



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

February 2026
Volume 15, Issue 2

ESM OUTREACH UPDATE

Mardy Zimmermann Outreach Coordinator

Discovery of a New Ice-Cold Earth-Sized Exoplanet

By Harvey Jong

Planets orbiting other stars are known as “exoplanets”. Since the first ground-based identification of an exoplanet (51 Pegasi b) in October 1995, over 6,100 exoplanets have been confirmed with multiple observations¹. These discoveries are sorted by type:

- 2,060 Neptune-like: similar size to Neptune or Uranus with hydrogen or helium atmospheres around rocky, heavy metal cores
- 2,040 Gas Giant: size of Saturn or Jupiter or larger with swirling gases above solid cores
- 1,771 Super Earth: may be rocky, gaseous, or a combination; larger than Earth but smaller than Neptune
- 222 Terrestrial: Earth-sized or smaller; made of rock and metal; may or may not have oceans or atmospheres
- 7 Unknown

Thousands more candidate planets await confirmation which includes a potential Earth-sized exoplanet orbiting a star (HD 137010) located 146 light years away from Earth in the constellation Libra. This

candidate has been designated as HD 137010 b, and its discovery was announced on January 27, 2026 in a paper published in *The Astrophysical Journal Letters* (Venner et al., 2026).

Detecting Exoplanets

Due to the challenges of observing extremely faint objects at very long distances, a number of different, mostly indirect, methods are used to detect exoplanets. To eliminate false positives, confirmation of candidates involves follow-up observations along with in-depth analysis.

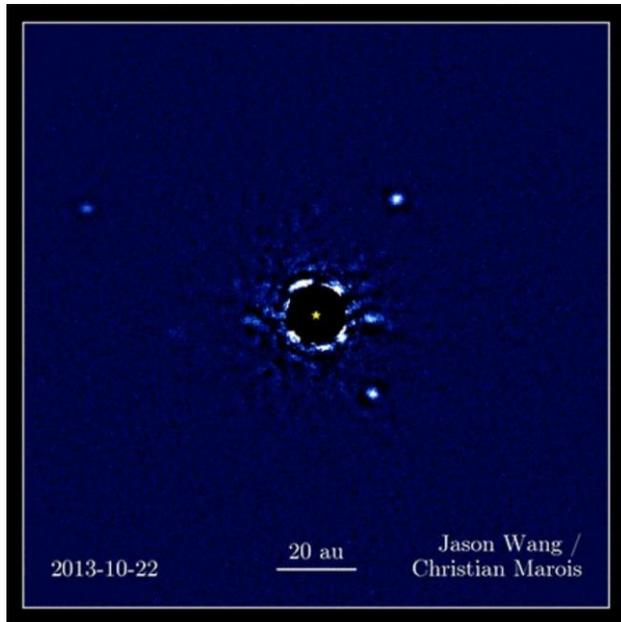
Some detection methods include:

Direct Imaging

Improvements in imaging technology along with new ground and space-based telescopes have enabled direct observation of exoplanets. Coronagraph instruments are used to block the glare of stars and reveal orbiting planets. The resulting images, however, are mainly confined to hot gas giants that are self-luminous. Currently, only 49 exoplanets have been detected through direct imaging.²

¹ According to the NASA exoplanets discovery dashboard, <https://science.nasa.gov/exoplanets/discoveries-dashboard/>, accessed on February 9, 2026.

² According to the NASA Exoplanet Archive, <https://exoplanetarchive.ipac.caltech.edu/>, accessed on February 16, 2026.



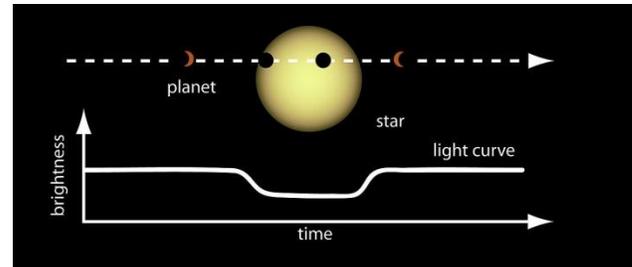
Screenshot of a Composite Movie Showing Four Planets Orbiting Around Star HR 8799

Jason Wang and Christian Marois animation, - PD, via science.nasa.gov

The HR 8799 system is the only directly imaged solar system with four super Jupiter size planets. The star is located 135 light years from Earth, while the planets are about 1.2 times the diameter of Jupiter. Click on the above image to view the movie which combines seven years of images acquired by the W.M. Keck Observatory in Hawaii.

