



# 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](http://www.earthsciencemuseum.org), [scote@earthsciencemuseum.org](mailto:scote@earthsciencemuseum.org), 602-973-4291

August 2021  
Volume 10, Issue 8

## ESM OUTREACH UPDATE

Mardy Zimmermann, Outreach Coordinator

The big project for the Marana Unified School District was completed and picked up. A new project for the Pima County Superintendent's Office is in process. I, with help from Lynne Wheeler, have completed 40 bags of 15 specimens for pre-school teachers to receive at a county in-service session in October. We will also complete sets of information about rocks and minerals for each teacher.

I am beginning to inventory all of the buckets of crushed rocks and minerals I have in Forest Lakes and will be reducing it by providing material for the school program the Payson Rimstones Rock Club provides for the Payson School District.

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Bill Yedowitz spray paints the picket fence for the Banquet of Rocks display. Catie Sandoval photos



Picket fence left to dry inside.



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

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

Catie Carter Sandoval

[cscarter@email.arizona.edu](mailto:cscarter@email.arizona.edu)

703.577.6449

Help support the museum at:

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

On Friday, August 27, Catie and Bill repainted the white picket fence that used to surround the Banquet of Rocks display at the AMMM. The fence will be used in a new food rocks display at the Cave Creek Museum. Installation is scheduled for mid-September and the display will be open to visitors starting in October when the museum reopens for the season. In addition, installation of the City Hall exhibit, 'From Mine to Medallion,' will begin in October as well. We still plan to run the Swallow Mine stamp mill for the public this fall, date TBD.





## Arizona Rocks 99

Text & Photos by Ray Grant

Another interesting place to visit in Springerville is the Casa Malpais Archaeological Park. The park is only open with a guided tour and you should call to reserve a spot. Go to [casamalpais.org](http://casamalpais.org) for information on how to sign up for a tour. The tours start at the Springerville Heritage Center at 418 E. Main Street. The Center has a free Museum open Tuesday to Saturday 8 AM to 4 PM with many artifacts from Casa Malpais.

The ruins are built on the edge of a basalt plateau, part of the Springerville Volcanic Field and the ruins are unusual because they are built of basalt. The Arizona Geological Survey Down-to-Earth 16, A Guide to the Geology of the White Mountains and Springerville Volcanic Field at [http://repository.azgs.az.gov/uri\\_gin/azgs/dlio/1536](http://repository.azgs.az.gov/uri_gin/azgs/dlio/1536) has three geologic features for Casa Malpais. They are slump blocks, rock varnish, and curved joints. There is clay under the harder basalt layer and as the clay weathers and erodes the basalt blocks slide down the face of the plateau forming the slump blocks. This is the main form of cliff retreat in Arizona. The rock (or desert) varnish is a thin layer on the basalt composed of clay and iron and manganese oxide. The prehistoric inhabitants of the area made drawings, petroglyphs, by chipping away the coating to expose the fresh rock. And the curved joints are long cracks in the basalt seen in the cliff faces. These cracks formed when the volcanic rock cooled. As cliffs form from the weathering and erosion of the rock, blocks will break off along these cracks.

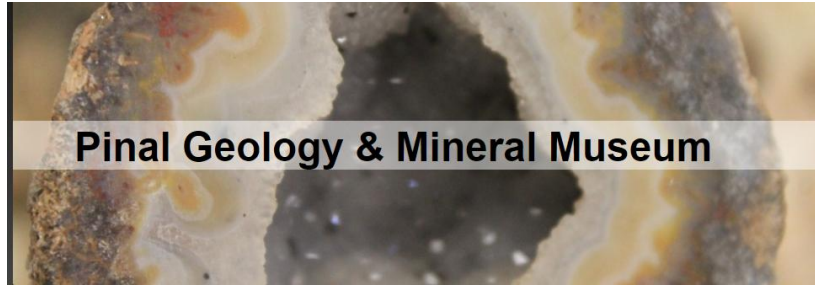
Use the Down-to-Earth guide to find many other places to visit in the White Mountains during the hot summer.



