



# DAISY MOUNTAIN ROCKCHIPS

*The purpose of Daisy Mountain Rock & Mineral Club is to promote and further an interest in geology, mineralogy, and lapidary arts, through education, field experiences, public service, and friendship.*

**VOLUME 9, ISSUE 1**

**JANUARY 2024**

# EARTHQUAKE DETECTION KIT



Attach firmly to a wall with tacks or nails.

If the eyes begin to shake, you are experiencing a quake.

**TAKE COVER!**

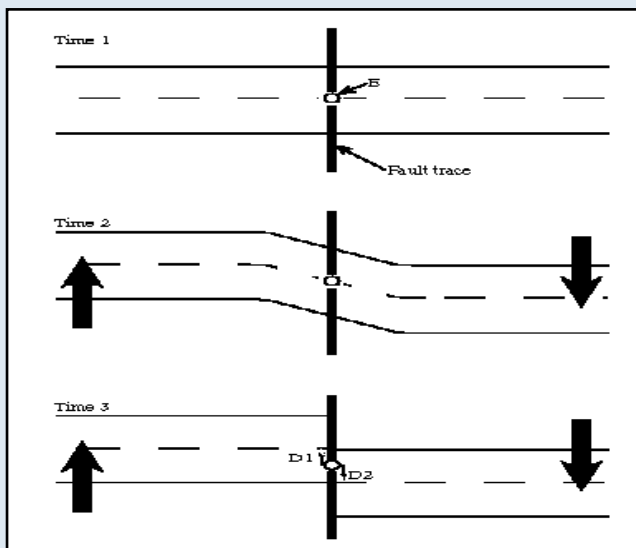
# EARTHQUAKES

By Susan Celestian

The New Year was rung in by a M7.5 earthquake in Japan, killing over 200 people, disrupting services, damaging buildings, and triggering tsunami warnings.

*What is an earthquake? What causes earthquakes? How are they classified? How do they impact the globe? How are they recorded? Are they rare events?*

An earthquake is a release of energy, resulting from movement along a fault, or rupture in the Earth's crust. Slow creep along a fault does not result in an earthquake. But sometimes friction locks up a fault until it suddenly releases pent up energy. This is called the Elastic Rebound, as described and illustrated in Figure 1.



**FIGURE 1 ELASTIC REBOUND and EARTHQUAKES** In the illustration above, a road crosses a fault, along which movement is to the top on the left, and to the bottom on the right. Friction along the fault increases the resistance to movement and slippage along the fault causes the Earth (and road thereupon) to bend (as seen in Time 2) — this is **elastic deformation**. This bending will continue until the strength of the friction is exceeded, and a sudden break occurs (as depicted in Time 3), allowing the rocks to return to their original shape (this is **elastic rebound**). With the rupture, stored elastic strain energy is suddenly released — and that is an earthquake. *Graphic by Bumfluff and licensed under Creative Commons [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/).*

Earthquakes continued on page 10....

**FACT: EARTHQUAKES occur all over the globe.....**

- \* at convergent tectonic boundaries (majority of great earthquakes)
- \* at divergent tectonic boundaries
- \* at transform fault boundaries
- \* where magma is moving—tectonic boundaries, hot spots
- \* when depressed crust is rebounding after removal of a load, such as glacial ice
- \* at ancient faults in continental interiors
- \* (rarely) along faults lubricated by human activity (dumping liquid waste, fracking)

**SAVE THE DATE!**

**ANTHEM SHOW**

**March 2-3, 2024**  
**Anthem Elementary**

**MORE VOLUNTEER SIGNUP OPPORTUNITIES AT FEBRUARY MEETING!!!**

**Proceeds pay for annual scholarship, meeting rooms, club events, and more.....**

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JANUARY SPEAKER

# ICELAND: Land of Fire & Ice

Susan Celestian

Iceland is a land of volcanic landscapes and glaciers, decorated with waterfalls, lighthouses, sheep, horses, birds and beautiful flowers.



Iceland sits astride the Mid-Atlantic Ridge, and is expanding at the rate of about 1"/year, as the North American Plate moves to the east, and the Eurasian Plate moves west. Iceland is built of mostly basalt, arriving at the surface via volcanoes.



Columnar Joints + column slice headstone



Very aggressive & territorial Arctic Tern, a bird that migrates from the Arctic to the Antarctic and back every year (nearly 20K miles).



Brúarfoss



Seitún Geothermal Area



Thermal features behind foreground of Nooka Lupine

# WIRE WRAPPING

**CLASS DATE:** on the 1st Tuesday

**CLASS TIME:** 4:30-6:15

**CLASS PLACE:** Anthem Civic Center, 3701 W Anthem Way

**Monthly meetings are prior to the general club meeting. Great class for beginner to advanced. Come and wire wrap with friends!!!**

**GENERAL RULE:** Bring a cabochon or other stone, 20 and 26 gauge copper-based wire, round nose pliers, flush cutters, and any other tools you might use.

MONTHLY PROJECT PARTICULARS will be posted on the DMRMC [Facebook](#) page.

\*If you want to try it out, the club has 4 sets of tools and wire that you may borrow during a class. If you like it, you can then purchase your own supplies.

The class is free; however tips are always welcome. All teachers are unpaid volunteers so the tips go towards gas and supplies to make things more fun for you!