Transit photometry

Transit photometry is one of the most common techniques used to detect exoplanets. A transit occurs when a planet passes in front of a star resulting in a slight dimming of its brightness. Measuring the amount of light that is blocked can provide information on the planet's size, while the orbital period can be determined by the time between transits.



The Drop In A Star's Brightness Due To A Planetary Transit

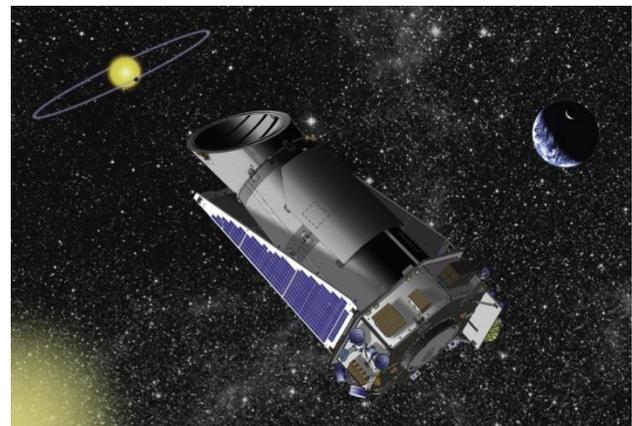
NASA Ames diagram, - PD, via Wikimedia Commons

Both ground and space-based telescopes can be used with this method providing complementary observations in confirming exoplanet candidates.

Space telescopes have played a key role in accelerating the discovery of new exoplanets, and NASA's Kepler space telescope conducted a ground breaking survey of over 500,000 stars in our galaxy.

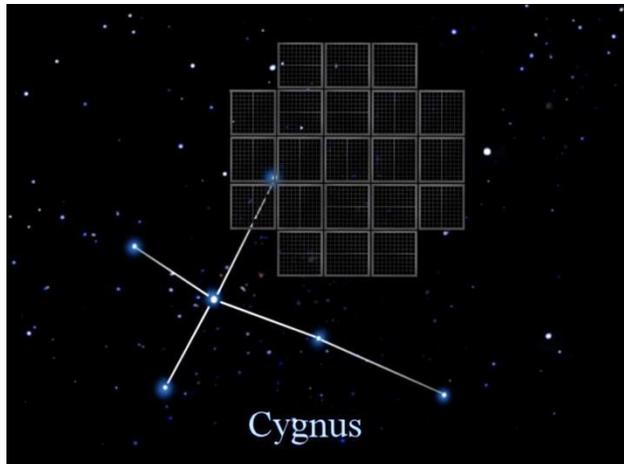
Kepler/K2 Mission

Launched in March 2009, the Kepler space telescope represented NASA's first dedicated planet-hunting mission. Its objective involved monitoring 100,000 main sequence stars in the constellation Cygnus over a period of three and half years. The spacecraft was built around a specially designed 1 m (3.3 ft) telescope with an ultra-precise pointing system for observing transits. This system relied on gyroscope-like reaction wheels to aim the spacecraft.



Kepler Space Telescope

NASA illustration, - PD, via Wikimedia Commons

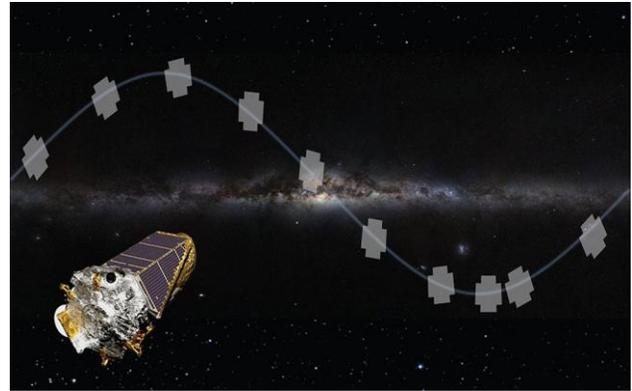


Target Field of View of the Original Kepler Mission

Screenshot from NASA animation [KeplerFOV_H264_FullSize.mp4](#), - PD, via science.nasa.gov

The constellation Cygnus was selected since it includes a dense field of stars and is located above the ecliptic plane of the solar system where light scattered by dust or asteroids would not interfere with Kepler's imaging system. This system has a total of 95 megapixels which as shown above are arranged in an array of 21 square modules.