Casa Malpais Ruins with a slump block in the center of the photograph. The layers often tilt back as they start to slide down the face of the eroding cliff.



Basalt showing the curved joints formed during the cooling of the lava flow and how the large blocks break off the cliff. People climbing to the top as part of the tour



## Pinal Museum and Club News

351 N. Arizona Blvd., Coolidge, AZ  
**Pinal Geology and Mineral Club meeting**  
**September 15, 2021 - YouTube on line**

[www.pinalgeologymuseum.org](http://www.pinalgeologymuseum.org)  
 Ray Grant [raycyn@cox.net](mailto:raycyn@cox.net).

Pinal Geology and Mineral Museum will be closed until further notice due to the health emergency.

We are continuing to work on our exhibits and make new ones in anticipation of a grand reopening event in the fall.

The cases shown here have been added over the past year while the Museum was closed. The wall cases were donated by the Flag Mineral Foundation ([flagmineralfoundation.org](http://flagmineralfoundation.org)). They were originally made for the Mineral Museum in Phoenix. The floor cases were donated by the Earth Science Museum, ([earthsciencemuseum.org](http://earthsciencemuseum.org)). The cases were repaired and painted by Israel Pineda and the lights and wiring were done by Joe Meinike. The Meteor Crater exhibit (left wall case) was made and donated by Carleton Moore. This was moved from the other room. The meteorite exhibit (left floor case) has samples donated by Carleton and Larry Akins. The fossil exhibit (right wall case) has specimens donated by the John Weber family. The dinosaur exhibit (right floor case) has specimens donated by the Earth Science Museum. A big thank you to all who helped and donated specimens!



## Imaggeo on Mondays: Giant's Causeway

By Laura Roberts-Artal November 30, 2015 Geochemistry, Mineralogy, Petrology & Volcanology, Geomorphology, Imaggeo, Imaggeo on Mondays, Regular Features, Tectonics and Structural Geology

The European Geosciences Union (EGU) is the leading organization for Earth, planetary and space science research in Europe. *Imaggeo is the EGU's online open access geosciences image repository. Photographers retain full rights of use, as Imaggeo images are licensed and distributed by the EGU under a Creative Commons license.*

Since its discovery back in the late 1600s the origin of the spectacular polygonal columns of the Giant's Causeway, located on a headland along the northern coast of Ireland, has been heavily debated. Early theories for its origin ranged from being sculpted by men with picks and chisels, to the action of giants, through to the force of nature. It wasn't until 1771 that Demarest, a Frenchman, suggested that the origin of the world-famous headland was indeed volcanic.



Giant's Causeway Credit: Bernhard Aichner (distributed via [imaggeo.egu.eu](http://imaggeo.egu.eu))

We now know that the hexagonal columns along the rugged Irish coastline formed some sixty million years ago, during a time when the ancestors to modern plant species started to emerge and the Earth was going through a period of warming. At the time, Antrim (a modern-day county of Ireland), was subjected to an intense period of volcanic activity as a result of the opening of the Atlantic Ocean.

