



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
www.earthsciencemuseum.org, scote@earthsciencemuseum.org, 602-973-4291

May 2023
Volume 12, Issue 5

ESM OUTREACH UPDATE

Mardy Zimmermann, Outreach Coordinator

On May 17th, Lynne & Terry Dyer taught 98 third grade students at Riverview School in El Mirage (4 classes and 4 teachers).



Mineral Flowers

By Harvey Jong

The phrase “April showers bring May flowers” is the inspiration for this article which explores some minerals with habits that resemble flowers. These floral forms have been described as “flowers”, “roses”, “rosettes”, or “sprays”. A search of mindat.org’s database for International Mineralogical Association (IMA)-approved minerals with such morphologies produced the following results:

Habit/morphology	Number of Minerals
Rose/rosette	86
Spray	33
Flower	2

The 121 “flowery” minerals represent about two percent of the 5,926 minerals currently recognized by the IMA.

Our journey through the garden of flower-like occurrences in the mineral kingdom will begin with desert roses.

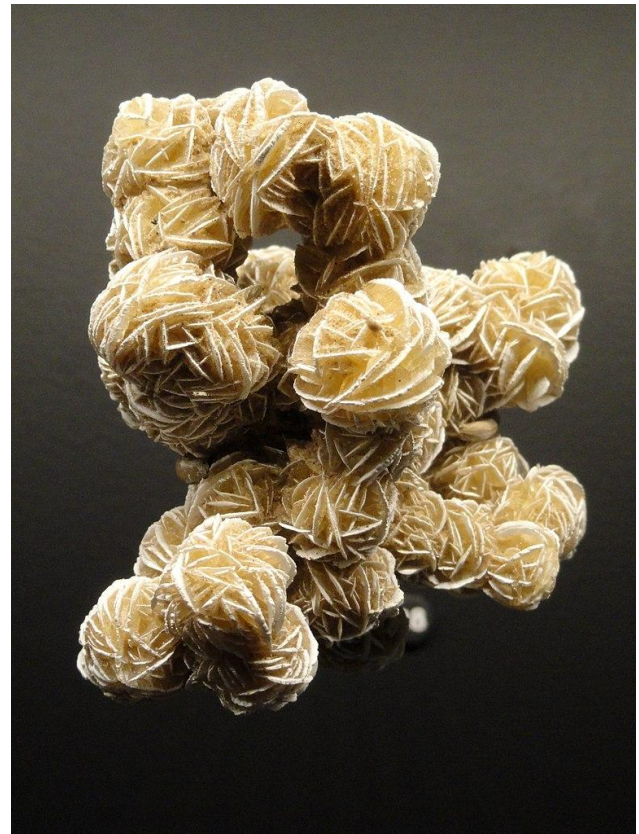
Desert Roses

Desert rose is a generic term that refers to any intricate crystal cluster which roughly appears like a rose. These intergrown groups of flattened crystals typically form by precipitation in arid regions and may contain

sand particles that impart an overall color. A variety of evaporite minerals may occur as desert roses, and gypsum (calcium sulfate hydrate, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) is an example of a common species.

Gypsum Roses

The Samalayuca Dune Fields in Chihuahua, Mexico is a well-known source of gypsum (selenite) roses. The tan-colored roses are found in playa lake deposits, and specimens range from single spherical groups to large aesthetic clusters of multiple rose formations.



Gypsum Roses

Daderot photo, CC0 1.0-UPD, via Wikimedia Commons

Chihuahua, Mexico

Natural History Museum of Utah specimen

Morocco has several large seas of dunes formed by wind-blown sand. These areas are called ergs, and gypsum roses have been collected from the dunes.



Gypsum Rose

Géry Parent photo, - PD, via Wikimedia Commons

Morocco

Dimensions: 9 cm wide



Group of Gypsum Roses

Edenesan photo, - CC_BY_SA-3.0, via Wikimedia Commons

Morocco

Dimensions: 18 x 10 cm

The salt lake of Chott el Djerid in South-West Tunisia has produced a large number of gypsum roses which are also known as Sahara

roses given the lake's location in the Sahara Desert. High salt content results in more crystalline specimens.