In May 2013, two of the four spacecraft reaction wheels failed which effectively ended the telescope's primary data collection mission. Engineers, however, devised a clever workaround using the pressure of sunlight and the remaining two reaction wheels to balance and maintain the spacecraft's position. Due to solar illumination constraints, this scheme involved shifting the spacecraft's field of view every 83 days. As a result, a larger swath of sky along the ecliptic plane was scanned. This extended mission, which was dubbed "K2", continued until October 2018 when the spacecraft ran out of fuel.



Locations of K2 Target Field of Views Along the Ecliptic Plane

NASA graphic, - PD, via astrobiology.nasa.gov
The K2 mission involved surveying a different part of the sky every 83 days. Nineteen areas were examined before the spacecraft ran out of fuel.

The huge amount of data collected by the Kepler/K2 mission was made available to the public as well as the scientific community. This open access created opportunities for "citizen science" where the general public can participate in the search for new exoplanets. Citizen scientists from the Planet Hunters project sifted through this data and helped flag the exoplanet candidate HD 137010 b.

Discovery of HD 137010 b

HD 137010 b was identified from a single 10-hour transit event observed during the K2 mission in 2017. Data analysis indicates that the candidate is orbiting a K-type dwarf star located 146 light years from Earth in the constellation Libra. It has a radius about 1.06 times that of Earth, an approximate orbital period of 355 days, and a likely rocky composition. Since the host dwarf star is dimmer than our Sun, the potential exoplanet has been estimated to receive only 29% of incident flux that the Earth does. This places HD 137010 b at the outer edge of the habitable zone of its star system. An equilibrium temperature of -68°C (-90.4°F) has been estimated which would make it colder than Mars (Venner et al., 2026).



Artist Concept of Exoplanet Candidate HD 137010 b

Keith Miller/JPL-Caltech/NASA illustration, - PD, via science.nasa.gov

Click on the above image to view an animation of HD 137010 b.

While a very thorough analysis of a single observation has been performed, confirmation of HD 137010 b as a recognized exoplanet requires follow-up observations. The candidate's Earth-like characteristics may encourage further investigation by other space probes, such as NASA's Transiting Exoplanet Survey Satellite (TESS).

References

Venner, A., A. Vanderburg, C.X. Huang, S. Dholakia, H.M. Schwengeler, S.B. Howell, R.A. Wittenmyer, M.H. Kristiansen, M. Omohundro, and I.A. Terentev (2026) A cool Earth-sized planet candidate transiting a tenth magnitude K-dwarf from K2. *The Astrophysical Journal Letters*, 997:L38 17p.



Artist Concept of the Exoplanets Discovered by the Kepler/K2 Mission

NASA Goddard Space Flight Center illustration, - PD, via exoplanets.nasa.gov

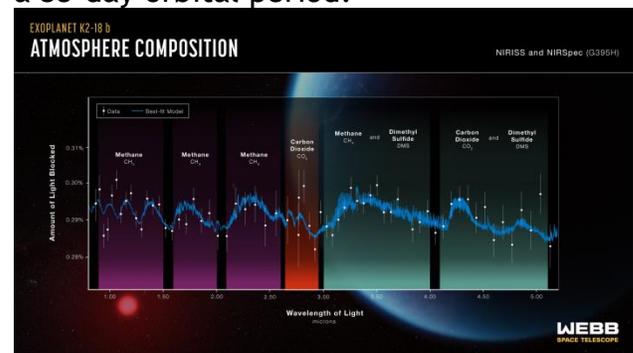
This illustration depicts the variety of exoplanets, ranging from small rocky worlds to gas giants, discovered by the Kepler Space Telescope.