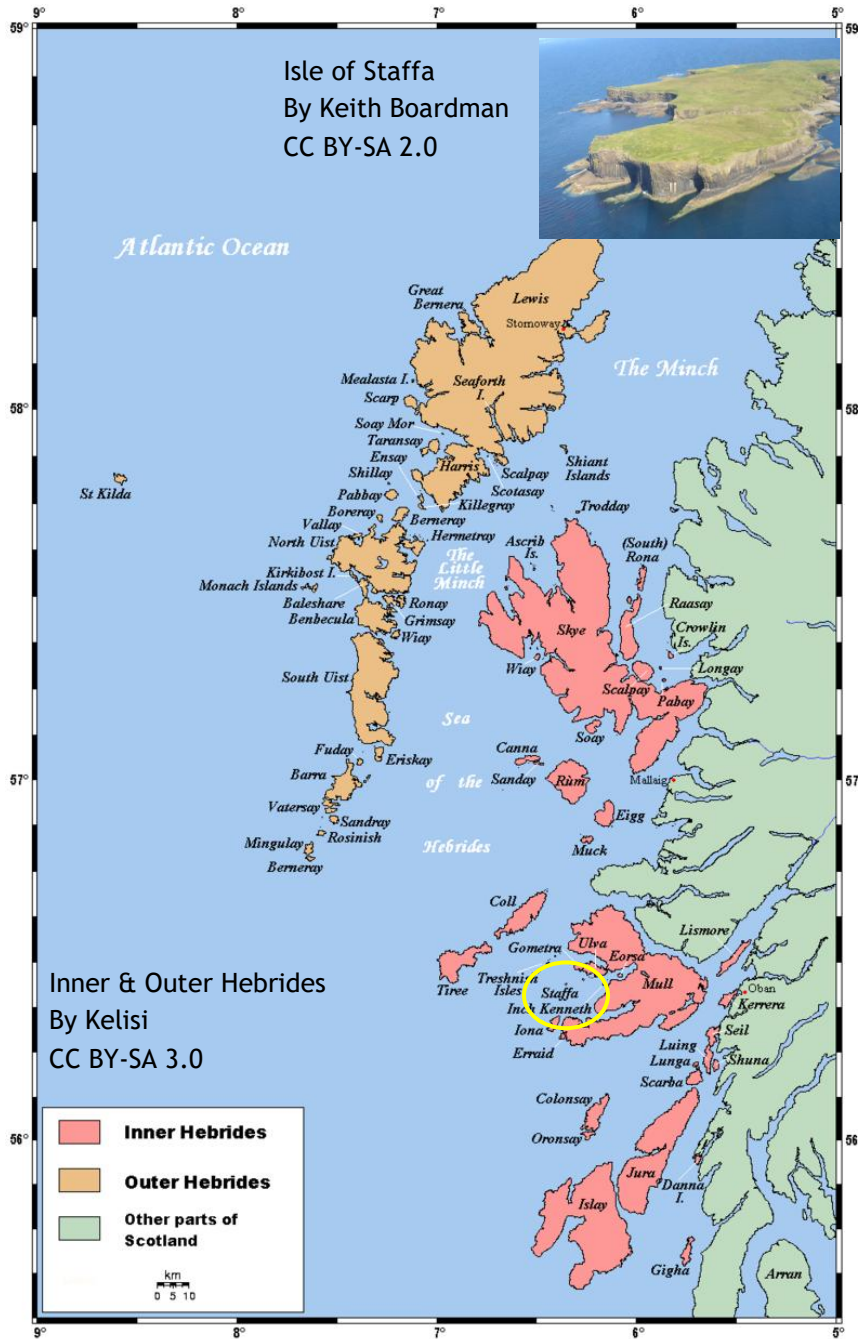
The Giant's Causeway is only a small part of a vast network of lava flows which extended over the Antrim landscape; much of which, through the passage of time, has been eroded away. There were three distinct periods of volcanic activity which resulted in a thick succession of lava flows which has been subdivided into the Lower, Middle and Upper Basalts.

The lavas of the Giant's Causeway belong to the Middle Basalts and comprise over 40,000 vertical columns. Recently, a new model was proposed for the formation of the striking polygonal pattern formed by the columns. They formed within a lava flow, which contracted and fractured while cooling very slowly. If the loss of heat is steady, then the pattern formed is uniform, but if areas cool faster than others, the fractures develop unevenly, meaning the

columns form in a variety of sizes and shapes: expect anything from pentagons to heptagons if you get a chance to visit the Causeway!

### Isle of Staffa - Scotland

80 miles north (as the crow flies) from the Giant's Causeway, is Fingal's Cave on the Isle of Staffa off the coast of Scotland.