Large Gypsum Rose Formation

Laura Peña photo, - CC_BY_SA-3.0, via Wikimedia Commons

Tunisian Desert



Sandrose
Gips: $\text{CaSO}_4 \cdot \text{H}_2\text{O}$
Fundort: Tunesien
MA-113

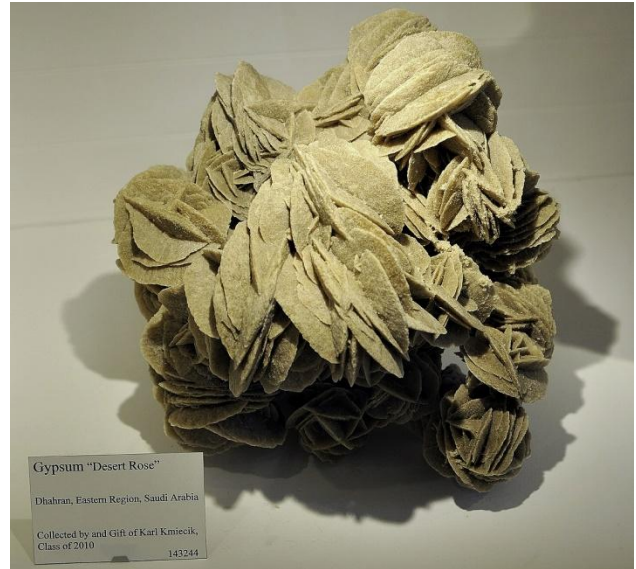
Gypsum Rose Cluster

Daderot photo, - CC0 1.0-UPD, via Wikimedia Commons

Tunisia

Natural History Museum Nuremberg specimen

Gypsum roses have been found in the desert regions of the Middle East, such as the Arabian, Sinai, and Syrian Deserts.



Gypsum Rose Cluster

DerHexer photo, - CC_BY_SA-4.0, via Wikimedia Commons

Dhahran, Eastern Region, Saudi Arabia
Harvard Museum of Natural History specimen

Other Flower-like Gypsum Occurrences

In addition to desert rose formations, gypsum has been found in flower-like arrangements as cave speleothems or crystal aggregates in lacustrine clay beds.



Gypsum Rose

Tiit Hunt photo, - CC_BY_SA-4.0 International, via Wikimedia Commons

Egypt

Estonian Museum of Natural History specimen



Gypsum Speleothems

James St. John photo, - CC_BY_SA-2,0, via Wikimedia Commons

Cleveland Avenue, Mammoth Cave, Kentucky



Gypsum Roses

Skrzylech photo, - CC_BY_SA-4.0 International, via Wikimedia Commons

Syrian Desert, Iraq



Gypsum Crystal Cluster

Marie-Lan Taj Pamart photo, - CC_BY_SA-4.0 International, via Wikimedia Commons
Red River Floodway, Winnipeg, Manitoba, Canada

Gallery of Mineralogy and Geology of the French National Museum of Natural History, Paris specimen

Baryte Roses

Baryte (formerly known as barite) is another mineral that can occur as rose-like aggregates. Oklahoma's Garber Sandstone formation is probably the best known source of baryte roses which are also known as rose rocks. In 1968, the Oklahoma state legislature designated the baryte rose as the official state rock, while an "emergency" law passed in 1983 declared that Noble, Oklahoma (a small town south of Norman) is the official rose rock capital of Oklahoma and the world!

The baryte roses from Oklahoma contain angular medium quartz sand and have a distinctive reddish tone is due to the presence of hematite. Specimens typically vary from 1-10 cm in diameter, but huge clusters weighing hundreds of kilograms have been found.



