



# EARTHQUAKE

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

Earth Science Museum, 3215 W. Bethany Home Rd., Phoenix, AZ 85017  
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November 2021  
Volume 10, Issue 11

## ESM OUTREACH UPDATE

Mardy Zimmermann, Outreach Coordinator

Requests for outreach have been slow to non-existent again this month and are not expected to change until after the first of the year.

# Help Wanted

By Harvey Jong and Shirley Coté

The ESM is planning to participate at the 49<sup>th</sup> Annual Flagg Gem and Mineral Show at Mesa Community College. The show will be held on January 7-9, 2022, so we are looking for some interested people to help staff our exhibit and sales tables.

The theme for the 2022 show is fluorescent minerals. Are you fascinated with fluorescent minerals? Do you own a UV light and would be interested in helping show visitors discover the hidden beauty of minerals that fluoresce?



If you have attended the show before, you may be familiar with our popular fluorescent mineral display that uses an enclosed black tent. To reduce the potential public and volunteer exposure to



the Covid-19 virus, we are, however, planning a new more open-air arrangement.

Instead of using a large, fully enclosed black tent to create a dark environment where visitors enter and gather around a display case, we are planning to fully enclose just the specimens with this photo lightbox.

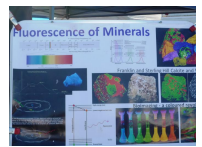
This enclosure has a small Velcro flap opening for viewing the glowing minerals. While the



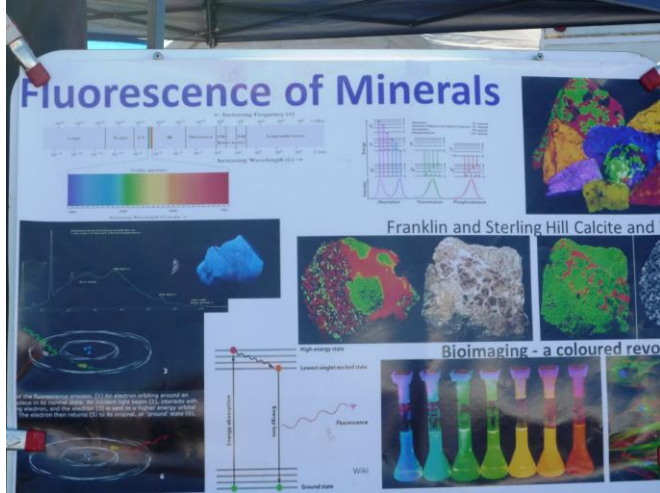
number of minerals on display will be reduced, we are planning to add a longwave UV light to the regular shortwave source. To reduce some of the ambient sunlight, the lightbox will be placed on a table under the black canopy with only one or two side panels.

Our black tent also hosted another crowd-pleasing activity where visitors checked whether their recent mineral prizes or purchases “glow”. This fluorescent checking will be moved to a separate area and will be carried out using a special viewing cabinet equipped with a UV light with three different wavelengths.

We are seeking volunteers to help with the fluorescent display area. This may involve explaining what visitors are seeing with either the display



samples or their specimens and answering questions.



Show volunteers are also needed to assist with the ESM's sales tables. Do you like talking with people about rocks, minerals and jewelry? There will be jewelry, rocks, fossils and flats of mineral specimens for sale.

Plans are to use 2-4 glass-topped enclosed metal cases (34 x 22 x 3 1/4 ") to display sales items. This will minimize the amount of causal contact.

Plenty of hand sanitizer and cleaning supplies will be on hand.

There are certainly lots of things to do during the three-day show. If you are planning to attend, can you please consider spending some time helping with ESM activities? Any help you can provide will be greatly appreciated. Also, the opportunity to meet and help other show visitors can be rewarding!

If you are interested in volunteering some time towards either selling minerals and jewelry or helping visitors discover the beauty of fluorescent minerals, please send a brief note on the day/time/activity that you can help to:

[harvey.jong@earthsciencemuseum.org](mailto:harvey.jong@earthsciencemuseum.org).

Thank you!

## Egg Carton Program on Hold

The ESM's Egg Carton Program has been a very popular long-standing activity at the Flag Show. It provides children the opportunity to build their own personal collections of rocks, minerals, or fossils. For just one dollar, kids can select 12 different labeled specimens. The program, however, involves lots of close contact and a high degree of touch among participants as children and their parents or relatives work together in choosing samples and finding the corresponding labels. Unfortunately, this presents a myriad of opportunities to spread the COVID-19 virus both during and after the show. Since no effective ways of mitigating the risk could be identified, a decision was made to hold off on this activity for the 2022 show. Continuing the program at future shows will be re-evaluated as pandemic conditions improve.



ESM Outreach at the yearly Flag Gem & Mineral Show; Egg Carton Program and Sales Tables (below)  
Photos by S. Coté



## A Fluorescent Mineral Christmas

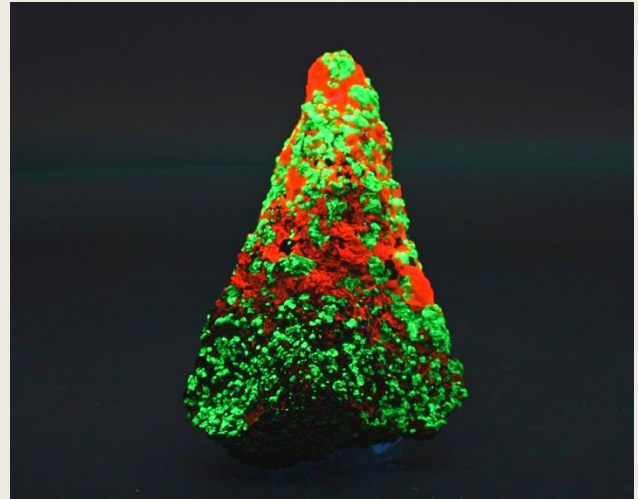
By Harvey Jong

Christmas is coming which means the halls, walls, or other display spaces will soon be decked out with festive red and green decorations. The traditional red and green color scheme has been traced back to Celtic celebrations of the winter solstice. The ancient Celts laid holly plants around their homes which they believed would bring good luck and protect against evil during winter. Among Christians, the colors have symbolic meaning where red represents Jesus' blood and green signifies his everlasting life. The association of red and green with Christmas, however, was popularized by Coca-Cola ads that ran from 1931-1965. These promotions featured Santa in his red suit drinking a Coke and delivering presents under a green fir tree.