## FEBRUARY PROJECT: Trees of Life



Photo of examples by Rebecca Noel

### WHAT TO BRING:

- ◆ 18-gauge wire
- ◆ 24-25 gauge wire
- ◆ 1 flat stone or cabochon
- ◆ Round nose pliers
- ◆ Flat nose pliers
- ◆ Wire cutters and a smile



Two views of an Iron Age brooch made of one length of copper alloy wire, twisted to form pin, spring & design.  
Image from *The Portable Antiquities Scheme/ The Trustees of the British Museum* and licensed under CC BY-SA 2.0 DEED

...Field trips continued from page 6

# FIELD TRIP to BRENDA AREA

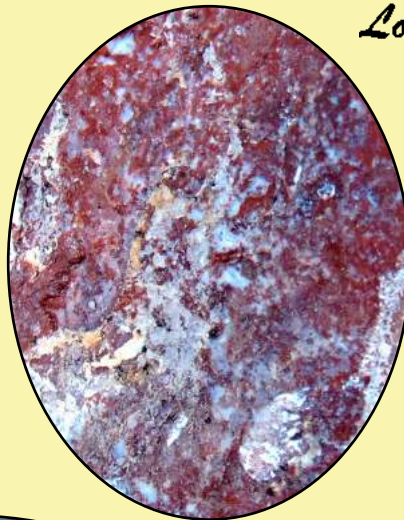
## Wednesday, January 3, 2024

Photos & text by Bill Freese

the DMRMC had our first mid-week trip of 2024 to the area west of Brenda, AZ. One of the best finds there is the Jasper with black druzy. There are many different types of treasures in this area as you can see by the pics. We had 19 folks on the trip and I think everyone picked up something different. Always a fun trip.



*Looks like some good cabs in the future!*



A wild pocket of barite found by Sam Rivers. Photo by Sam River6

Field trips continued on page 5..

...Field trips continued from page 5

## FIELD TRIP to FOURTH OF JULY BUTTE

### Wednesday, January 17, 2024

*Photos & text by Bill Freese*

Hey Rockhounds, the DMRMC had a mid-week trip on Wednesday to 4th of July Butte for agates. We ended up with 34 members in many vehicles making the trek down that dusty 21 mile trail. The weather was great and the everyone scattered after we arrived at the site, so the only pic I have is the group shot. The agates were on the small side but still colorful.



This is an agate nodule from the Chimney Beds at Fourth of July Butte, found by Sue & Stan Celestian many years ago. This nodule is about 3.5" diameter. There is definitely some nice material in the area!!! *Photo by Stan Celestian*

...Field trips continued from page 6

## FIELD TRIP to QUARTZSITE

### Saturday, January 20, 2024

*Photos & text by Bill Freese*

Hey Rockhounds. The DMRMC had a Club Day at Quartzsite on Sat Jan 20th. We ended up with about 20 of us roaming around the Pow Wow and Desert Garden shows. We all spent too much, but we good very cool minerals. The weather was cool and overcast. No rain though. Everyone enjoyed their shopping spree. Until next time...



*Field trips continued on page 8...*

...Field trips continued from page 7

# FIELD TRIP to DOBELL RANCH

## Sunday, January 21, 2024

Photos & text by Bill Freese

Hey Everyone. The DMRMC had a trip to DoBell Ranch for petrified wood on Sun Jan21st. We invited 6 clubs, but only had 3 others with attendees - Wickenburg, Mingus & Payson. We had about 16 adventurous rockhounds brave the light rain at the ranch to collect some petrified wood. The rain made all of the pieces look better! (no squirt bottle needed) This is ALWAYS a fun trip. Rhonda fed us lunch and we all enjoyed the company. Until next time...



Field trips continued on page 9...



...Field trips continued from page 8

# FIELD TRIP to CONTACT MINE

## Saturday, January 27, 2024

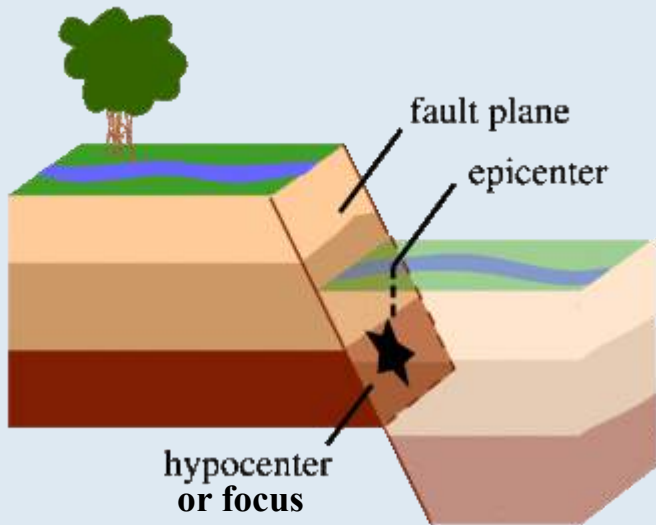
Photos & text by Bill Freese

Hey Rockhounds, The DMRMC had a trip on Saturday to the Contact Mine for Amethyst. We had a great crew of 22 folks that made it out on a beautiful AZ desert day. Everyone found some great specimens and enjoyed the beautiful landscape. That is exactly what we want for a rockhound trip . Until next time...



...Earthquakes continued from page 2

See Figure 2 for illustrated terminology associated with a fault along which an earthquake has occurred.



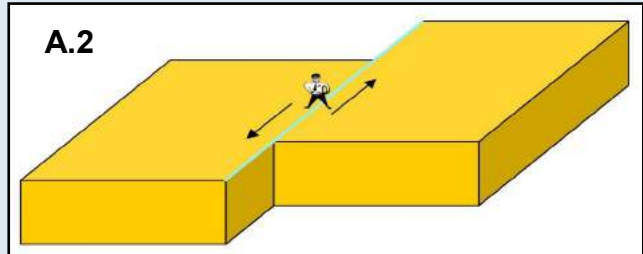
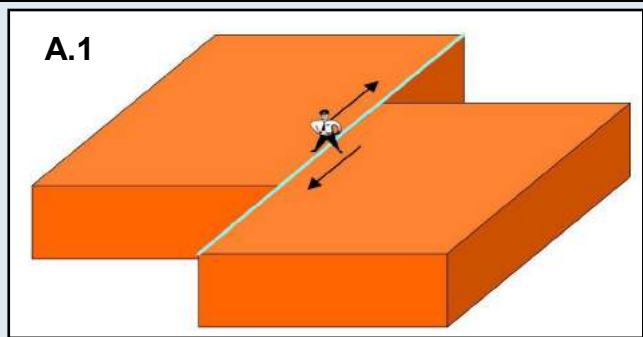
**FIGURE 2 EARTHQUAKE ON A FAULT**