Baryte Roses

Rob Lavinsky photo, iRocks.com, - CC_BY_SA-3.0, via Wikimedia Commons
Lake Thunderbird area, Norman, Cleveland County, Oklahoma
Dimensions: 10.2 x 7.1 x 5.5 cm



Large Cluster of Baryte Roses

Archbob photo, goodfreephotos.com - CC0 1.0-UPD, via Wikimedia Commons

Baryte roses have also been found in Kansas, Germany, Morocco, and Australia. Samples from Germany's Rockenberg sand pit have a light tan color and are comprised of around 50% quartz sand particles and 40% baryte.



Baryte Roses

Hanes Grobe/AWI photo, - CC_BY_SA-4.0 International, via Wikimedia Commons
Sand pit, Rockenberg, Wetterau, Hesse, Germany



Baryte Roses

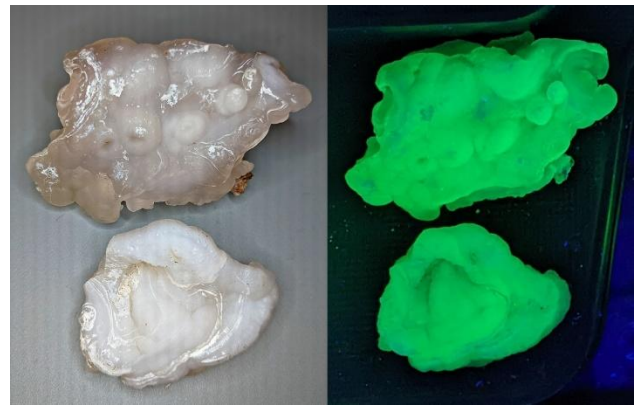
Tiia Monto photo, - CC_BY_SA-3.0, via Wikimedia Commons
Naturmuseum Augsburg specimen

Chalcedony Roses

The term “desert rose” also includes rose-shaped chalcedony clusters. Chalcedony is a cryptocrystalline variety of silica (SiO_2) that forms when silica-rich water percolates through rocks and precipitates in cavities or fractures. The resulting deposits may involve spherical aggregates which grow into and around one another producing layered

bubbly masses. Round groups may resemble roses, and some specimens may have surfaces covered by tiny sparkling quartz crystals. In addition, a few chalcedony roses may contain impurities, such as uranyl ions, and exhibit a bright green fluorescence under short wave ultraviolet light.

Chalcedony roses have been collected at numerous locations throughout Arizona, and two well-known sites include Saddle Mountain in Maricopa County and Round Mountain in Greenlee County.



Chalcedony Roses Under White Light and Short Wave Ultraviolet

Harvey Jong photo, Shirley Coté specimens
Saddle Mountain, Maricopa County, Arizona
Dimensions: top rose 6.5 x 4.1 x 2.5 cm
bottom rose: 4.6 x 3.5 x 1.6 cm

Chalcedony Rose

James St. John photo, - CC_BY_SA-2.0, via Wikimedia Common
Round Mountain, Arizona (*Note: the county was not specified, but is most likely Greenlee County*)

New Mexico also has several localities where chalcedony roses have been found. Colors may vary from colorless, gray, pink, to light lavender, while many specimens may fluoresce bright green.



Group of Chalcedony Roses

Rob Lavinsky photo, iRocks.com, -
CC_BY_SA-3.0, via Wikimedia Commons
Lincoln County, New Mexico
Dimensions: 9.6 x 6.4 x 2.3 cm

Below is an example of a chalcedony rose covered with drusy quartz.



Chalcedony Rose with Drusy Quartz

Elke Wetzig photo, - CC_BY_SA-3.0, via
Wikimedia Common
Knoxville, California
Mineralogical Museum Bonn specimen

Azurite Roses

Like desert roses, azurite may occur as radiating flower-like clusters of lustrous crystals. Many noteworthy specimens have been collected from classic Arizona localities, such as Bisbee and Morenci.