Artist Concept of Exoplanet K2-18b

Joseph Olmsted/NASA, ESA, CSA illustration, - PD, via science.nasa.gov

K2-18b is an exoplanet orbiting a red dwarf star located 120 light-years from Earth. The exoplanet was discovered in 2015 and is around 8.6 times as massive as Earth. It has a radius of about 2.6 times that of Earth and a 33-day orbital period.



Atmospheric Composition of K2-18b

Ralf Crawford and Joseph Olmsted/NASA graphic, - PD, via science.nasa.gov

The James Webb Space Telescope recently obtained the spectra of K2-18b which revealed an abundance of methane and carbon dioxide in the exoplanet's atmosphere. The detection of methane and carbon dioxide and a shortage of ammonia suggest the possible presence of an ocean underneath a hydrogen-rich atmosphere. Earlier in 2019, data from the Hubble Space Telescope indicated the presence of water vapor. ◇ ◇ ◇



Arizona Rocks 153

Text by Ray Grant
Photos are screenshots

Arizona Bulletin 196 (1985) of the Arizona Geological Survey has about 5,500 mines listed.

It is interesting to look at the names of Arizona mines. Some mine names conjure up visions of good luck for example Ace in Hole, Gold Hope, Lucky Dream, Lucky Find, and New Year's Gift Mine. Others are named for wives, girlfriends, or maybe lost loves such as Betty Jo, Betty Lou, Cora, Judy Jane, Lady Jane, and Little Daisy Mine. Some of the mine names have a negative context, ones like Hardly Able, Relief, and Dig More Mine. These are all names of mines in Maricopa County; there are 267 mines listed for the county.

In the list, there were in Arizona, 13 Silver Queen Mines, 11 Silver Kings, 11 Copper Kings, 10 Copper Queens, 10 Gold Hill Mines, 8 Gold Kings, and 7 Gold Coins. Then there are some interesting mine names such as Crazy Swede, Fruit Peddler, Ideal Dump, Spotted Goat, Beanpot, Hot Rocks, and Suckerite. Would you invest in the Suckerite Mine?

And there are mines that I can't find, for example the Mineralogy of Arizona lists kasolite and soddyite from the Steel City Mine in Yavapai County. I can't find any information about the location of this mine. There are also mine names collectors make up to keep a locality secret like Melissa for South Geronimo or Barking Spider for Finch. Lots of names, lots of fun finding out where they are!

Wulfenite coated with quartz, Finch Mine



South Geronimo or Melissa Mine, La Paz County, Arizona



Wulfenite South Geronimo Mine
Marc Fleischer photograph



Barking Spider or Finch Mine, Gila County, Arizona





Pinal Geology & Mineral Museum

Pinal Museum and Society News

351 N. Arizona Blvd., Coolidge, AZ

Pinal Geology and Mineral Society next meeting

March 18, 2026

Meetings are the third Wednesday at 7pm, doors open at 6:00 so stop in early to have a look around and see what is new--we have added new displays and will have new loaned specimens on display!