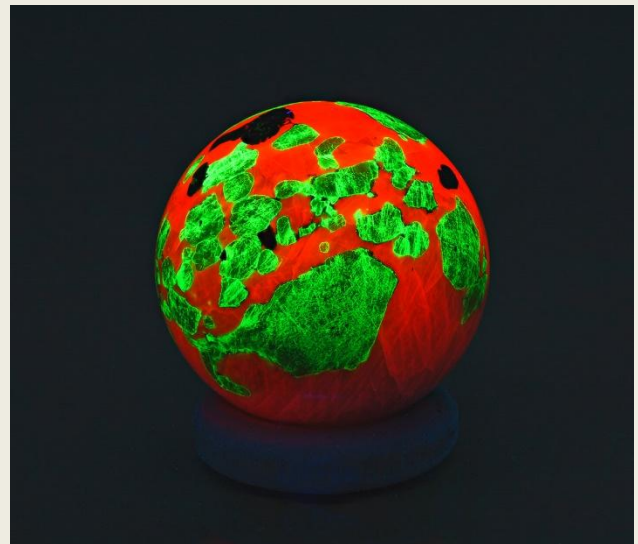
To celebrate the holiday color scheme in a bright mineralogical way, we will take a look at some combinations of fluorescent minerals. The one of the best known pairings involves calcite and willemite.

### *Calcite and Willemite*

Calcite and willemite are usually found in zinc ore deposits, such as the famous mines in Franklin and Ogdensburg, New Jersey. These minerals are fluorescent only if some of their constituent atoms are replaced by trace amounts of impurities (about 1-2%). For willemite, a zinc silicate, substitution of zinc with manganese is needed, while calcite, a calcium carbonate, requires replacement of calcium with lead along with manganese. When illuminated by a shortwave ultraviolet (UV) light, the calcite glows an orange-red color, while willemite appears yellow green.

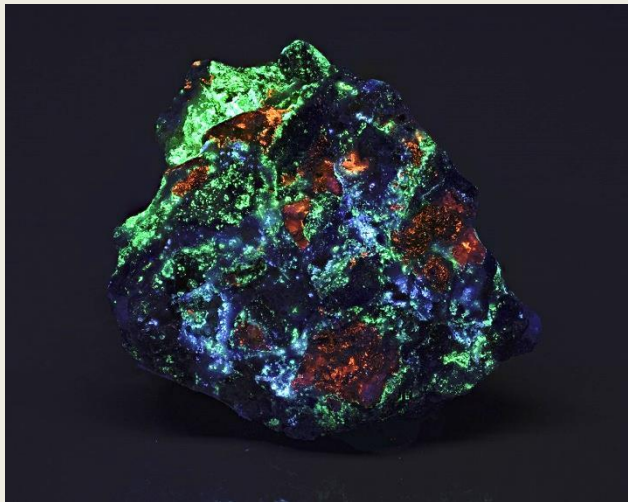


Harvey Jong photo and specimen  
*Calcite and Willemite "Santa Hat"*  
Sterling Hill, Ogdensburg, New Jersey  
Dimensions: 9.0 x 6.5 x 3.0 cm  
Under shortwave UV



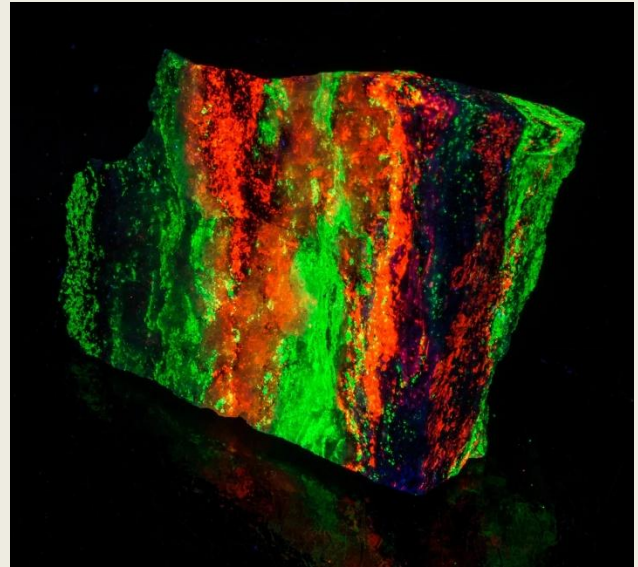
Harvey Jong photo and specimen  
*Calcite and Willemite Mini Sphere "Ornament"*  
Sterling Hill, Ogdensburg, New Jersey  
Dimensions: 2.9 cm diameter  
Under shortwave UV

Fluorescent calcite and willemite are also found in many locations in Arizona. The most notable locality is the Paul Hinshaw property around Casa Grande. Several tons of this material were quarried and shipped to Los Angeles and Hollywood for fluorescent fireplaces (Wilson and Roseveare, 1949).



Harvey Jong photo and specimen  
*Calcite and Willemite*  
Casa Grande, Arizona  
Dimensions: 5.0 x 5.0 x 2.5 cm  
Under shortwave UV

The Garpenberg Mine in southern Sweden is an active underground zinc-lead-silver-copper mine that has produced some very bright fluorescent calcite and willemite specimens. The mine is situated in replacement-type sulfide deposits hosted in complex folded and faulted limestone skarns. The extensive alteration is reflected in samples with distinct bands of calcite and willemite. No collecting is permitted due to the automated mining operations, so specimens are limited and highly prized.

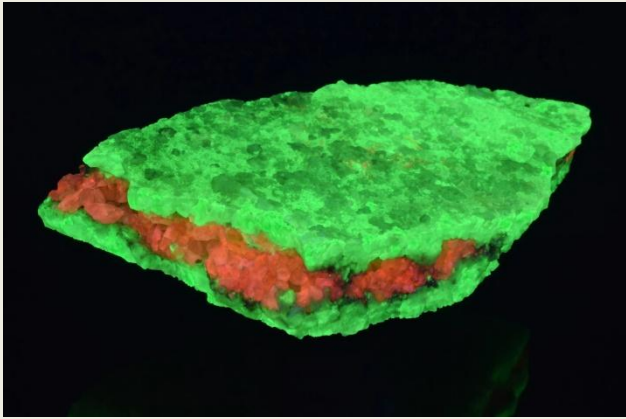


Mark Cole photo and specimen - CC-BY-SA-3.0, via <https://www.naturesrainbows.com/>  
*Willemite, Calcite, and Fluorite*  
Garpenberg Mine, Sweden  
Dimensions: 5.0 x 5.0 x 3.8 cm  
Under shortwave UV