Azurite Rose

Rob Lavinsky photo, iRocks.com, -
CC_BY_SA-3.0, via Wikimedia Commons
Cole Mine, Bisbee, Warren district, Cochise
County, Arizona
Dimensions: 2.5 x 2.1 x 1.9 cm



Azurite Rose

Rob Lavinsky photo, iRocks.com, -
CC_BY_SA-3.0, via Wikimedia Commons
Detroit Mine, Morenci, Copper Mountain
district, Greenlee County, Arizona
Dimensions: 9.8 x 7.8 x 6.7 cm
In the 1980s-1990s, many azurite roses of
varying sizes were collected at the Morenci
Mine which included this large specimen.

La Sal in southeastern Utah is another well-known source of sharp, deep blue azurite roses.



Azurite Rose

Rob Lavinsky photo, iRocks.com, - CC_BY_SA-3.0, via Wikimedia Commons
La Sal, La Sal district, San Juan County, Utah
Dimensions: 3.1 x 2.7 x 2.3 cm

The first azurite roses may have been collected from the Chessy-les Mines in France which is the type locality for azurite. Note that the mineral was originally known as “chessylite”, but was later renamed in 1824.



Azurite Rose

Rob Lavinsky photo, iRocks.com, - CC_BY_SA-3.0, via Wikimedia Commons
Chessy-les_Mines, Rhône, Rhône-Alpes, France

Dimensions: 2.8 x 2.8 x 2.6 cm

Around 1980s, some exceptional azurite specimens, which included rose-shaped clusters, were found at the Shi Lu Copper Mine in Guangdong Province, China. These azurites were reminiscent of specimens from Arizona



Azurite Rose

Rob Lavinsky photo, iRocks.com, - CC_BY_SA-3.0, via Wikimedia Commons
Shi Lu Copper Mine, Guangdong Province, China

Dimensions: 4.5 x 3.8 x 3.4 cm

Pseudomorph after Azurite Roses

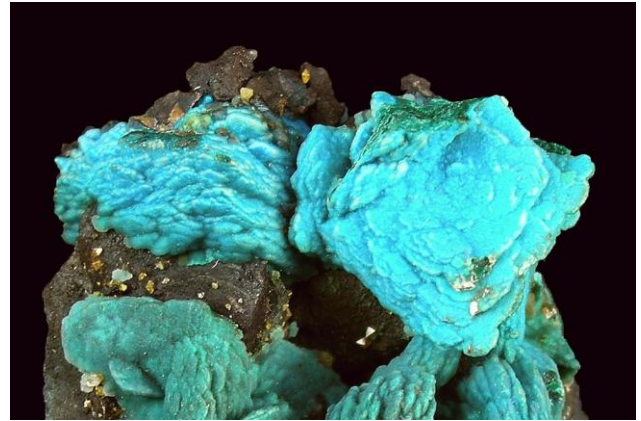
Azurite may be replaced by different minerals, such as malachite and native copper, which leads to rose-shaped pseudomorphs. Below are a few examples:



Malachite after Azurite Rose

Rob Lavinsky photo, iRocks.com, -
CC_BY_SA-3.0, via Wikimedia Commons
Milpillas Mine, Municipio de Cananea,
Sonora, Mexico

Dimensions: This rose is part of a larger 9.2 x
3.8 x 3.5 cm specimen



Chrysocolla after Malachite after Azurite Roses

Rob Lavinsky photo, iRocks.com, -
CC_BY_SA-3.0, via Wikimedia Commons
Whim Creek Copper Mine, Whim Creek,
Pilbara Region, Western Australia, Australia
Dimensions: Close-up of 5.0 x 4.0 x 2.9 cm
specimen

Hematite Roses

Hematite is another mineral that may
exhibit a rosette habit. Rounded aggregates
of tabular crystals appear like rose petals,
and these formations have been called "iron
roses".



