Legion Post #53
 402 E. Narramore Ave., Buckeye



White Mountain Gem & Mineral Club

Meetings are on the 1st Sunday
 (unless a Holiday then 2nd Sunday)
 Next Meeting: June 3, 2018, 1:00 pm
www.whitemountain-azrockclub.org
 @ VFW Hall
 381 N. Central, Show Low



Wickenburg Gem & Mineral Society

Meetings are on the 2nd Friday
 (February & December on the 1st Friday)
 Next Meeting: September 14, 2018, 7:00 pm
www.wickenburggms.org
 @ Coffinger Park Banquet Room
 175 E. Swilling St., Wickenburg



Pinal Geology & Mineral Museum

Pinal Museum and Club News

Next Pinal Gem and Mineral Club meeting
Wednesday, September 19, 2018
www.pinalgemandmineralsociety.org

The Museum will be closed for the summer and reopen in September, but tours are possible by calling (520)723-3009 (Coolidge Chamber of Commerce) to schedule a time.

Coolidge Public Library

Arizona Gems & Minerals

With the Pinal Gem & Mineral Society



Photo courtesy Pinal Gem & Mineral Society

Come learn about the gems, minerals, and rocks in Pinal County & Arizona during this interactive presentation.

Geared towards ages 12+.

**Friday
June 8
12:00 p.m.**



Photo courtesy Pinal Gem & Mineral Society



Coolidge Public Library
160 W Central Ave
(520) 723-6030
www.coolidgeaz.com/library





Mike Conway
Sr. Research Scientist, Arizona
Geological Survey at the Univ.
of Arizona
(fmconway@email.arizona.edu)

Dave Briggs - Arizona Economic Geologist & Mining Historian

Dave Briggs is well-known to the men and women who comprise the Arizona mining community. Dave was born and raised in Richmond, Virginia, where he received a B.S. and M.S. from Virginia Tech. After a short stint with the U.S. government (Federal Power Commission), Dave relocated to Tucson in 1977, where he has remained ever since.

For the past 40 years, Dave has been involved in mapping and studying copper and copper production from porphyry copper mines in Arizona. He served, and continues to serve, the geosciences community as President, Past President, Secretary and Vice-Secretary of the Arizona Geological Society. Dave manages the day-to-day and year-to-year task of keeping the Society's website up-to-date and on-track.

He has a deep interest in mining communities and the history of mining in Arizona. Since retiring, Dave has researched and published a suite of important papers on the mining history of some of Arizona's most celebrated mines and mining districts. These articles are available for free download at the Arizona Geological Survey's Online Document Repository (<http://repository.azgs.az.gov/>)

- [History of the Verde Mining District, Jerome, Arizona](#)
- [History of the Ajo Mining District, Pima County, Arizona](#)
- [History of the Copper Mountain \(Morenci\) Mining District AZ](#)
- [History of Helvetia-Rosemont Mining District, Pima County, Arizona](#)
- [History of the San Manuel-Kalamazoo Mine, Pinal County, Arizona](#)
- [History of the Silver Bell Mining District, Pima County, Arizona](#)
- [History of the Warren \(Bisbee\) Mining District.](#)
- [Recovery of Copper by Solution Mining Techniques](#)
- [Superior, Arizona - An old mining camp with many lives](#)



Figure 3. Two miners standing in front of a 20-stamp mill at Pinal City (circa 1880s) (2011-030-4253, ADMMR Photo Archive, Arizona Geological Survey).

ATTENTION TEACHERS



GeoTeachers 1st Annual Arizona Field Workshop for K-12 Earth Science Teachers

July 23 – July 27, 2018

Flagstaff, Arizona

Registration begins March 1, 2018

REGISTRATION ENDS JUNE 18TH

CEU's & Graduate Credit

As a professional development program GeoTeachers also provides support for educators seeking to translate their learning into effective lessons/activities for use in their educational environment via short courses, breakout sessions and key note presentations. Participants receive 43 Continuing Education Units. In addition, those participants seeking graduate credit can register for a 3-credit graduate course through the University of Northern Colorado for \$300.

Workshop Schedule

<i>Time</i>	<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>
<i>AM</i>		<i>Field Trip</i>	<i>Field Trip</i>	<i>Field Trip</i>	<i>Curriculum Work</i>
<i>Noon</i>	<i>Workshop Opens</i>	<i>Field Lunch</i>	<i>Field Lunch</i>	<i>Field Lunch</i>	<i>Workshop Closes</i>
<i>PM</i>	<i>Short Courses</i>	<i>Field Lunch</i>	<i>Field Trip</i>	<i>Field Trip</i>	
<i>Evening</i>	<i>Keynote</i>				

Short course segments allow participants to choose from multiple topics relevant to their interest presented in 90-minute blocks. Field trips will focus on natural and industrial sites within 2 hours of Flagstaff. Details will be posted on the GeoTeachers website as they become available.

Questions?

Check out www.geosociety.org/geoteachers or
Contact Dean Moosavi , Education Programs Coordinator at
(303-357-1015) or smoosavi@geosociety.org

What is GeoTeachers

GeoTeachers is the Geological Society of America's (GSA) program supporting professional development for K-12 teachers of Earth Science. GSA recognizes that not all educators work in traditional classrooms and the society encourages informal educators, home school parents, university faculty serving teacher preparation programs and pre-service teachers to participate alongside classroom teachers.

With K-12 curricula and standards set at the local and state level GeoTeachers field workshops are designed with the local/state focus in mind. GeoTeachers field workshops provide participants with quality field trips focused on natural outcrops and sites demonstrating the key geologic processes needed to understand the geology of the host region. Field trip itineraries also include visits to industrial sites involved in resource extraction, processing and site mitigation, as these often provide great insight into subsurface geology while demonstrating where society acquires critical materials needed to build and sustain modern society.

Participants will have an opportunity to interact with professional geoscientists from industry, academia, and government agencies working in their diverse profession at field trip sites and as workshop presenters, mentors and trip leaders. GeoTeachers workshops are staffed by members of GSA who have chosen to volunteer their time to help teachers understand the field they love and help to improve general geoscience literacy of teachers and the next generation.

Host Site

GeoTeachers Arizona 2018 will be hosted at Northern Arizona University in Flagstaff. Meals will be provided in dining halls and by bag lunch with lodging for the workshop in university dormitories.

Registration

Registration for GeoTeachers workshops includes lodging (4 nights at double occupancy), meals, field trip transportation, and resources provided during the workshop. Transportation to and from Flagstaff is NOT provided in the workshop fee. Optional graduate credits are available for an extra fee.

Early registration is available at the reduced rate of \$500 for GSA members until May 1, 2018. The full workshop cost of \$700 for GSA members will be charged to registrants after April 1 until the maximum workshop capacity of 45 is reached. Non-members can register at higher rates. GSA membership for K-12 teachers is \$40/year.

Pre-registration is available at
<https://goo.gl/forms/8qOw4UHx0X7kRoD32>

Registration and further details will be available March 1 at: www.geosociety.org/geoteachers

REGISTRATION ENDS JUNE 18TH

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ESM's Meeting Notice

ESM's next meeting will be at the Century Branch library, 1450 E. Highland, Phoenix, on Sunday, TBA 2018, at 1:30 p.m.

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Mission
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 We envision a community where students and the general public have curiosity about, passion for, and understanding of the underlying principles of earth sciences.

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