Fingal's Cave - By Open.edu



Isle of Staffa, Fingal's Cave (right) Boat Cave (left) Geology Page photo

The following is from Wikipedia:

Steadily rising sea levels isolated the little island of Staffa, which is entirely of volcanic origin. It consists of a basement of tuff, underneath colonnades of black fine-grained 50 million year old basalt, overlying which is a third layer of basaltic lava without a crystalline structure. By contrast, slow cooling of the second layer of basalt resulted in an extraordinary pattern of predominantly hexagonal columns which form the faces and walls of the principal caves. The lava contracted towards each of a series of equally spaced centers as it cooled and solidified into prismatic columns, a process known as columnar jointing. The columns typically have three to eight sides, six being most common. The columns are also divided horizontally by cross joints. These columnar jointed sections represent the tops and bottoms of individual lava flows. Between these sections lie regions of much more chaotic jointing, known as the **entablature**. The origin of the entablature is unknown, but could be due to flooding of the lava flow, causing much more rapid cooling, or the interaction of stress fields from the two regions of columnar jointing as they approach one another.



} Entablature

} Columnar jointed or colonnades

**Trivia:** Romantic German composer Felix Mendelssohn visited in 1829 and wrote an overture, *The Hebrides*, Op. 26, (also known as *Fingal's Cave overture*), inspired by the weird echoes in the cave. Mendelssohn's overture popularized the cave as a tourist destination.

**Other notable places showing columnar jointing of basalt:**



Devils Tower National Monument, Wyoming, NPS photo



Devils Postpile National Monument, CA, NPS photo



Los Organos, Spain, by Ingo Ronner CC BY 2.0



Cape Stolbchaty, Russia by Sergey Kotov CC BY-3.0  
(Polygons within polygons, how cool is that?)



Svartifoss (Black Fall) is a waterfall in Skaftafell National Park in Iceland - The World Geography



Akun Island, Alaska - The World Geography



Kuril Islands - Kunashir, Cape Stolbchaty - Kunashir Island - By Eugene Kaspersky



South Puyallup River Camp, Mt. Rainier National Park - NPS photo





## Parent/Teacher Resource Page 1

<https://www.earthsciweek.org/>

### EARTH SCIENCE WEEK UPDATE - AUGUST

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#### EARTH SCIENCE WEEK BEGINS WITH EARTHCACHE DAY

What a great time to learn outdoors! Earth Science Week 2021 will begin with the 14th annual International EarthCache Day on Sunday, October 10. The public is invited to explore this exciting and educational geoscience experience along with the Geological Society of America, which runs the global EarthCache program in partnership with Geocaching HQ, and AGI, which coordinates Earth Science Week.

International EarthCache Day is a time when EarthCachers around the globe learn about the Earth. Each of these individuals hunts for an EarthCache, a place that can be found with a GPS device.

EarthCachers participate in a kind of "treasure hunt" called geocaching. The treasure that is found at an EarthCache is a lesson about the Earth science. Learn more at [EarthCache](#).

#### HELP ENSURE THAT GEOSCIENCE IS FOR EVERYONE

AGI, the organizer of Earth Science Week, values inclusiveness and supports efforts to address issues of intolerance and prejudice. Promoting learning activities that stimulate experiential learning and mobilize conceptual thinking in the geosciences, Earth Science Week celebrates the inclusive potential and importance of the geosciences in the lives of all people, inviting people of all descriptions to explore studies and careers in the geosciences.

On the Earth Science Week website is a selection of strategies designed to support inclusive educational activities. They are organized under headings given in [Appendix D of the Next Generation Science Standards](#), which you can visit for a more detailed discussion of each approach.

Each strategy is also accompanied by an example of a related geoscience-focused learning experiences. To learn more, see [Diversity, Equity, and Inclusion Strategies](#) online.

#### HOW TO PUT YOUR EVENT ON THE MAP — ONLINE

If you're hosting a virtual or safe live public event during Earth Science Week 2021 (October 10-16), let people know about it! The best way is to post your event details on [Events in Your Area](#). This web page provides information on events taking place through program partners across the country.

The Earth Science Week Event Registry enables you to promote your event more effectively than ever. To register your event, simply provide a few key details. Fill out the easy-to-use [online form](#), and let the Earth Science Week team and the world know about your event.