Faults are planar fractures along which there has been movement. The point at which rupture occurs is called the hypocenter or focus. The epicenter is the point on the Earth's surface directly above the focus. *Graphic by the USGS, Public Domain.*

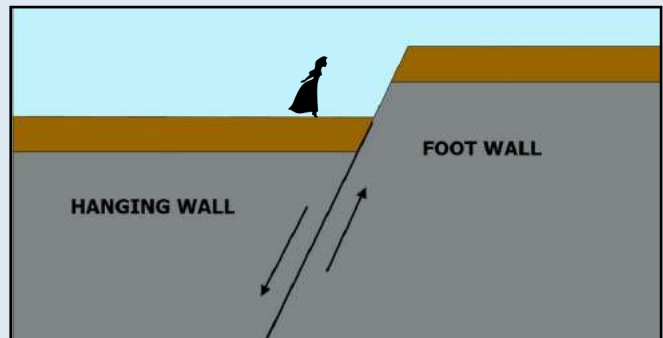
**TYPES OF FAULTS**

There are three types of faults, and they all may produce earthquakes. See Figures 3-5.

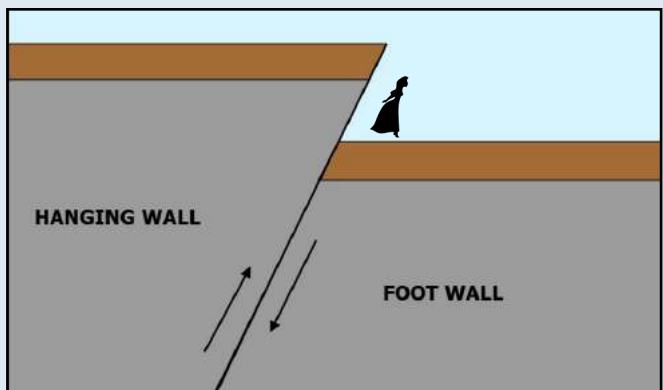
- ◆ Strike-slip: Movement along these faults is largely horizontal, with little vertical offset. One example of this type is the San Andreas Fault. This type of fault is associated with **shear stress**. Figure 3
- ◆ Dip-slip: Movement along these faults is largely vertical, with little horizontal offset.
  - Normal faults: the hanging wall goes down relative to the foot wall; associated with **tension**. Figure 4
  - Reverse & thrust faults: the hanging wall goes up relative to the foot wall; associated with **compression**. Figure 5
- ◆ Oblique-slip: Movement along these faults involves significant vertical and horizontal offset.



**FIGURE 3 STRIKE-SLIP FAULTS** These faults are expressed by horizontal offset. A.1 depicts a right-lateral fault; A.2 depicts a left-lateral fault. *Graphic by Susan Celestian.*



**FIGURE 4 NORMAL DIP-SLIP FAULTS** These faults are expressed by vertical offset, with the hanging wall going down relative to the foot wall. *Graphic by Susan Celestian.*

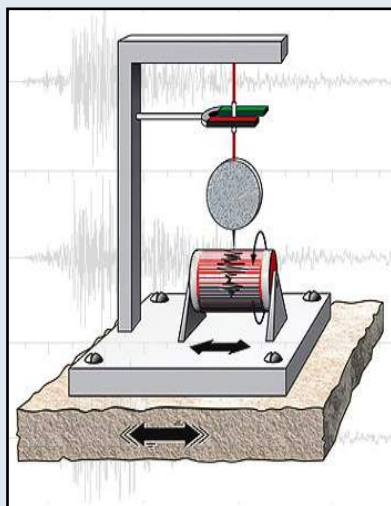


**FIGURE 5 REVERSE DIP-SLIP FAULTS** These faults are expressed by vertical offset, with the foot wall going down relative to the hanging wall. *Graphic by Susan Celestian.*

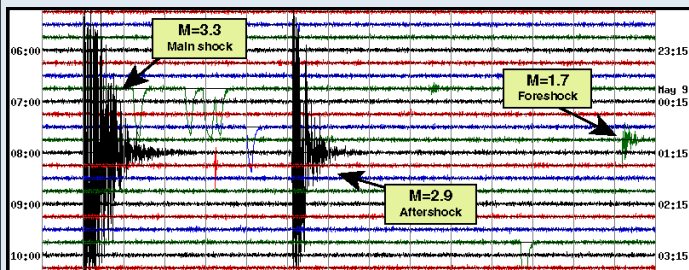
...Earthquakes continued from page 10

**HOW ARE EARTHQUAKES RECORDED?**

Machines that record the arrival and amplitude of earthquake waves are called seismometers. In simplest terms, a seismometer is firmly attached to the ground (or in the ground). Inside, is a very heavy pendulum attached to a spring at one end and a pen at the other. Under the pen is a scrolling roll of paper. When the ground shakes, the machine moves, EXCEPT for the inertia-rich pendulum. As the paper scrolls past the pen, it records ground movement as squiggles. See Figure 6-7. TODAY, these machines are electronic and the data is digital.