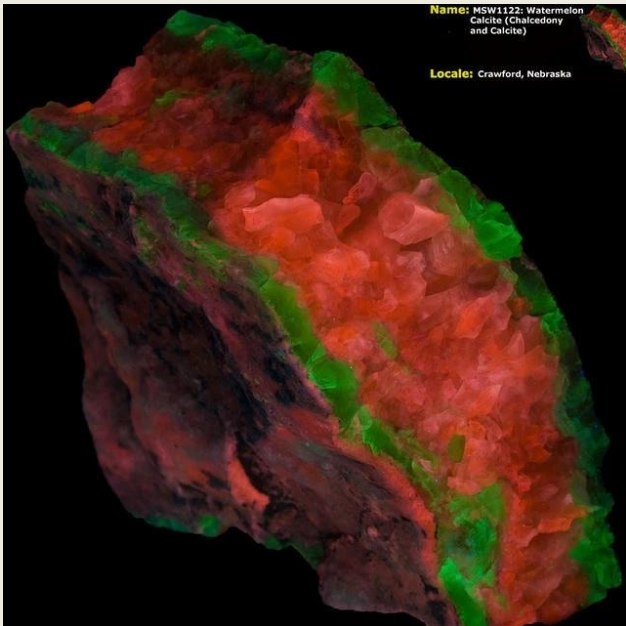
### *Calcite and Chalcedony*

Calcite and chalcedony may occur as a fluorescent red and green combination. As mentioned earlier, manganese and lead impurities are responsible for calcite's orange-red fluorescence. The bright green response of the chalcedony, however, involves trace amounts of the uranium ion group, uranyl (UO<sub>2</sub>). Uranyl is a fairly soluble and stable impurity that may appear in a number of different host minerals.

Examples of fluorescent calcite and chalcedony have been found in Midwestern states, such as South Dakota and Nebraska. The calcite is usually enclosed by the chalcedony which led to nicknames, such as "watermelon rock" and "watermelon calcite".



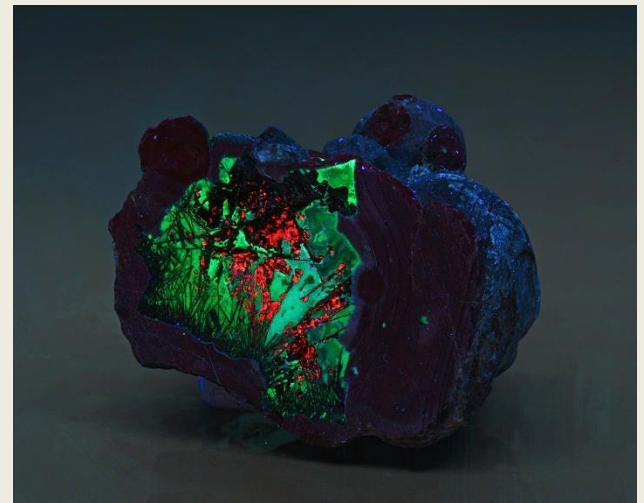
Chris Clemens photo and specimen - CC-BY-SA-3.0, via <https://www.naturesrainbows.com/>  
**Calcite and Chalcedony "Watermelon Rock"**  
 Buffalo Gap National Grasslands, Weta, South Dakota  
 Dimensions: 12.0 x 6.6 x 1.8 cm  
 Under shortwave UV



Mark Cole photo and specimen - CC-BY-SA-3.0, via <https://www.naturesrainbows.com/>  
**Calcite and Chalcedony "Watermelon Calcite"**  
 Crawford, Nebraska  
 Dimensions: not available  
 Under shortwave UV

Another interesting example of a fluorescent calcite and chalcedony association may be found in thundereggs. Thundereggs are roughly spherical nodules that formed within rhyolite ash layers. They may contain various forms of chalcedony, such as agate, jasper or opal, along with quartz or calcite crystals. The chalcedony may exhibit intricate patterns, shapes, or colors and in some instances may be fluorescent.

A tremendous number and variety of thundereggs have been collected from the Little Florida Mountains near Deming, New Mexico. Some well-known sites include the Blue Sky bed, Rockhound State Park, and Sugar Bowl Mine. "Lava Cap" thundereggs are a relatively recent area find and have interiors consisting of blue agate and calcite needles embedded in a manganese oxide. The blue agate fluoresces a bright green; while the calcite crystals are orange red.

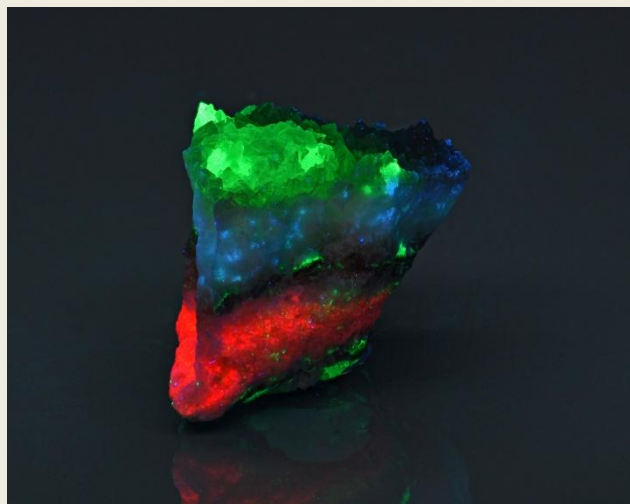


Harvey Jong photo and specimen  
**Calcite and Chalcedony "Lava Cap" Thunderegg**  
 Lava Cap Thunderegg claim, Deming, Little Florida Mountains, New Mexico  
 Dimensions: 5.4 x 3.8 x 4.4 cm  
 Under shortwave UV

### *Calcite and Adamite*

Calcite and adamite represent a somewhat rare fluorescent pairing. While the two minerals often occur together, fluorescent specimens usually involve only one species. For example, the Ojuela Mine near Mapimi, Durango, Mexico is considered to be *the* classic source of exceptional adamites, but the fluorescence of most specimens is limited to just the bright green response of the adamite. Adamite's fluorescence is attributed to uranyl impurities.

Calcite and adamite have also been found at the El Potosi Mine in the Santa Eulalia Mining district, Chihuahua, Mexico. Some fluorescent samples of this combination consist of lustrous adamite crystals atop a layer of calcite.



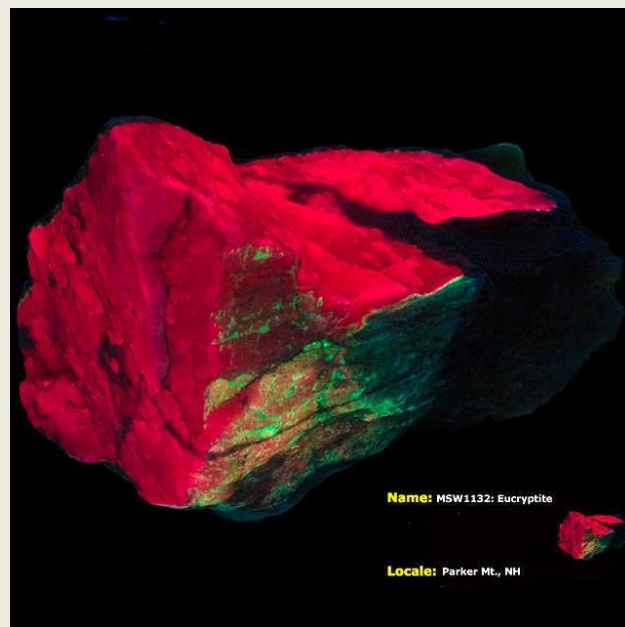
Harvey Jong photo and specimen  
*Calcite and Adamite*  
 El Potosi Mine, Santa Eulalia, Chihuahua, Mexico  
 Dimensions: 3.0 x 2.1 x 2.1 cm  
 Under shortwave UV

### *Eucryptite and Hyalite*

Eucryptite is known for its distinctive crimson color under shortwave UV, and the Midnight Owl Mine in Yavapai County,

Arizona is recognized as the one of the best localities for this lithium aluminum silicate. The replacement of aluminum ions with iron impurities is responsible for the bright response. Note that iron in the ferrous state ( $\text{Fe}^{2+}$ ) inhibits the fluorescence of most minerals, but ferric iron ( $\text{Fe}^{3+}$ ) produces the light emission of eucryptite and feldspar minerals.