In addition, your organization can be listed in [Earth Science Organizations](#), a site that offers clickable links to geoscience organizations such as parks, museums, science and technology centers, university geology departments, local geological societies, and other nearby locations.

To post your event, please email Earth Science Week at [info@earthsciweek.org](mailto:info@earthsciweek.org). Be sure to provide a brief description of the event, time and date, street address, phone number, email address, and URL. We'll be happy to direct Earth Science Week participants to your event!

## Parent/Teacher Resource Page 2

<https://www.sciencepartnership.org/science-resources>

### Teach Earth Science

Science Partnership of the East Bay Home | NGSS

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Earth Science is an interdisciplinary science that includes content from Geology, Atmospheric Science, Oceanography, and Space Science.

#### Geology

- [Earth Materials](#)
- [Plate Tectonics](#)
- [Earthquakes](#)
- [Volcanoes](#)
- [Weathering](#)
- [Erosion](#)
- [Streams and Rivers](#)
- [Mass Wasting \(Landslides\)](#)

#### Atmospheric Science

- [Elements of Weather](#)
- [Heating the Earth's Atmosphere](#)
- [Atmospheric Circulation & Climate](#)
- Structure of the Atmosphere (coming soon)
- Hurricanes (coming soon)

#### Earth Science Misconceptions

Scientific misconceptions are common and hinder deeper understanding of science content. People commonly build their knowledge of science on their current understanding including their misconceptions. The way that we may identify misconceptions in our students is through questioning and listening (assessment). Although a student may be told that their understanding is incorrect, most have a hard time giving up their misconception. The video documentary A Private Universe is an excellent study showing the prevalence of scientific misconceptions and the difficulty that students have in giving them up. A Private Universe can be viewed online by clicking [here](#). The following are links to some lists of misconceptions in the Earth Sciences.

['Easier to Address' Earth Science Misconceptions \(SERC\)](#)

[Common Geoscience Misconceptions Organized by the Earth Science Literacy Principles \(Michigan Teacher Excellence Program\)](#)

**ALL ARIZONA CLUB SHOWS MAY BE CANCELED  
DUE TO HEALTH CONCERNS! (Please check their website before you go!)**



## PAYSON RIMSTONES ROCK CLUB

**Presents  
23rd Annual Gem & Mineral  
Show**

**September 17 - 19, 2021**

**Friday - 2 pm to 7 pm**

**Saturday - 9 am to 5 pm**

**Sunday - 10 am to 4 pm**

Admission is \$3.00 for adults

Children under 13 are free

Mazatzal Hotel and Casino

Event Center, on HWY 87  
mile marker 251, Payson AZ  
Tonto Apache Reservation

Gems, minerals, fossils, lapidary equipment,  
jewelry and jewelry findings, slabs and  
rough material

The club sponsors an education center for  
the children and adults with a geologist to  
answer questions, a Spinning Wheel (where  
everyone wins a rock!), a magnificent  
fluorescent mineral display, a free Treasure  
Hunt for a rock collection, beading,  
sandstone/rock painting, and more. Silent  
auction with beautiful minerals and rocks

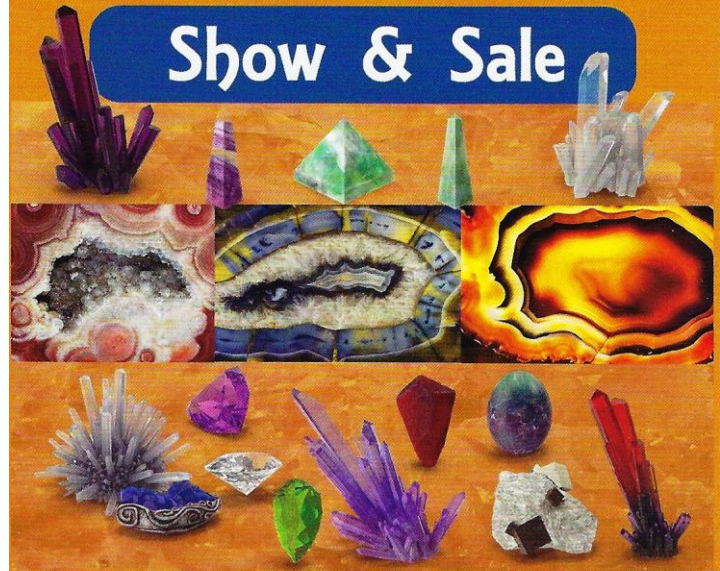
Becky Bagshaw at 928-476-3419  
paysonrimstones@aol.com  
or lbagsfam@aol.com