Native Copper after Azurite Rose

Rob Lavinsky photo, iRocks.com, -
CC_BY_SA-3.0, via Wikimedia Commons
Copper Rose Mine, San Lorenzo, Grant
County, New Mexico

Dimensions: 3.2 x 2.8 x 1.9 cm



Hematite Rose

Rob Lavinsky photo, iRocks.com, -
CC_BY_SA-3.0, via Wikimedia Commons
Central St. Gotthard Massif, Ticino,
Switzerland

Dimensions: 4.9 x 4.1 x 2.7 cm

Very lustrous, well-formed hematite roses have been collected from the numerous Alpine-type clefts in Switzerland.



Hematite Roses with Quartz

Rob Lavinsky photo, iRocks.com, - CC_BY_SA-3.0, via Wikimedia Commons
Traversella, Torino Province, Piedmont, Italy
Dimensions: 7.9 x 4.5 x 3.8 cm, hematite roses are up to 2.6 cm across

The Traversella mining area is located 60 km North of Torino and has produced specimens of black hematite associated with milky white quartz crystals. The hematite may occur as very thin, disk-shaped crystals intergrown as tight spherical, flower-like aggregates.



Hematite Rose

Rob Lavinsky photo, iRocks.com, - CC_BY_SA-3.0, via Wikimedia Commons
Serra das Éguas, Brumado, Bahia, Brazil
Dimensions: 4.1 x 3.2 x 1.3 cm

Bright, metallic clusters of hematite have been collected in Bahia and Minas Gerais, Brazil. Specimens consist of numerous parallel growth crystals.



Hematite Roses with Quartz

Rob Lavinsky photo, iRocks.com, - CC_BY_SA-3.0, via Wikimedia Commons
Lechang Mine, Guangdong Province, China
Dimensions: 8.4 x 6.8 x 4.1 cm

Aesthetic specimens of hematite roses interspersed with quartz crystals have been found in several Chinese provinces, such as Guangdong, Hunan, and Sichuan.

Other Flower-like Mineral Occurrences

Some mineral floral patterns are revealed only after being cut and polished. Chrysanthemum stone or “flower rock” is an example of such an embedded rosette occurrence.

Chrysanthemum Stone

Chrysanthemum stone has been mined in China for over 200 years. Carving and polishing this lapidary material has produced some amazing ornamental objects, such as the one depicted in the link below:

[Large Chrysanthemum Stone That Has Been Sculpted to Reveal Several Flower Formations](#)

Xinhua/Song Wen copyrighted photo, via China.org.cn

Chrysanthemum stone may vary in composition based on the locality where it was found. Initial studies of samples from the Liuyang, Hunan Province, China indicated that the flower-like formations are comprised of celestine (a strontium sulfate, SrSO_4 , formerly known as celestite). Subsequent finds from Shaanxi, Hubei, and Jiangxi Provinces were either assumed to involve celestine or identified as ikaite, a hydrated calcium carbonate.

A recent analysis, however, has shown that the rosettes are a calcite paramorph (a pseudomorph formed by a change in molecular structure without changing the chemical composition) after a strontium-bearing carbonate and include tiny grains of celestine, strontianite, and occasional baryte (Makovicky et al., 2006). The rosette petals may be coated and replaced by chalcedony to varying degrees.

It should be noted that specimens are often enhanced in which crystal patterns are painted with a dye and outlined in black ink. Lacquer or wax may also be applied to darken the limestone matrix.



Chrysanthemum Stone

Parent Géru photo, - PD, via Wikimedia Commons

Daxi River, Liu Yang, Hunan China



Chrysanthemum Stone

Two+two=4 photo, - PD, via Wikimedia Commons

China



Chrysanthemum Stone

Mike Beauregard photo, specimen from the Laval University, Quebec City, Canada collection - CC_BY_SA-2.0, via Wikimedia Commons

China

Dimensions: 4 x 8 in.

This specimen depicts a butterfly and flower.



Chrysanthemum Stone

小川処堂 photo, - CC_BY_SA-4.0 International, via Wikimedia Commons

Neo area, Gifu Prefecture, Japan

The flower patterns of Japanese chrysanthemum stone are made of aragonite, while the red centers are due to presence of iron. The stone is found in a gorge which is part of a national monument of Japan, and collecting is strictly prohibited.