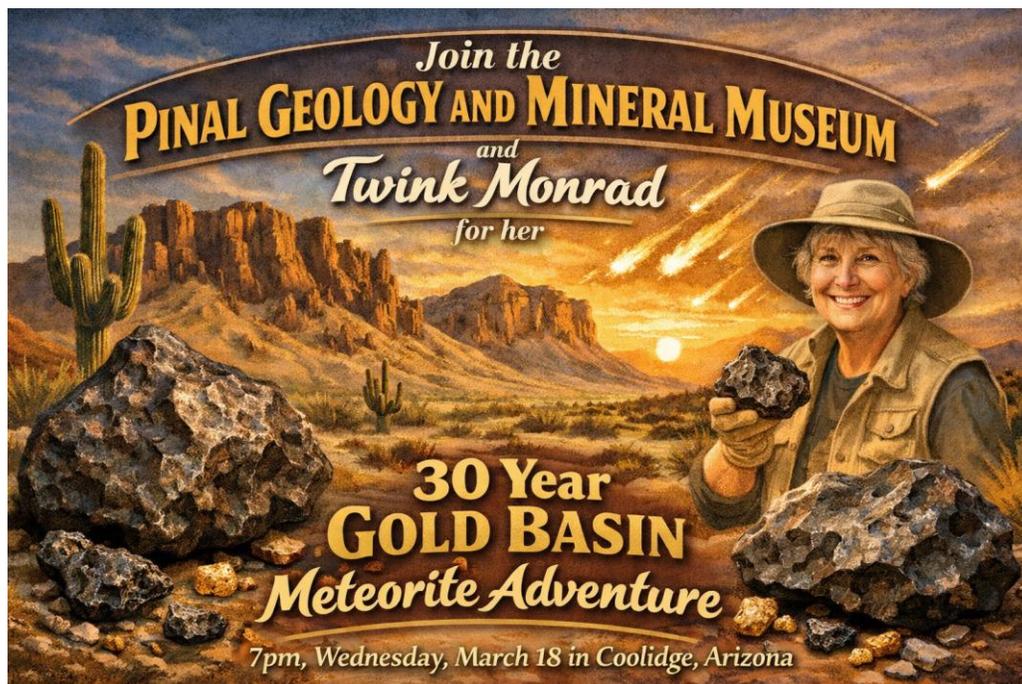
www.pinalgeologymuseum.org

Ray Grant ray@pinalgeologymuseum.org

Pinal Geology and Mineral Museum
museum open Fridays & Saturdays from 10 - 4
admission is free.

Groups can arrange special visits please call 520-723-3009.

Our March speaker will be Twink Monrad of Oro Valley, Arizona and she will present her 30-year adventure of collecting meteorites--particularly her involvement in the famed Gold Basin strewn field of Mohave County.





AZ Mining, Mineral & Natural Resources Education Museum Update February 2026

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

Catie Carter Sandoval
 cscarter@email.arizona.edu
 703.577.6449

Help support the museum at:
<http://tinyurl.com/SupportMM-NREMuseum>

Our special exhibit at the recent 71st annual Tucson Gem and Mineral Show was awarded this year's Betty & Clayton Gibson Memorial Trophy for Best Museum Exhibit. Our exhibit was titled "Museums: The Spirit of America," and was a twist on the show theme of "Red White & Blue - Celebrate the Spirit of Minerals." The display used real museum data and specimens from the collection to showcase why museums and their collections are important to the American people.

According to TGMS judges, the main criteria for the award was education, and we did indeed design this display with education in mind. The informational labels cited three reasons why museums are vitally important: they preserve objects and stories, they inspire curiosity and learning, and they build community. The themes were formulated from actual visitor data from the American Alliance of Museums' 2025 and 2024 Surveys of Museum-Goers. We then connected the themes to our specimens on display, including information about Arizona's gold and silver mining history (with historic gold and silver specimens), Arizona's non-metal mineral commodities (with peridot and perlite specimens), and finally, minerals we need for our rapidly changing modern society (with various minerals needed to build clean energy infrastructure).

One section of our case details how museums inspire curiosity and learning, and showcases peridot and perlite, two non-metal mineral commodities from Arizona.

This exhibit prompted some interesting discussions with TGMS visitors, and we learned that many people agree with us about the continued importance of museums for our country's heritage and future. We were honored to win the award and had a wonderful time at the show. Thank you, Tucson Gem and Mineral Society!



Our special exhibit, "Museums: The Spirit of America," at the 2026 Tucson Gem and Mineral Show.



The TGMS Betty & Clayton Gibson Memorial Trophy for Best Museum Exhibit. Catie with the award at exhibit takedown.



**Sun City Rockhound Mineral Museum
Sundial Recreation Center
14801 N. 103rd Ave.
Sun City, AZ 85351**

The museum offers private party tours for schools, clubs and individuals. We'd love to show off our museum to your club or private group. If you are interested, please contact the museum at scrockmuseum@gmail.com.

Please take a minute to check out our new website at scrockmuseum.com.

**Carol Bankert George Honored with
new title Director Emeritus of Sun
City Mineral Museum
By Carol Ann Hewett**



Carol Bankert George receiving her award from Sun City Rockhounds President Lynn Applebaum on February 12, 2026.