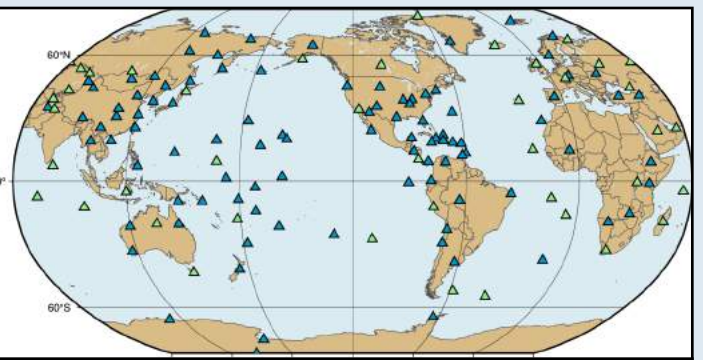


**FIGURE 6 SEISMOMETER**  
The inertia of the heavy weight holds essentially holds the pen in a “stationary” position, while the base moves back and forth.  
*Graphic by Dollynarak - Own work, FAL at Wikipedia Commons*



**FIGURE 7 SEISMOGRAM** A record of the arrival and amplitude of various seismic wave.  
*Graphic by the USGS, Public Domain.*

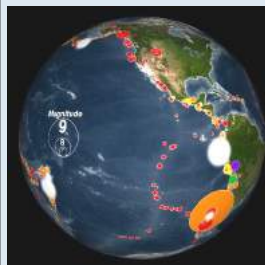
It takes the seismic record of at least 3 seismic stations to pinpoint the epicenter of any earthquake (although the more the merrier) A global network of at least 2000 seismographic stations — each consisting of multiple machines, recording various earthquake waves — transmit information to scientists around the world The U.S. maintains at least 150 stations. See Figure 8.



**FIGURE 8 GLOBAL SEISMOGRAPHIC NETWORK**  
Each triangle represents a seismographic site: Blue triangles are USGS-owned, and green are IRAS/IDA-owned.  
*Graphic by the USGS, Public Domain.*

**ARE EARTHQUAKES RARE?**

There are hundreds of thousands of earthquakes every year! Most are not felt by anyone, but the tiniest earthquake will register on seismographs. Ctrl/Click on the image below (Figure 9) to link to a NOAA website depicting earthquake history over 100 years - 1/1/1901-12/30/2000. Be sure to read the explanation below the image on the website.



**FIGURE 9 EARTHQUAKES OF THE 20th CENTURY** Each earthquake recorded during the 1901-2000 period will appear as a flash — one year per second. It is eye-opening!! *Graphic by the NOAA, Public Domain.*

**EARTHQUAKE VOCABULARY**

I won't bore you with a long list of words and their meanings. However, should you wish to bone up on earthquake-speak, [HERE](#) is a good website maintained by the USGS, Earthquake Hazards Program.

To follow the earthquake activity in or neighboring states go [HERE](#) or elsewhere, go [HERE](#).

For information about earthquakes in Arizona, go [HERE](#).

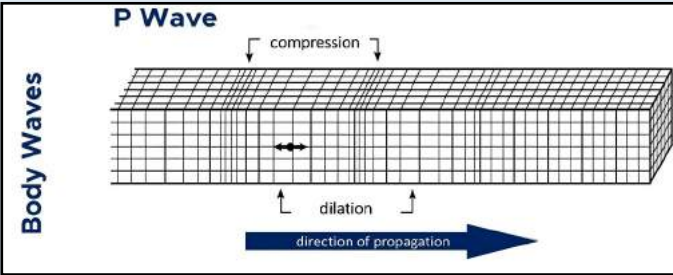
[THIS](#) IRIS website has cool interactive maps of earthquakes around the world.

If you feel an earthquake, report it [HERE](#).

...Earthquakes continued from page 11

**TYPES OF SEISMIC WAVES**

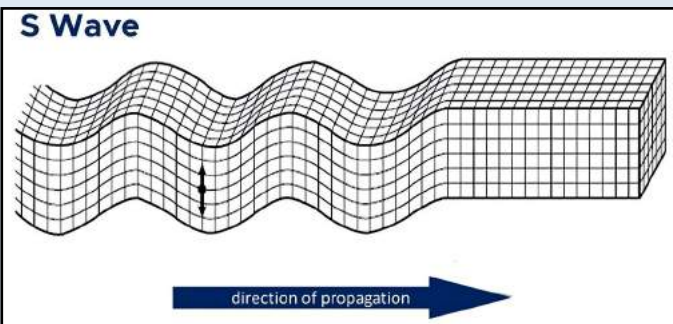
There are 4 types of energy waves generated when an earthquake occurs: P waves, S waves, Raleigh waves and Love Waves. P and S wave move through the Earth; while Raleigh and Love waves travel along the Earth's surface. See Figures 10-13.



**FIGURE 10 P WAVES** Primary or P waves are the first to arrive at seismic stations. They move through the Earth and persist through solids, liquids or gases. P waves will move fastest through the densest material. They will be slowest in unconsolidated material, liquids and gases.

**P waves move in a push-pull fashion, particles moving parallel to the direction of propagation.**

*Image by Luke Triton, Steven Earle, Mario Bačić, Lovorka Librić, Danijela Jurić Kačunić, Meho Saša Kovačević and licensed under Wikipedia CC BY-SA 4.0 DEED*

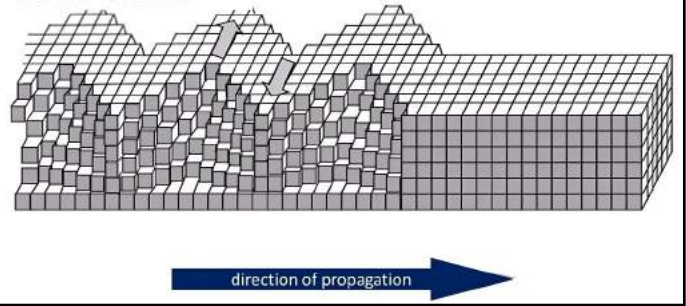


**FIGURE 11 S WAVES** Secondary or S waves are the second to arrive at seismic stations. They move through the Earth and persist only through solids. The velocity of S wave will vary with the density of the material through it is moving.