One Last Example

We will conclude our tour of the garden of mineral flowers with a special specimen of cavansite [calcium vanadyl silicate hydrate, $\text{Ca}(\text{VO})\text{Si}_4\text{O}_{10} \cdot 4\text{H}_2\text{O}$]. Cavansite was discovered in 1967 and is named for the elements calcium, vanadium, and silicon in its chemical composition. The type locality is the Owyhee Dam in Lake Owyhee State Park, Malheur County, Oregon, but India's Wagholi quarries are recognized as the key source of exceptional specimens.



Cavansite on Quartz

Rob Lavinsky photo, iRocks.com - CC_BY_SA-3.0, via Wikimedia Commons

Wagholi quarries, Wagholi, Pune District, Maharashtra, India

Dimensions: 3.1 x 1.3 x 1.2 cm

This specimen features a flowery spray of cavansite perched on a "stem" of quartz.

References

Makovicky, E., S. Karup-Møller, and J. Li (2006) Mineralogy of the chrysanthemum stone. *Neues Jahrbuch für Mineralogie - Abhandlungen (New Yearbook of Mineralogy - Treatises)* 182(3):241-251.



AZ Mining, Mineral & Natural Resources Education Museum Update May 2023

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

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703.577.6449

Help support the museum at:

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

This month we continued working with our design-build team to prepare for renovations on our El Zaribah Shrine building at 1502 W. Washington St. Our contractors and architects have been working diligently to determine priority improvements and assess structural and electrical systems. Part of the renovation process includes working with the Arizona State Historic Preservation Office (SHPO) to assess the historical features of the building, which was originally built in 1921 and renovated from 1990-1991. Some of the original features that we hope to renew and preserve include the windows, hardwood floor, and exterior facade.

We've also started to clear out the inside to prepare for interior demolition. We are in the process of moving cases and supplies to other organizations, including Bullion Plaza Cultural Center & Museum in Miami, AZ. Thanks to Bullion Executive Director Tom Foster, and volunteers Bill Yedowitz and Les Presmyk for helping get material ready to move.

Another notable event from May included a visit from Regent DuVal of the Arizona Board of Regents. We are lucky to have the support of ABOR and other government organizations. And as always, we are very grateful for the support of our museum friends and will continue to keep you posted about our progress. Thank you!



Walking on the roof which holds solar panels providing power to our building

Photo is facing west towards the State Capitol.



An official from the AZ State Historic Preservation Office (SHPO) assesses the building's exterior paint and stucco. Did you know that the original accent color wasn't light blue, but a beautiful dark coral?



Arizona Rocks 120

Text and photos by Ray Grant

This column marks ten years of Arizona Rocks. You can go to earthsciencemuseum.org and pick newsletters to find all the past columns.

Arizona Rocks!!!! Because:

Geology: The Grand Canyon is the number one geological site in the United States and millions of people come from all over the world to see it. Lots more good geology everywhere in the state, like volcanoes at the San Francisco Peaks, Sunset Crater, Superstitions and Chiricahuas, rocks from over two billion years old to rocks just a few thousand years old, and Meteor Crater the world's best preserved impact site, to name just a few.

Minerals: Arizona is right at the top or near in the state with the most minerals. We have documented over a 1000 different mineral species and 95 type minerals (first place found in the world) in Arizona. It is also famous for all the turquoise that has been found here.

Fossils: Not as famous as some other state's dinosaur fossils but many good fossils found in Arizona and the fossil petrified wood at the Petrified Forest National Park is some of the world's best.

Ore Deposits: Arizona is the leading state for copper production and also produces gold, silver, lead, zinc, manganese and other metals.

If anyone has suggestions or questions about geology for future topics don't hesitate to send them.