According to mindat.org, eucryptite has been found at 36 localities worldwide, including the Parker Mountain Mine in New Hampshire. The Parker Mountain Mine is a former mica and feldspar mine which operated from 1880-1959. Specimens collected from the mine's granite pegmatite include eucryptite with hyalite coatings which fluoresces bright green due to uranyl impurities.



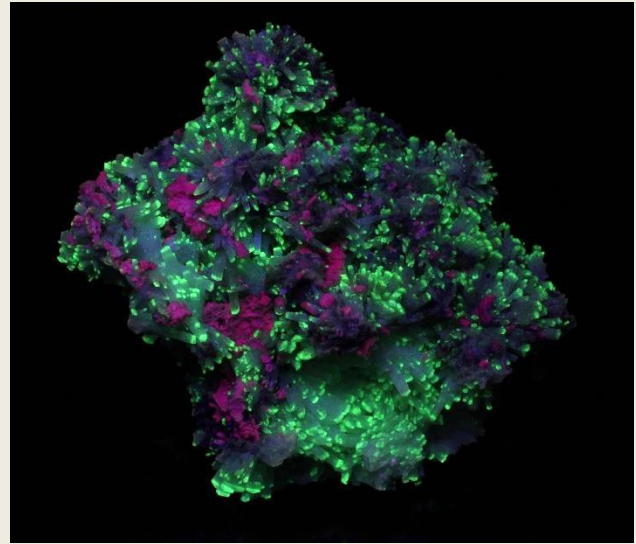
Mark Cole photo and specimen - CC-BY-SA-3.0, via <https://www.naturesrainbows.com/>  
*Eucryptite and Hyalite*  
 Parker Mountain, New Hampshire  
 Dimensions: not available  
 Under shortwave UV

### ***Natrolite and Microcline***

Natrolite is a common member of the zeolite silicate group, while microcline belongs to the potassium feldspar group and is commonly found in igneous rocks. Less common is the fluorescent combination of these two minerals. Some natrolite occurrences, however, may include uranyl impurities which lead to the typical bright green shortwave fluorescence. Similar to eucryptite, ferric iron ions may replace some aluminum atoms in microcline resulting in a dull red response.

A well-known locality where the fluorescent species are found together is the Poudrette quarry, Mont Saint-Hilaire, Quebec, Canada. The Poudrette quarry started as a small quarry that produced materials for asphalt and concrete. Later, a discovery was made that an igneous intrusion had created a large variety of mineral forming environments. Over 430 mineral species have been identified, and many of these minerals are considered among the best occurrences in the world.

Natrolite specimens from the quarry may include clusters of translucent, bladed crystals where only the tips are fluorescent. These clusters are associated with irregular-shaped microcline crystals which produces an interesting contrast of fluorescent patterns. The overall appearance somewhat suggests a holly plant with microcline “berries” and natrolite “leaves”.



Frédéric Messier Leroux photo and specimen - CC-BY-SA-3.0, via <https://www.naturesrainbows.com/>  
***Natrolite and Microcline***  
 Mont Saint-Hilaire, Quebec, Canada  
 Dimensions: 12.8 x 9.4 x 8 cm  
 Under shortwave UV

### ***Wickenburgite and Willemite***

Wickenburgite is a rare calcium lead aluminosilicate that was first discovered in 1968 at the Potter-Cramer Mine. The mine is located about 25 miles southwest of Wickenburg, and the mineral was named after the town. Wickenburgite may be found as small, lustrous colorless to pink crystals or as white fine-grained masses. Its shortwave UV fluorescent response may vary from bubble-gum pink to deep crimson red. The main impurity which causes this fluorescence has not been identified.

The wickenburgite from the Potter-Cramer Mine is often associated with fluorescent willemite. The willemite may have a more yellowish hue than the previous examples since it involves a mixture of yellow-fluorescing willemite along with the yellow-green variety.



Harvey Jong photo and specimen  
*Wickenburgite and Willemite*  
Potter-Cramer Mine, Wickenburg, Arizona  
Dimensions: 3.4 x 5.0 x 2.3 cm  
Under shortwave UV

### ***Tugtupite***

Our last fluorescent red and green mineral combinations involve tugtupite which has been called the “King of Fluorescent Minerals” for its incredibly intense red shortwave fluorescence. This rare beryllium aluminum silicate chloride was first found in 1957 at Tugtup agtakôrfia, Greenland. Tugtupite is also known as Tuktu, a name derived from the Inuit word, tuttu, for reindeer and means “reindeer blood”.

Tugtupite is very scarce at its original location; however, more deposits were later discovered in the Illimaussaq intrusive complex in southwest Greenland. The new tugtupite finds included red, blue, and purple varieties, and the red variety started being used as a gemstone in 1965. Faceted tugtupite is highly valued due to its extreme rarity, attractive raspberry-red color, and unique luminescent properties.



Photo courtesy of William Rohtert  
*Part of the Smithsonian's National Museum of Natural History Tugtupite Gemstone Suite*  
Largest faceted gemstone: 3 ct

In addition to its bright cherry red fluorescence under shortwave UV, tugtupite appears as a salmon orange color with longwave UV, is phosphorescent, and exhibits tenebrescence. Phosphorescence refers to the property in which a substance continues to glow (up to several seconds) after a UV light source is removed. Tenebrescence, also known as reversible photochromism, involves intensifying a substance's color with exposure to certain wavelengths of light, such as ultraviolet. The original color is, however, restored when illuminated by a bright light source that doesn't contain these wavelengths or when a sample is kept in the dark for a long period of time.