**S waves move in a shear fashion, particles moving vertically perpendicular to the direction of propagation.**

*Image by Luke Triton, Steven Earle, Mario Bačić, Lovorka Librić, Danijela Jurić Kačunić, Meho Saša Kovačević and licensed under Wikipedia CC BY-SA 4.0 DEED*

**Love Wave**

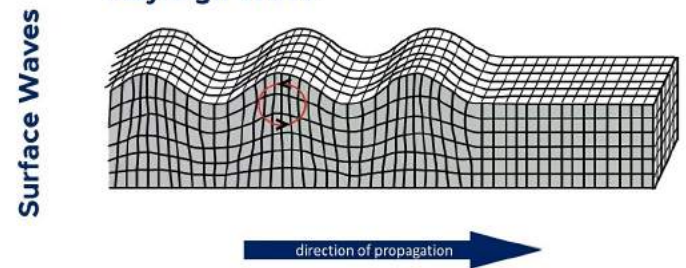


**FIGURE 12 LOVE WAVES** Love waves are the third to arrive at seismic stations. They move along the surface of the Earth. These waves are the most destructive, their motion jerking structures back and forth, and up and down. And they are the ones most felt by people.

**Love waves zig zag back and forth, particles moving horizontally perpendicular to the direction of propagation.**

*Image by Luke Triton, Steven Earle, Mario Bačić, Lovorka Librić, Danijela Jurić Kačunić, Meho Saša Kovačević and licensed under Wikipedia CC BY-SA 4.0 DEED*

**Rayleigh Wave**



**FIGURE 13 RALEIGH WAVES** Raleigh waves (ground roll) are the last to arrive at seismic stations. They move along the surface of the Earth.

**Raleigh waves move in an elliptical fashion, particles moving both horizontally and vertically.**

*Image by Luke Triton, Steven Earle, Mario Bačić, Lovorka Librić, Danijela Jurić Kačunić, Meho Saša Kovačević and licensed under Wikipedia CC BY-SA 4.0 DEED*

...Earthquakes continued from page 11

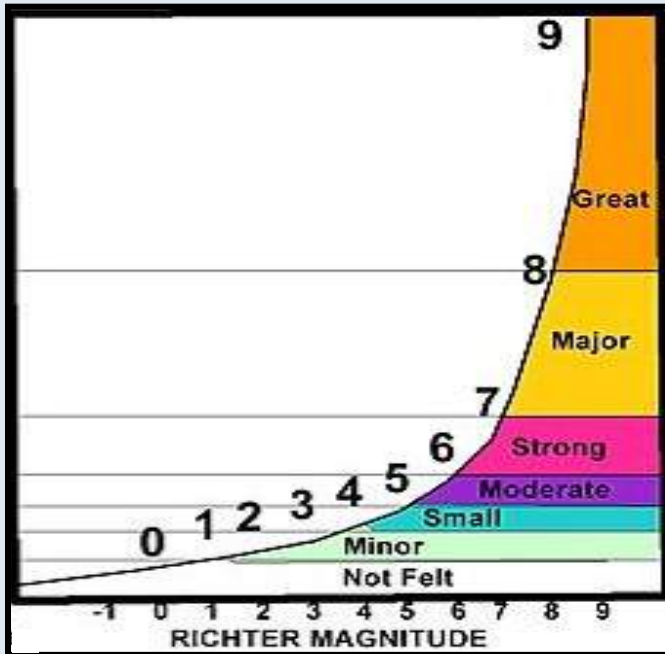
**HOW ARE EARTHQUAKES CLASSIFIED?**

There are two ways to classify or measure earthquakes: **magnitude and intensity**.

**MAGNITUDE** is a measure of the size of an earthquake. Every earthquake can be quantified with a single magnitude number. It is a measure of the energy released in an earthquake, as reflected in the amplitude of the seismic waves.

We are all familiar with the Richter Scale of Magnitude (Figure 14). More refined — but similar — scales are in use, such as Moment Magnitude; however, most news reports refer to Richter magnitude. The scale is logarithmic, which means that a M2 earthquake has an amplitude 10 times higher than and M1, a M3 is 10 times higher than M2 — and therefore 100 times higher than M1!

Another way to view magnitude is the amount of energy involved. In this case, each whole number represents a 32 times increase in energy!



**FIGURE 14 RICHTER SCALE OF MAGNITUDE**  
Graphic by Benjamin J Burger and licensed under Wikipedia [CC BY-SA 4.0 DEED](https://creativecommons.org/licenses/by-sa/4.0/); cropped

In other words, a M3 earthquake released 1,024 times the energy of an M1. And an M5 releases over 1,000,000 times the energy of an M1!!

You can see how any change in magnitude represents a significant change in the size of an earthquake. There is no lower or upper limit to the various scales, however it is estimated that the Earth can probably not generate an earthquake larger than 9.5-11 (although that would be a BIG one!).

**INTENSITY** is a measure of the amount of shaking resulting from an earthquake. This will change for every location, depending on the distance from the focus, the direction of fault rupture, and the geology of the area. In the United States, the Modified Mercalli Intensity Scale (Figure is 15) employed. It can be calculated, using instrumentation, however is traditionally a subjective scale based on observations reported on questionnaires (now web-based) — how much shaking, extent of building damage, ringing of bells, how many people felt it, did windows break, did furniture move or overturn, and so forth.

**PRIMARY EFFECTS OF EARTHQUAKES**

There are many, many infrastructure and personal secondary effects of earthquakes (building/road damage/dam, death, disruption of electricity service, fire). These all result from the several significant primary effects of earthquakes on Earth/earth:

- \* Ground Shaking
- \* Liquefaction: the liquification of wet soils due to compaction with shaking. Think of what happens when you tap your foot on a wet beach or mud patch.
- \* Landslides
- \* Fissures
- \* Surface Offset
- \* Avalanches
- \* Tsunami (Seismic Sea Wave)

Earthquakes continued on page 13....