## Clarkdale Rocks

### Gem & Mineral Show

47<sup>th</sup> Show

**Show & Sale**




**September 24-26, 2021**  
**Clark Memorial Clubhouse Auditorium**

19th N. Ninth Street, Clarkdale, AZ 86324

**FRI & SAT 9am-5pm, SUN 9am-4pm**

**Free Admission**

Mingus Gem & Mineral Club  
[www.mingusgem.club](http://www.mingusgem.club)

Crystals Minerals Gems Jewelry  
Fossils Cabachons Findings  
Rock Slabs  Geode Splitting  
Daily Raffles and much more!

**ALL ARIZONA CLUB SHOWS MAY BE CANCELED  
DUE TO HEALTH CONCERNS! (Please check their website before you go!)**



West Valley  
Rock & Mineral Club

Buckeye's 7th Annual

## **HELZAROCKIN' GEM & MINERAL SHOW**

October 9 \*10 \*11 2020

9 a.m. - 5 p.m. Fri-Sat

9 a.m. - 2 p.m. Sun

Adults \$3 kids under 13 free

Open Air Event

**Buckeye Arena**

802 N 1st Street (Miller Road)

**Buckeye, Arizona**

Rocks, Gems, Jewelry, Minerals,

Fossils, Beads, Slabs, Cabs,

Gold Panning & Scavenger Hunt

Rock Painting

Snacks and Beverages Available

Information contact:

[show@westvalleyrockandmineralclub.com](mailto:show@westvalleyrockandmineralclub.com)

website: [westvalleyrockandmineralclub.com](http://westvalleyrockandmineralclub.com)

Lara: (602) 405-2926

Alice: (602) 329-2519

# Rock, Gem & Jewelry Show

**October 16 & 17**  
**Sat 10-5 / Sun 10-4**

Sedona Red Rock High School - 89A at  
Upper Red Rock Loop Rd, W. Sedona

**Hourly Raffles**  
**Grand Prize**

Admission - \$ 4  
Children under 12 - Free



For more information go to:  
[www.sedonagemandmineral.org](http://www.sedonagemandmineral.org)

**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: September 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: September 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: September 13, 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  
(September, October & November meetings)  
Next Meeting: September 16, 2021, 7:30 pm  
[www.msaaaz.org](http://www.msaaaz.org)  
Franciscan Renewal Center  
5802 E. Lincoln Dr., Scottsdale



**Pinal Geology & Mineral Society**  
Meetings are on the 3<sup>rd</sup> Wednesday  
Next Meeting: September 15, 2021, 7:00 pm  
**YouTube on line meeting**  
[www.pinalgemandmineralsociety.org](http://www.pinalgemandmineralsociety.org)  
@ Artisan Village  
351 N. Arizona Blvd., Coolidge



**West Valley Rock & Mineral Club**  
Meetings are on the 2<sup>nd</sup> Tuesday  
Next Meeting: September 14, 2021, 6:30 pm  
[www.westvalleyrockandmineralclub.com](http://www.westvalleyrockandmineralclub.com)  
@ American Legion Post #53  
402 E. Narramore Ave., 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: TBA 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: October 9, 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)
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- Peter & Judy Ambelang
- Stan & Susan Celestian
- Russ Hart
- Will & Carol McDonald
- Debbie Michalowski
- Janet Stoepplmann
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Name: \_\_\_\_\_

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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

**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).

*We're on the Web!*

*Visit us at:*

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

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

**EARTH SCIENCE MUSEUM  
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