Ore Deposits: Morenci Copper Mine, the largest or future largest copper mine in the United States



Geology: Grand Canyon number one geological site in the United States



Minerals: Wickenburgite, one of the over 1000 minerals found in Arizona, named after Wickenburg, Arizona. Photo by Ron Gibbs



Fossils: Petrified wood from the Petrified Forest, Arizona





Pinal Museum and Society News

351 N. Arizona Blvd., Coolidge, AZ

Pinal Geology and Mineral Society next meeting

September 20, 2023

www.pinalgeologymuseum.org

Ray Grant ray@pinalgeologymuseum.org

SUMMER HOURS

Fridays 10-3

Also, Open May 30, June 1, June 2

closed Saturday, June 3

We've been holding in-person meetings since September, with a wide range of speakers. Meetings are the third Wednesday at 7pm, doors open at 6:30.

On May 15, the Pinal Geology and Mineral Museum hosted a meeting of the Pinal County Museum Meet up, a somewhat informal group of museums in Pinal County that meet three times a year. Janice Klein of the Museum Association of Arizona spoke about museum volunteers, followed by a potluck lunch and then reports by each of the museums.





The 3rd PHOENIX HERITAGE MINERAL SHOW



GET READY TO ROCK PHOENIX!

AZURITE, MALACHITE
Morenci Mine, Greenlee County, Arizona, USA
9.7cm – Barbara Muntyan Collection – Jeff Scovil Photo

JUN · 3 & 4 · 2023 · PHOENIX SHRINE AUDITORIUM · 552 N 40th STREET | PHOENIX, AZ 85008 · Saturday 9am - 5pm Sunday 9am - 4pm



Café & Bar: 9am - 1pm
Admission:
CASH ONLY – ATM Available
• \$5.00 Adults
• \$3.00 MSA Members
• FREE 12 years & younger with paying adult
• FREE Parking during show
msaaz.org

Largest Quality Mineral Show in Capital City of Arizona!
Featuring: Minerals, Kids Activities, Raffles & Exhibits.
Saturday Night Program: Dinner, Talk, Auctions and Live Acoustic Duet by Evan Jones & Bernie Lezotte playing Grateful Dead and more!
Sat Night Tickets on Sale:
<https://www.msaaz.org/event-4972307>



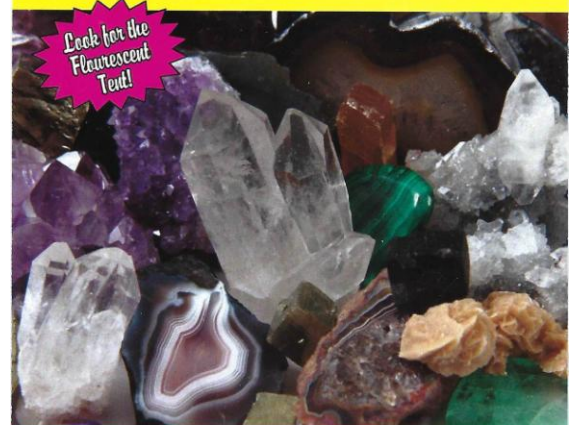
Mineralogical Society of Arizona**June 3-4, 2023****Sat. 9-5, Sun. 9-4**

\$5 adults, \$3 MSA members, 12 & under free
 El Zaribah Shriners Auditorium and Event
 Center, 552 N 40th Street
 Phoenix, AZ

**White Mountain Gem
and Mineral Club****Annual Show****July 14-16, 2023****Fri. & Sat. 9-5, Sun. 10-4**

Adults \$4, Children with an adult free
 Show Low Elks Lodge
 805 E. Whipple
 Show Low, AZ

PRESCOTT
GEM & MINERAL SHOW
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**AUGUST, 4th
5th & 6th**

FINDLAY TOYOTA EVENT CENTER

3201 N Main St - Prescott Valley
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FRI & SAT 9-5, SUN 9-4

Admission is Cash Only - ATM Available

FREE PARKING!**\$5 Adults**

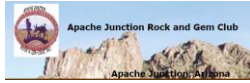
\$4 Seniors 65+, Vets, Students
 Children under 12 FREE w/paid Adult

www.PrescottGemMineral.org**West Valley Rock & Mineral Club****Annual Show****October 6-8, 2023****Fri. & Sat. 9-5, Sun. 9-2**