Original Color



Color after 30 minute  
shortwave UV exposure



Harvey Jong photos, ESM specimen, donated by William Rohtert

***Tenebrescence of Tugtupite***

Kvanefjeld, Greenland

Dimensions: 4.2 x 3.5 x 0.5 cm

Under white light

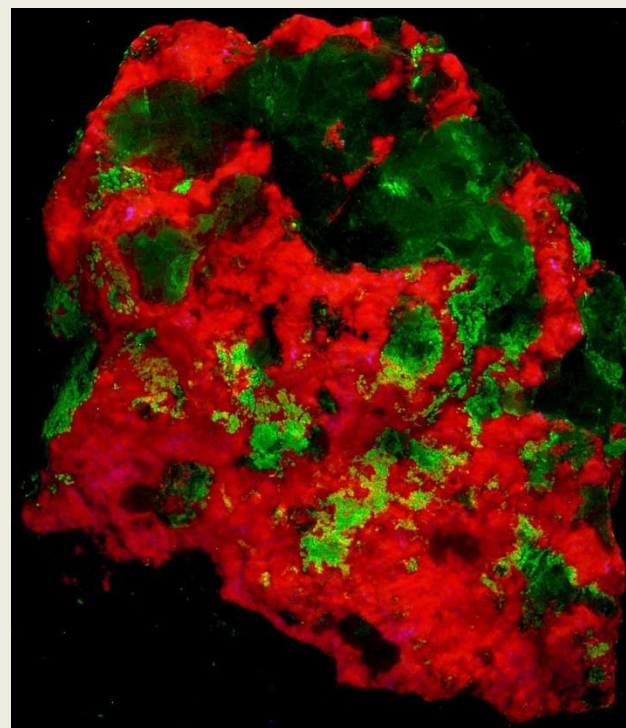
Different impurities have been identified for tugtupite's optical behavior. The tenebrescence appears to be related to the substitution of chlorine ions with sulfur. The sulfur atoms introduce extra electrons which absorb energy from the UV light and become trapped in crystal lattice defects. These electrons are involved with selective light absorption, and the color of the tugtupite subsequently becomes darker. As the energy difference decreases, the electrons move from the lattice defects, and the tugtupite returns to its original color.

The bright fluorescence may involve emissions from several different impurities. Ferric iron replacing aluminum or silicon ions produces a red glow with a peak output at 670nm. Manganese substituting sodium or beryllium atoms can lead to a blue-green response (around 495-512 nm). Finally, a violet color (around 430nm) may result from the presence of europium. (Gaft, Reisfeld, and Panczer, 2015)

***Tugtupite and Analcime***

Fluorescent tugtupite and analcime have been found at the Taseq Slope which is a mountainous area spanning the 8 km width of the Illimaussaq intrusive complex. The tugtupite occurs as coarse grained veins in massive analcime.

Analcime is a member of the zeolite group and may with an unidentified impurity exhibit a pale blue fluorescence under shortwave UV. A bright green response can also result from the presence of uranyl impurities.



Mark Cole photo and specimen - CC-BY-SA-3.0, via <https://www.naturesrainbows.com/>

***Tugtupite on Analcime***

Taseq Slope, Illimaussaq Complex, Greenland

Dimensions: not available

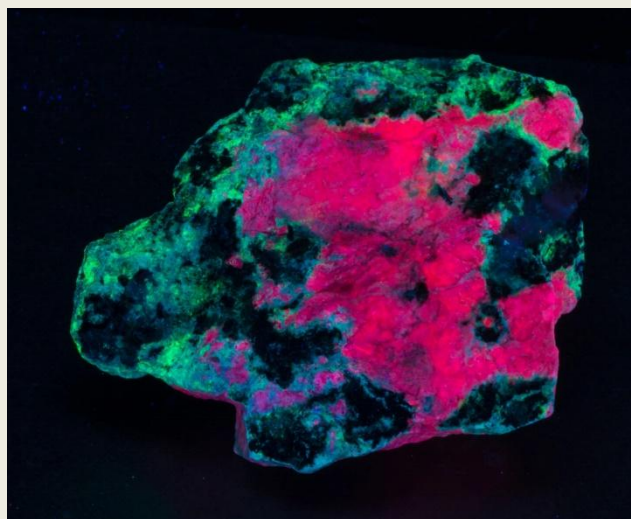
Under shortwave UV

**Tugtupite and Chkalovite**

Tugtupite specimens from the Kvanefjeld plateau often involve a replacement of the rare sodium beryllium silicate, chkalovite. The chkalovite may contain uranyl impurities that produce a vivid green shortwave response.

The Kvanefjeld plateau is located in the northwestern part of the Illimaussaq complex. It hosts the second-largest rare-

earth deposit in the world and the sixth largest uranium deposit (Parsons, 2012). The area is also the main source of gem quality tugtupite (Jensen and Petersen, 1982).



Mark Cole photo and specimen - CC-BY-SA-3.0, via <https://www.naturesrainbows.com/>  
**Tugtupite, Chkalovite, and Beryllite**  
 Mount Kvanefjeld, Illimaussaq Complex, Greenland  
 Dimensions: not available  
 Under shortwave UV

## Summary

Hope you have enjoyed this quick look at fluorescent minerals that glow Christmas colors. May it brighten your Christmas or whatever holiday you may be celebrating this season!

## References:

Gaft, M., R. Reisfeld, and G. Panczer (2015) *Modern Luminescence Spectroscopy of Minerals and Materials* 2nd ed. Heidelberg: Springer: 606 p.

Jensen, A. and O. V. Petersen (1982) Tugtupite: a gemstone from Greenland, *Gems and Gemology*, Summer 1982, Vol. 18, No. 2: 90-94.

Parsons, I. (2012) Full stop for mother Earth, *Elements*, Vol. 8, No. 5: 396-398.

Wilson, E.D. and G. H. Roseveare (1949) Arizona nonmetallics: a summary of past production and present operations (3<sup>rd</sup> ed.). *Arizona Bureau of Mines Bulletin* 155: 60 p.

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49<sup>TH</sup> ANNUAL  
**FLAGG GEM and MINERAL SHOW**

**FLUORESCENT MINERALS**  
 JANUARY 7<sup>TH</sup>/8<sup>TH</sup>/9<sup>TH</sup>, 2022  
 MESA COMMUNITY COLLEGE | 9am - 5pm  
 NE CORNER OF US 60 & DOBSON ROAD  
 THE TAILGATE SHOW TRADITION CONTINUES!  
**WWW.FLAGGSHOW.INFO**

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Continuing with the Fluorescent Mineral theme, the Tucson Gem & Mineral Show® presents *The Show That Glows 2022*.

The Tucson Gem and Mineral Society Proudly Presents:

**THE 67<sup>TH</sup> ANNUAL**  
**Tucson Gem & Mineral Show®**  
 February 10 - 13  
**The Show That Glows 2022**  
 featuring  
**THE APATITE SUPERGROUP**  
 and the Fluorescent Mineral Pavilion  
 with over 80 Spectacular Displays by  
**The Fluorescent Mineral Society**

**TUCSON GEM & MINERAL SOCIETY**  
 TUCSON CONVENTION CENTER  
 For more information, visit: [www.tgms.org](http://www.tgms.org)

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## Arizona Rocks 102

Text by Ray Grant

The Arizona Geological Survey is a source of information that I have used for the 47 years that I have lived in Arizona. There are some great things on their website ([azgs.arizona.edu](http://azgs.arizona.edu)). I have referenced it many times in this column, but this time I wanted to point out some special things that might be of interest to you.