Carol Bankert George has been officially named Director Emeritus of the Sun City Mineral Museum, marking a significant milestone in her distinguished career with the Sun City Rockhounds. This honor reflects Carol's years of dedicated leadership as Vice President, unwavering commitment to the museum as its director, and her passion for



**Winter Hours
October – April
10 am to 1 pm
Closed Thurs., & Sunday
Summer Hours
May-September 10am-1pm
Saturdays only**

education and community engagement within the museum.

Carol has been an active part of the Sun City Rockhound and Mineral Museum since moving to Sun City in 2014. Her love of rocks and minerals started in childhood. While serving on the board and volunteering in the museum, her knowledge of rocks, minerals, and the hobby of rockhounding deepened.

In 2025, Carol became the Museum Director. During this time, she led the museum through a refurbish which was completed during the summer of 2025. This created an opportunity to reimagine the exhibit layout. All displays were redesigned and unveiled at the museum's 35th anniversary celebration on October 1, 2025. One of her visions has been to increase community involvement through on-loan exhibits from other museums, organizations, and private collectors. Over the years she has built strong relationships resulting in current displays from the Arizona Mining, Mineral, and Natural Resources Education Museum, Pinal Geology and Mineral Museum, SALT (Studying Ancient Lifeways and Technologies), and private collector Bob Homes. Through her guidance, the Sun City Mineral Museum has become a valued asset to the community, sparking interest and exploration among visitors, young and old.

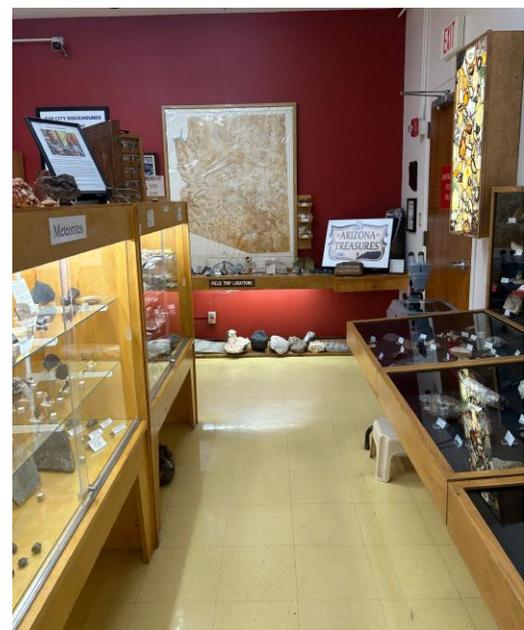
At the Sun City Rockhounds meeting Carol was presented with a prestigious award in recognition of her exceptional service and contributions to both the museum and the broader rockhounding community. The

award celebrates her role in fostering a welcoming environment for enthusiasts, students, and visitors, and her efforts in advancing the appreciation of minerals, geology, and natural history throughout Sun City and beyond.

As Director Emeritus, Carol will continue to serve as an ambassador for the museum, offering her expertise and guidance to future leaders and supporting ongoing initiatives. The recognition by the Sun City Rockhounds further underscores the lasting impact of her service and the deep appreciation held for her by colleagues and friends alike.

The Sun City Mineral Museum and the Sun City Rockhounds extend their heartfelt gratitude and congratulations to Carol for her outstanding contributions. Her legacy will continue to shape the museum's mission and inspire future generations of mineral enthusiasts and learners.

The following photos are showing the newly refurbished Mineral Museum that was completed summer of 2025. Carol's greatest accomplishment!



Arizona Rock and Gem Shows



DAISY MOUNTAIN ROCK AND MINERAL SHOW

FEBRUARY 28 & MARCH 1 2026 at the

OUTLETS NORTH PHOENIX

SATURDAY 9 TO 5 PM AND SUNDAY 10 TO 4 PM

CHILDREN UNDER 12 FREE WITH ADULT

Presenting Rocks, Crystals, Fossils, Jewelry, Meteorites, Beads PLUS a Raffle every 30 minutes

ALSO KIDS ROW - Lots of activities for the little ones including our **FAMOUS EGG CARTON COLLECTION** that can be filled with over 50 different types of specimens from which to choose.

FOR MORE INFORMATION GO TO: www.dmrmc.com



WULFENITE IS THE STATE MINERAL

This one was collected at the Red Cloud Mine on one of the Daisy Mountain Rock and Mineral Club's field trips.