Adults \$3, Children under 13 free
 Buckeye Arena
 802 N. 1st Street
 Buckeye, AZ

Huachuca Mineral and Gem Club**49th Annual Show****October 14-15, 2023****Sat. 9-5, Sun. 10-4**

Free Admission & Parking
 Sierra Vista Mall
 2200 El Mercado Loop
 Sierra Vista, AZ



Apache Junction Rock & Gem Club

Meetings are on the 2nd Thursday
Next Meeting: June 8, 2023, 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
(unless a Holiday then 2nd Tuesday)
Next Meeting: June 6, 2023, 6:30 p.m.

Please go to their website for more info

www.dmrnc.com

@ Anthem Civic Building

3701 W. Anthem Way, Anthem, AZ



Maricopa Lapidary Society, Inc

Meetings are on the 1st Monday
(unless a Holiday then 2nd Monday)
Next Meeting: June 5, 2023, 7:00 pm

www.maricopalapidarysociety.com

@ North Mountain Visitor Center
12950 N. 7th St., Phoenix



Mineralogical Society of Arizona

Meetings are on the 3rd Thursday
(Except December & June)
Next Meeting: Sat., June 17, 2023, 11:00 am

Please go to their website for more information

www.msaaaz.org



Pinal Geology & Mineral Society

Meetings are on the 3rd Wednesday
Next Meeting: September 20, 2023, 7:00 pm

In person meeting

www.pinalgeologymuseum.org

@ Artisan Village

351 N. Arizona Blvd., Coolidge



West Valley Rock & Mineral Club

Meetings are on the 2nd Tuesday
Next Meeting: June 13, 2023, 6:30 pm

www.westvalleyrockandmineralclub.com

@ Buckeye Community Veterans Service Center

402 E. Narramore Avenue, Buckeye, AZ



Gila County Gem & Mineral Society

Meetings are on the 1st Thursday
(unless a Holiday then the next Thursday)

Next Meeting: June 1, 2023, 6:30 pm

www.gilagem.org

Club Building

413 Live Oak St, Miami, AZ



Wickenburg Gem & Mineral Society

Meetings are on the 2nd Friday
(February & December on the 1st Friday)
Next Meeting: September 8, 2023, 7:00 pm

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. 7th St., Phoenix, on Tuesday, TBA 2023, at 6:30 p.m.

BECOME A MEMBER!
Join the Earth Science Museum's



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

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**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
- Friends of the AZ Mining & Mineral Museum
- Maricopa Lapidary Society
<http://maricopalapidarysociety.com/>
- Mineralogical Society of AZ
www.msaz.org
- Payson Rimstones Rock Club
- Sossaman Middle School
- White Mountain Gem & Mineral Club
www.whitemountain-azrockclub.org
- Wickenburg Gem & Mineral Society
<http://www.wickenburggms.org>
www.facebook.com/pages/Wickenburg-Gem-and-Mineral-Society/111216602326438
- West Valley Rock and Mineral Club
<http://www.westvalleyrockandmineralclub.com/>
- Staples Foundation
www.staplesfoundation.org
- Anita Aiston
- Peter & Judy Ambelang
- Stan & Susan Celestian
- Russ Hart
- Will & Carol McDonald
- Debbie Michalowski
- Janet Stoeppelmann
- Dennis & Georgia Zeutenhorst

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Editor E-Mail:
 scote@earthsciencemuseum.org

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.

We're on the Web!

Visit us at:

www.earthsciencemuseum.org

NOTICE:
 ESM's next meeting will be at North Mountain Visitor Center, 12950 N 7th St, Phoenix, on Tuesday, TBA 2023, at 6:30 p.m.

THANK YOU FOR YOUR CONTINUING INTEREST & SUPPORT!!!

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