One of them is the Down-to-Earth series (DTE). There are 21 publications in this series. If you traveling in Arizona and are interested in seeing geology, check the series to see if there is one about the area you will be visiting. For example, DTE 20 is a Guide to the Geology of Sedona and Oak Creek Canyon. It describes 24 features in the area with maps, directions, and photographs. If you are buying a home in Arizona, then check DTE 13, A Home Buyers Guide to Geologic Hazards in Arizona to find out what problems you might encounter.

Another is Ask a Geologist. Go to the home page and click on Ask a Geologist and you will find the procedure for asking questions. You can even add a photograph if you have a specimen to be identified. Warning, I get emails with photographs of specimens and most times it is hard to identify them from a photograph, except for the most common rocks or minerals. I usually have to ask them to bring the sample for me to see. There is also a list of some of the questions with answers that I enjoyed reading. We are really fortunate to have such an outstanding state geological survey.

### Sinkhole

#### FEATURE 12

**Location:** From the junction of Highways 89A and 179, follow Highway 179 for 1.4 miles (2.25 km) south to Morgan Road. Turn left or east and drive 0.6 miles (0.97 km) to the end of the pavement. Walk the Broken Arrow Trail for about 0.6 miles (0.97 km). The sink hole, locally called the Devil's Dining Room, is fenced and is located just to the left of the trail.



Figure 12.1 The Devil's Dining Room sinkhole.

The deep, circular depression in Figure 12.1 is a sinkhole. It is about 20 ft. (6 m.) wide and approximately 90 ft. (27 m.) to the bottom of the depression. The sinkhole is probably developed in the Redwall Limestone, which underlies the Supai Group surface rock.

After the deposition of the Supai Group, downward-moving groundwater dissolved a cave in the Redwall Limestone. When the cave grew beyond the supportive power of the limestone its roof collapsed, forming a sinkhole that is filled with sandstone and siltstone debris from the Supai Group (Figure 12.2).

Sinkholes are common features in landscapes produced by the dissolving action of groundwater on limestone, dolostone, or marble. Where sinkholes extend below the water table they hold small lakes or bogs. In northern Arizona, sinkholes in the Redwall Limestone filled with rock debris from the Supai Group and other formations are of economic interest because they contain copper and uranium deposited by mineral-rich groundwater.

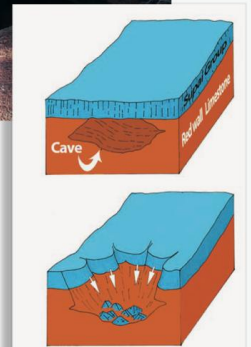


Figure 12.2 Block diagrams illustrating the formation of the Devil's Dining Room sinkhole.

## Ask a Geologist

Questions about the minerals, rocks, landscape features, or natural hazards of Arizona? Ask us!



Ask a Geologist



## AZ Mining, Mineral & Natural Resources Education Museum Update November 2021

<https://ammnre.arizona.edu/>

Catie Carter Sandoval

cscarter@email.arizona.edu

703.577.6449

Help support the museum at:

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

To prepare for the upcoming public event on December 4<sup>th</sup>, we conducted a work activity on November 10 for both inside and outside the Arizona Mining, Mineral & Natural Resources Education Museum (AMMNREM).

Our work activity started at 09:00 with a short safety meeting conducted to discuss any possible safety issues and address them. We had the following (9) volunteers present: George Busby, Roger Camplin, Charlie Connell, Stuart Harrah, Rick Herrem, Bill Lytle, Mike Pollak, Don Richardson, and Bill Yedowitz. Catie oversaw the work activity.



The following is a summary of the work completed:

### Inside Museum

Copper Gallery & Gift Shop Area - Catie cleaned the general area to make it presentable.

Hallway & Gift Shop area - Mike vacuumed hallway and gift shop area

Display Case Work - Bill Y and Roger cut the dowel rods for the display cases.

Food Rock Display Case - Bill Y unlocked the heavy floor case for the Food Rock display, making the need for a locksmith not necessary.

### Outside Museum

Primary Jaw Crusher - We have had issues with the jaw crusher drive pulley over the years. The problem is that the crusher shaft does not have a key way and we ended up drilling a hole in the pulley and then drilled and threaded a hole in the shaft. The pulley was a little oversized and was never very tight and had a tendency to wobble. The pulley was also damaged and we will need a new pulley.

After we completed our days activities at about noon Catie, Bill Y, Rick and I drove over to R&C Supply at 7<sup>th</sup> street just south of the river crossing. We had worked with R&C for several years and they have been quite helpful with labor and materials being donated. Catie got to meet the folks at R&C so they could put a face with our leader's name at the museum.

We talked with Luis and he took us to the bone yard out back and found two pulleys that would fit on the crusher shaft. They problem is that our shaft does not have a key way. Luis said they have a portable machine that could put a key way in our shaft, in place, at the museum. They are also donating labor to do the key way. This will resolve a long standing issue with our crusher and will cost us nothing!

Stamp Mill Related Work - We completed checking and tightening bolts, grease and lubricated the components on the mill, installed new stiffer spring in out feeder, and conducted a general walk down. We will run the mill and the rest of the outside equipment before the next official run of the outside equipment.



George and Rick inspecting the jackshaft and other equipment that requires lubrication

Incline Repair Work - Some the cross member on the incline have deteriorated after (14) years and needed to be replaced. We have spent two work activities replacing the deteriorated timbers and have completed the task and now the incline is in top shape.



Everyone chipping in to clean up the debris from the incline cross members being replaced

Millman Training - We always try to incorporate training any time we are at the museum and this was no different. We took a new member of the Monday crew around and explained the outside equipment setup.

Hoist House - Catie and Michael swept the inside of the hoist house that needs to be conducted frequently since it collects dirt and bird feathers all the time.



Catie and Michael sweeping the hoist house removing dust and bird feathers that have accumulated over the summer.

Display work activities - Bill Y put a fresh coat of paint on a petrified wood stand, we cut some wood dowels to be used to hold cases open when installing and removing minerals.



Bill Y putting a fresh coat of paint on the petrified wood Holder

Museum Vacuuming - Catie and Michael vacuumed the areas where we are going to have visitors on December 4<sup>th</sup>.

As already mentioned we worked until about noon and then a few of us drove over to R&C Supply to look at pulleys. We left there at about 1PM.



## Pinal Museum and Society News

351 N. Arizona Blvd., Coolidge, AZ

**Pinal Geology and Mineral Society meeting**

**December 15, 2021**

[www.pinalgeologymuseum.org](http://www.pinalgeologymuseum.org)

Ray Grant [raycyn@cox.net](mailto:raycyn@cox.net).