**FIGURE 15 MERCALLI MODIFIED INTENSITY SCALE** Graphic public domain, modified from USGS

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.

**BOARD MEETING MINUTES****January 2, 2024**

**ATTENDEES:** Johanna Raupe, Cynthia Freese, Greg Josey, Renee Isaack, Bill Freese, Marc Flescher, Stan Celestian, Susan Celestian, Edward Winbourne, Kirsten Verbus, Don Richardson, Jessie Caltabiano, Tom Edwards, Claudia Marek, Brian Gummel, Bill Powell

**ABSENT:** Deanne Gosse, Rebecca Slosarik, Tiffany Poetsch

**GUEST:** Alexis Reed

**DATE:** January 2, 2024, 5:00 PM

**LOCATION:** Anthem Civic Center, 3701 W. Anthem Way, Anthem, AZ 85086

1. 'Called to Order at 5:05 PM
2. Welcomed the new additional board members and our Youth Guest for 2024
  - a. **New Board Members:** Tom Edwards, Jessica Caltabiano, Brian Gummel, Marc Flescher, Cynthia Freese
  - b. **Youth Guest:** Alexis Reed
  - c. **Bylaws:** Need to be updated to add up to two Youth Guest ages 14-18 to the board.
3. Acceptance of December's meeting minutes
  - a. Motioned by Susan Celestian
  - b. Accepted by all, none opposed
4. Insurance
  - a. All policies in with liability on everything
  - b. Need to check with Deanne if there is a 2024 budget outlined that includes the insurance?
5. Club Program Evaluation Plan
  - a. Rebecca not available for an update
6. Financial Budget Items
  - a. Honorariums, insurance
  - b. Investments – first statement not received
  - c. Reviewed financial statement for the past year.
    - i. The club did slightly better 2023 over 2022
    - ii. Extra money is available to put towards the 2024 show
7. Merchandise & Volunteer Incentives:
  - a. New show T-shirts
    - i. This year's color is flash green
    - ii. No V-necks available for women's T-shirts
    - iii. Claudia needs the t-shirt order forms turned in this week.
  - b. Stickers
  - c. Canvas Bags (\$15)
  - d. Scholarships
    - i. Two x \$2000
  - e. Sandwich Signs – Claudia wants more of these for this year's show. She has already done some research on procuring the new signs. List price \$270/sign. She believes the vendor will give her a better deal once she gets approval for quantity.
    - i. Wants four or five new signs. (five @ \$250/each)
    - ii. Bill motioned to approve \$1250.00 for the signage.
    - iii. Tom seconded
    - iv. All approved the \$1250.00, none opposed

...Minutes continued from page 14

- f. Claudia discussed a donut vendor that was amenable to working with no sales guarantee.
    - i. He originally wanted \$600/day guarantee
  - g. Claudia needs the following additional personnel for the show:
    - i. Hospitality chair
    - ii. Publicity chair
    - iii. Security
  - h. Education has two STEM nights scheduled
    - i. New River February 1, 2024 – 5-7 p.m.
    - ii. Canyon Springs March 7, 2024 - 5-7 p.m.
  - i. Bill Smardo has a new raffle specimen, Pyrite Crystals. He would like for Stan and Susan to look at it for a value assessment.
  - j. Claudia asked Stan about the status of the showcases.
8. Club Membership – Renewals (2024 renewals \$25-single, \$35-family)
    - a. Tiffany was not at the meeting to collect membership renewals.
  9. Wire Wrapping Class with instructor Rebecca Noel – Thank You
    - a. Class has been going exceptionally well.
  10. SHOW Stuff
    - a. AJ supposedly cancelled their show and only mailed notifications to the vendor list
    - b. Discussed opening the show to more vendors. Other shows are indicating that customers are spending less.
    - c. Last year we had 49 vendors. Capacity maximum decided to stay at 50.
    - d. We currently have 35 vendors signed up.
  11. Claims Committee:
    - a. Need a new claims chair
  12. Field Trips
    - a. Ran out of time to discuss
    - b. Bill planning to discuss in the general meeting
  13. Safety Committee: CPR classes, volunteers, upcoming events
    - a. Greg will get with Bill in the next couple of weeks to schedule some dates
  14. Special General Meeting with Sign Up Event
    - a. Sign up to happen immediately after Sue's presentation
  15. Speakers for General Meeting
    - a. February – Rattlesnake Solutions – Bill confirmed with Brian this will happen in February
  16. Kids Program
    - a. There is a lot of interest in the kid's program. Maybe Alexis can be an ambassador for the program.
    - b. Ed W. made a motion to amend the Bylaws and add an youth membership/guest member / non-voting, with an age range 14-18 with a maximum of two individuals.
    - c. Bill F. seconded the motion
    - d. All approved, none opposed
  17. New Specimens for the raffles for the remainder of the year need to be purchased in February.
    - a. This needs to be addressed in the February meeting. Stan & Sue need money approved to purchase the raffle minerals for next Fall.
    - b. The plan is to have a mineral specimen every six months

Minutes continued on page 16.,.

...Minutes continued from page 15

18. Marc F wants to explore more options for a new lapidary location for the club before Doug D retires.
19. A quote was obtained for a bus charter to Quartzite, but the price was too expensive for the number of people that want to go.
20. Meeting Adjourned @ 6:01 p.m.