Sun City Rockhounds Open House and Rock Sale

Rock Sale March 14, 8-1

Sun Dial Recreation Center

Museum Open house March 14

Time: 9-2

Location: Sun City Mineral Museum

Sun Dial Recreation Center 14801 N. 103rd
Ave, Sun City AZ 85351

Contact us at scrockmuseum@gmail.com

Gila County Gem & Mineral Society Spring Show and Sell

April 11, 2026

Sat. 9:00 am to 2:00 pm

Bullion Plaza Cultural Center & Museum
Lawn

150 Plaza Circle

Miami, AZ

Website: GilaGem.org

Arizona Rock and Gem Shows

Gila County Gem & Mineral Society

SPRING SHOW & SELL

Bento Guy Food
Truck on site!



Interested in being a vendor?

We offer 8-foot table spaces for \$10 each.
Must be rock/mineral related items.
Tables provided. Vendor to bring chairs, canopies and
table covers if desired.

Deadline to Reserve: March 30, 2026

For information/reserve a table:

Beverly Hawkins: gilagem.shows@gmail.com
or 928-363-0345



Saturday, April 11, 2026
9 A.M.-2 P.M.

Bullion Plaza Cultural Center & Museum Lawn
150 Plaza Circle, Miami AZ 85539

Arizona Rock and Gem Shows



**THE PINAL GEOLOGY AND MINERAL MUSEUM
AND JOHN CHRISTIAN PRESENT**

**ARIZONA
FOSSIL FEST
2026**

SATURDAY, MAY 9
351 N. ARIZONA BLVD, COOLIDGE, AZ
10AM-4PM

**HAVE YOUR FOSSILS IDENTIFIED BY EXPERTS
FREE EVENT!**

Arizona Rock and Gem Clubs



Apache Junction Rock & Gem Club

Meetings are on the 2nd Thursday
Next Meeting: March 12, 2026, 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: March 3, 2026, 6:30 p.m.

www.dmrmc.com

@ Anthem Civic Building

3701 W. Anthem Way, Anthem, AZ



Maricopa Lapidary Society, Inc

Meetings are on the 3rd Tuesday

Next Meeting: March 17, 2026, 7:00 pm

www.maricopalapidarysociety.com

@ North Mountain Visitor Center

12950 N. 7th St., Phoenix, AZ



Mineralogical Society of Arizona

Meetings are usually on the 3rd Thursday
(Except June & December)

March 19, 2026, 6:30 pm

@ Franciscan Renewal Center, (Piper Hall),

5802 E. Lincoln Drive, Scottsdale, AZ

www.msaz.org



Pinal Geology & Mineral Society

Meetings are on the 3rd Wednesday

Next Meeting: March 18, 2026, 7:00 pm

www.pinalgeologymuseum.org

351 N. Arizona Blvd., Coolidge



West Valley Rock & Mineral Club

Meetings are on the 2nd Tuesday

Next Meeting: March 10, 2026, 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: March 5, 2026, 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: March 13, 2026, 7:00 pm

www.wickenburggms.org

@ Coffinger Park Banquet Room

175 E. Swilling St., Wickenburg, AZ

ESM's Meeting Notice

ESM's next meeting will be at North Mountain Visitor Center, 12950 N. 7th St., Phoenix, on Tuesday, TBA 2026, 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
- Friends of the AZ Mining & Mineral Museum
- Maricopa Lapidary Society
<http://maricopalapidarysociety.com/>
- Mineralogical Society of AZ
www.msaaaz.org
- Payson Rimstones Rock Club
<https://www.rimstonesrockclub.org/>
- Sossaman Middle School
- White Mountain Gem & Mineral Club
www.whitemountain-azrockclub.org
- Sun City Rockhound Club & Mineral Museum
<https://suncityaz.org/recreation/clubs/rockhound-club-mineral-museums/>
- 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	Will & Carol McDonald
Peter & Judy Ambelang	Debbie Michalowski
Stan & Susan Celestian	Janet Stoepplmann
Russ Hart	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 2026, at 6:30 p.m.

THANK YOU FOR YOUR CONTINUING INTEREST & SUPPORT!!!

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