The Museum will be open on Saturdays,  
in December from 10 a.m. to 2 p.m.

The Museum is reopening on a limited basis for right now and hopes to expand the open days in the future please check our website to see which days we are open.

Masks are required for all visitors and volunteers over five years old. We have taken this step to protect our volunteers so they can safely open the Museum for you. Please provide your own masks. We will have some on hand at the Museum, but cannot guarantee to provide them. If wearing a mask is a problem, please plan your visit for later.

Laurie Manifold has painted a new beautiful and exciting mural by the entrance to the Museum. It is of Pteranodons to go with the one flying overhead. Pteranodons are flying reptiles in the pterosaur family. They lived in North America during the Cretaceous Period about 85 million years ago, and could have wing spans over 18 feet.





## Parent/Teacher Resource Page 1

[HTTPS://WWW.EARTHSCIWEEK.ORG/NEWSLETTER](https://www.earthsciweek.org/newsletter)

### EARTH SCIENCE WEEK UPDATE

November 2021

#### WATER WEBINAR SERIES AVAILABLE ONLINE NOW

If you missed the Earth Science Week 2021 "Water Today and for the Future" Webinar Series last month, you still can catch all the informative, intriguing presentations. Recordings of the entire series, aimed at the general public and education community, are available online now:

- "[Groundwater Exploration in Response to Humanitarian Crises](#)," Dr. Paul Bauman, Technical Director of the Near Surface Geophysics Group, BGC Engineering Inc.
- "[Water Supply Issues in the Delaware River System: A Tale of Tunnels, Transfers, Tumult, and Trout](#)," Dr. David Wunsch, Director and State Geologist of the Delaware Geological Survey and President of the American Geosciences Institute.
- "[Perspectives on a Crucial Resource: The Importance and Vulnerability of Our Water Supplies](#)," Dr. David Kreamer, University of Nevada, Las Vegas and President of the International Association of Hydrogeologists.
- "[Earth Science and the International Year of Caves and Karst](#)," Dr. George Veni, Executive Director of National Cave and Karst Research Institute.

Find the "Water Today and for the Future" Webinar Series, as well as last year's "Earth Materials Frontiers" Webinar Series, [online](#) now.

#### EXPLORE 'BIG IDEAS' IN VIDEOS, CLASSROOM ACTIVITIES

Earth Science Week now offers award-winning videos and related classroom activities to help students, educators, and others explore the "big ideas" of Earth science all year long. Recently added are dozens of additional activities selected specifically to help educators teach about core concepts of Earth science.

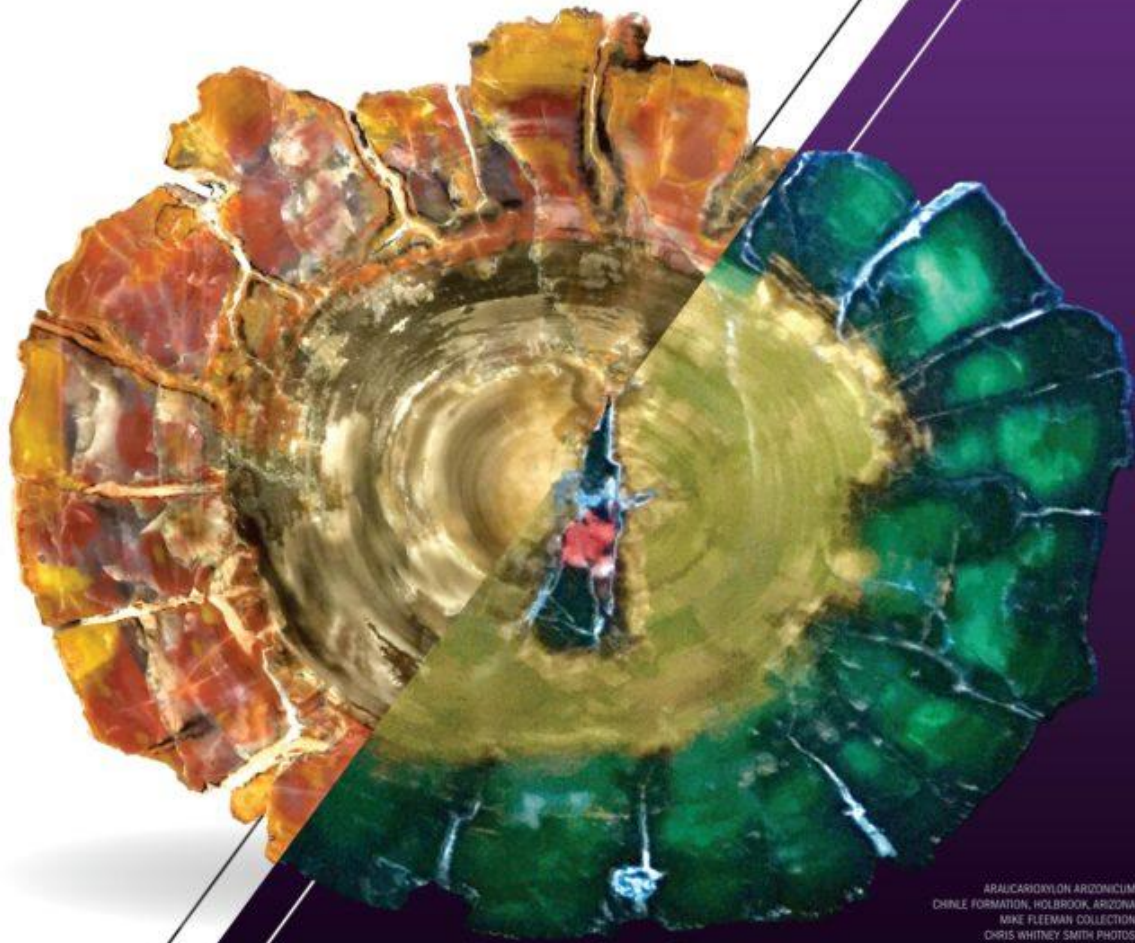
For example, you won't want to miss the video and accompanying activities for Big Idea 5 — *Earth is the water planet* — as you celebrate the Earth Science Week 2021 theme of "Water Today and for the Future."

Big Ideas videos are brief video clips that bring to life the big ideas of Earth science — the nine core concepts that everyone should know. The Earth Science Literacy Initiative, funded by the National Science Foundation, has codified these underlying understandings of Earth science which form the basis of the Big Ideas videos.

View the Big Ideas videos on [YouTube](#). The Earth Science Week website provides related resources. Educators can find more than 100 related classroom activities [online](#) to help students build understanding of the "big ideas."