Sincerely Submitted,

Johanna Raupe, for Rebecca Slosarik

## GENERAL MEETING MINUTES

### January 2, 2024

**DATE:** January 2, 2024, 6:30 PM  
**LOCATION:** Anthem Civic Center, 3701 W. Anthem Way, Anthem, AZ 85086  
**ATTENDANCE:** 74 members

1. 'Called to Order at 6:30 PM
2. Announced that Randy Jordan, an active member of the club was on life-support.
3. Guest Speaker; Susan Celestian on Iceland and its Geology
  - a. Known as land of fire & ice
  - b. New vocabulary – rock flour – super fine rock dust
  - c. Awesome photography accompanied the awesome presentation.
4. Break from 7:15 to 7:50 PM to allow for show volunteer sign ups.
  - a. Extensive talk about shirts
  - b. Flash-green – custom make – makes the shirts and the flash green is being phased out.
  - c. For women there is a chart to see if you can fit into the child's larger size or get a men's medium or small. Women need to decide if they want a tight or loose shirt to fit into the different size groups.
  - d. Claudia needs to order shirts by January 5<sup>th</sup>
  - e. Claudia needs approximately 150 volunteers to fill these spots for
    - i. New hospitality person
    - ii. Welcoming committee
    - iii. Security people
    - iv. Publicity chair
    - v. Break for single vendor support
    - vi. Setup and breakdown Friday & Sunday
    - vii. Show meeting will be end of January first of February
5. Introduced New Guest and how they heard about the club
  - a. James & Jessica Sharland – found on website
  - b. could not hear name – post on facebook page
6. Reviewed the financials for December 2023 – positive income
7. The front Raffle made \$230
8. Claims committee needs a new chairman

Minutes continued on page 17...



...Minutes continued from page 16

9. Field Trips –

- a. Bill Reviewed the four trips in December
  - i. Blue cube & spectrum
  - ii. Stone World
  - iii. Rowley Mine
  - iv. Burro Creek
- b. Advertised the January Trips
  - i. Brenda
  - ii. 4<sup>th</sup> of July Butte <22 people signed up>
  - iii. Club Date in Quartzite
  - iv. Contact Mine
- c. Others to maybe add in
  - i. DoBell
  - ii. Took a vote on weekday or Sundays for additional field trip days. It was decided by vote Sundays would be an alternate for additional field trip days.
- d. Bill talked about additional trips in February & the 1<sup>st</sup> of March

10. Bill expanded on wire wrapping

11. Bill also talked about the February speaker – Rattlesnakes

12. Meeting adjourned at 8:20PM.

13. 8:25 PM silent auction

Sincerely Submitted,

Johanna Raupe, for Rebecca Slosarik



Blue Calcite, Patagonia Mountains, Santa Cruz County, Arizona

*Photo by Stan Celestian*

# GEO MINI MINERAL ID: Cleavage

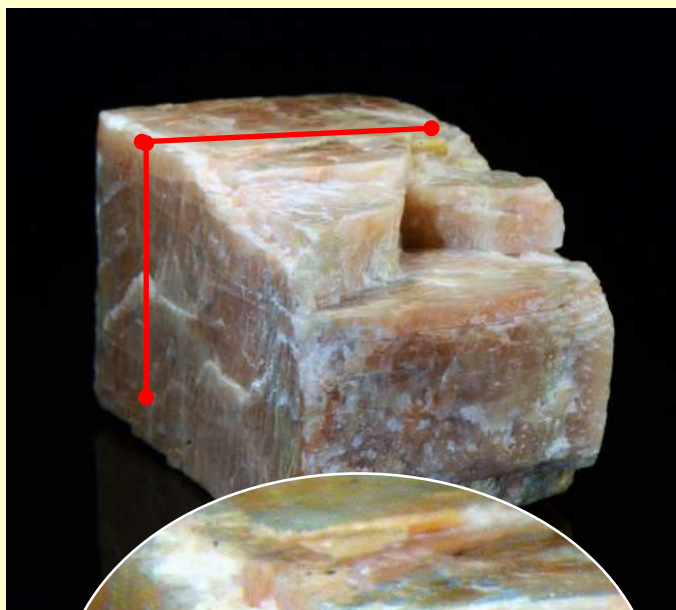
In this fourth installment of Mineral ID, we will discuss **CLEAVAGE**. Cleavage is when the way a mineral breaks is determined by planes of weakness within the atomic structure. The result: minerals break along relatively flat and repeatable surfaces, in one to multiple planes.

Images of types of cleavage follow in Figures A-H. Increase the magnification of the page view, to really get a close look:



**FIGURE A CLEAVAGE IN ONE DIRECTION**

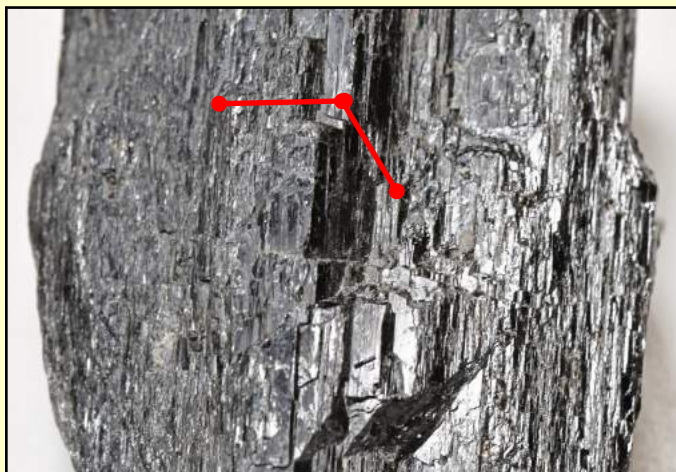
Pronounced in the micas, weak bonding between atomic sheets results in the minerals breaking along a single parallel planes. Muscovite mica breaks so easily that you can peel thin sheets away with your fingers — no hammer needed. You can see the cleavage repeated over and over in the close-up. Photos by B. Domangue and licensed under Creative Commons [CC BY-SA 4.0 DEED](https://creativecommons.org/licenses/by-sa/4.0/)



**FIGURE B CLEAVAGE IN TWO DIRECTIONS AT RIGHT ANGLES**

This is a cleavage fragment of orthoclase feldspar. Feldspars, in general, cleave along two perpendicular planes, as indicated by the red lines in the photo. You can see the two directions repeated in the close-up.