49<sup>TH</sup> ANNUAL

# FLAGG GEM and MINERAL SHOW



ARAUCARIDOLYON ARZONICUM  
CHINLE FORMATION, HOLBROOK, ARIZONA  
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## FLUORESCENT MINERALS


**JANUARY 7<sup>TH</sup>/8<sup>TH</sup>/9<sup>TH</sup>, 2022**  
MESA COMMUNITY COLLEGE | 9am - 5pm  
NE CORNER OF US 60 & DOBSON ROAD

THE TAILGATE SHOW TRADITION CONTINUES!  
**WWW.FLAGGSHOW.INFO**





DESERT GARDENS ROCK GEM & MINERAL SHOW



# DESERT GARDENS ANNUAL INTERNATIONAL ROCK, GEM AND MINERAL SHOW

January 1 – February 28  
9:00 am – 5:00 pm  
(Seven Days Weekly)

1055 Kuehn Street  
Quartzsite, AZ 85346

**ALL ARIZONA CLUB MEETINGS MAY BE CANCELED  
DUE TO HEALTH CONCERNS!**



### Apache Junction Rock & Gem Club

Meetings are on the 2<sup>nd</sup> Thursday  
Next Meeting: December 9, 2021, 6:30 pm  
[www.ajrockclub.com](http://www.ajrockclub.com)  
@ Club Lapidary Shop  
2151 W. Superstition Blvd., Apache Jct.



### Daisy Mountain Rock & Mineral Club

Meetings are on the 1<sup>st</sup> Tuesday  
(unless a Holiday then 2<sup>nd</sup> Tuesday)  
Next Meeting: December 7, 2021, 6:30 p.m.  
**Please go to their website for more info**  
[www.dmrmc.com](http://www.dmrmc.com)  
@ Anthem Civic Building  
3701 W. Anthem Way, Anthem, AZ



### Maricopa Lapidary Society, Inc

Meetings are on the 1<sup>st</sup> Monday  
(unless a Holiday then 2<sup>nd</sup> Monday)  
Next Meeting: December 6, 2021, 7:00 pm  
[www.maricopalapidarysociety.com](http://www.maricopalapidarysociety.com)  
@ North Mountain Visitor Center  
12950 N. 7<sup>th</sup> St., Phoenix



### Mineralogical Society of Arizona

Meetings are on the 3<sup>rd</sup> Thursday  
Saturday, December 11, 2021, 1 pm  
**Holiday Jamboree**  
[www.msaaaz.org](http://www.msaaaz.org)  
Undisclosed location  
Scottsdale



### Pinal Geology & Mineral Society

Meetings are on the 3<sup>rd</sup> Wednesday  
Next Meeting: December 15, 2021, 7:00 pm  
**On YouTube until further notice**  
[www.pinalgeologymuseum.org](http://www.pinalgeologymuseum.org)  
@ Artisan Village  
351 N. Arizona Blvd., Coolidge



### West Valley Rock & Mineral Club

Meetings are on the 2<sup>nd</sup> Tuesday  
Next Meeting: December 14, 2021, 6:30 pm  
[www.westvalleyrockandmineralclub.com](http://www.westvalleyrockandmineralclub.com)  
@ Buckeye Community Veterans Service Center  
402 E. Narramore Avenue, Buckeye, AZ



### White Mountain Gem & Mineral Club

Meetings are on the 1<sup>st</sup> Sunday  
(unless a Holiday then 2<sup>nd</sup> Sunday)  
Next Meeting: December 5, 2021, 1:00 pm  
[www.whitemountain-azrockclub.org](http://www.whitemountain-azrockclub.org)  
@ VFW Hall  
381 N. Central, Show Low



### Wickenburg Gem & Mineral Society

Meetings are on the 2<sup>nd</sup> Friday  
(February & December on the 1<sup>st</sup> Friday)  
Next Meeting: December 3, 2021, 7:00 pm  
[www.wickenburggms.org](http://www.wickenburggms.org)  
@ Coffinger Park Banquet Room  
175 E. Swilling St., Wickenburg

**ESM's Meeting Notice**

ESM's next meeting will be at North Mountain Visitor Center, 12950 N. 7<sup>th</sup> St., Phoenix, on Tuesday, TBA 2021, at 6:30 p.m.

**BECOME A MEMBER!**  
Join the Earth Science Museum's



**IS IT TIME TO RENEW YOUR MEMBERSHIP?**  
Please renew today! 😊😊😊

----- cut here -----  
**ESM Earth Science Investigation  
 Team Membership Form**  
 \_\_\_\_\_ **New Member**      \_\_\_\_\_ **Renewal**

Membership levels:

\_\_\_\_\_ **ESI Family \$20**

\_\_\_\_\_ **ESI Individual \$10**

Membership benefits:

- ◆ Monthly e-newsletter *Earthquake*
- ◆ Official team membership card
- ◆ Knowledge that your contribution is making a difference in earth science education.

**MANY THANKS TO OUR MAJOR DONORS!**

- AZ Leaverite Rock & Gem Society
- Flagg Mineral Foundation  
[www.flaggmineralfoundation.org](http://www.flaggmineralfoundation.org)
- Friends of the AZ Mining & Mineral Museum
- Maricopa Lapidary Society  
<http://maricopalapidarysociety.com/>
- Mineralogical Society of AZ  
[www.msaz.org](http://www.msaz.org)
- Payson Rimstones Rock Club
- Sossaman Middle School
- White Mountain Gem & Mineral Club  
[www.whitemountain-azrockclub.org](http://www.whitemountain-azrockclub.org)
- Wickenburg Gem & Mineral Society  
<http://www.wickenburggms.org>  
[www.facebook.com/pages/Wickenburg-Gem-and-Mineral-Society/111216602326438](https://www.facebook.com/pages/Wickenburg-Gem-and-Mineral-Society/111216602326438)
- Staples Foundation  
[www.staplesfoundation.org](http://www.staplesfoundation.org)
- Anita Aiston
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- Russ Hart
- Will & Carol McDonald
- Debbie Michalowski
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- Dennis & Georgia Zeutenhorst

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**Earth Science Museum**

3215 W. Bethany Home Rd.  
Phoenix, AZ 85017

**Phone:**

602-973-4291

**Editor E-Mail:**

scote@earthsciencemuseum.org

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*We're on the Web!*

*Visit us at:*

[www.earthsciencemuseum.org](http://www.earthsciencemuseum.org)

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**Mission**

Our Mission is to excite and inspire all generations about earth sciences through educational outreach.

**Vision**

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

For more information about the ESM, how to become a member or how to arrange for a school visit or Community function, go to:  
[www.earthsciencemuseum.org](http://www.earthsciencemuseum.org).

**NOTICE:**

ESM's next meeting will be at North Mountain Visitor Center, 12950 N 7<sup>th</sup> St, Phoenix, on Tuesday, TBA 2021, at 6:30 p.m.

**THANK YOU FOR YOUR CONTINUING INTEREST & SUPPORT!!!**

**EARTH SCIENCE MUSEUM  
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**Earth Science Museum**

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