Photos by Stan Celestian



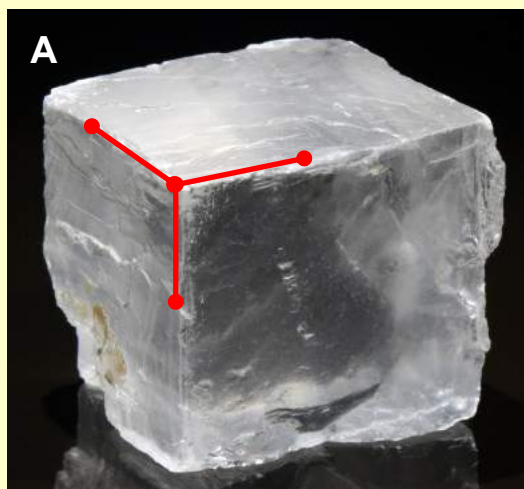
**FIGURE C CLEAVAGE IN TWO DIRECTIONS NOT AT RIGHT ANGLES**

This is a cleavage fragment of hornblende. The angle between cleavage planes is  $120^\circ$ , giving the mineral a splintery appearance.

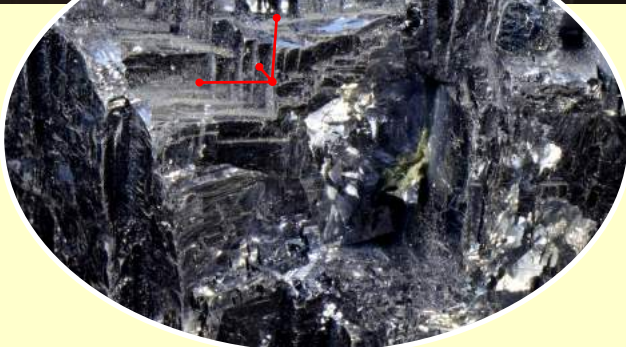
Photo by Stan Celestian

Cleavage continued on page 19...

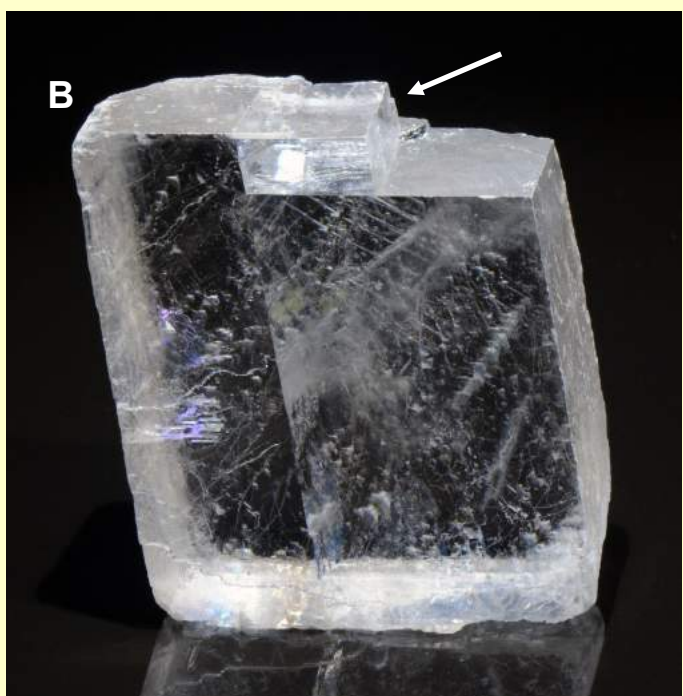
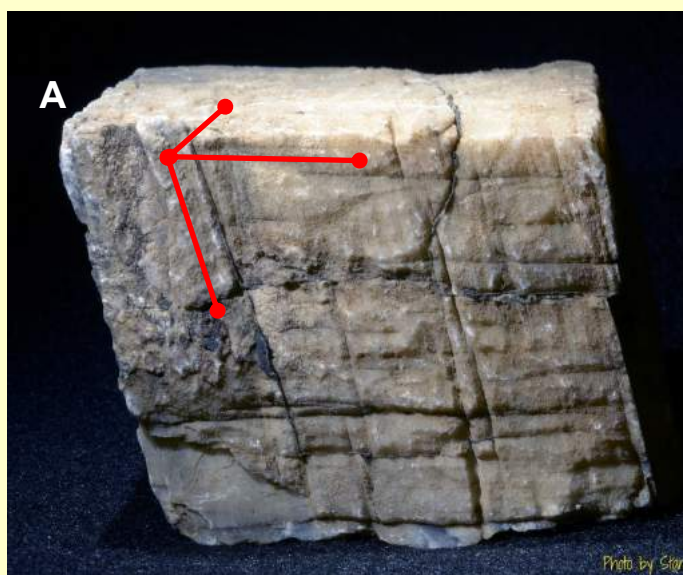
....Cleavage continued from page 18



Use a hand lens or other magnifier to view salt out of your salt shaker at home. Each cube is a cleavage fragment, produced when the salt was crushed for the grocery store.



**FIGURE D CLEAVAGE IN THREE DIRECTIONS AT RIGHT ANGLES** Cleavage in three directions at 90° to each other is called Cubic Cleavage. (A) is a cleavage cube of halite (table salt) and (B) is galena. For both of these minerals, perfect cubic cleavage is diagnostic and easily observed. The red lines accentuate the cleavage plane (increase view magnification). *Photos by Stan Celestian*



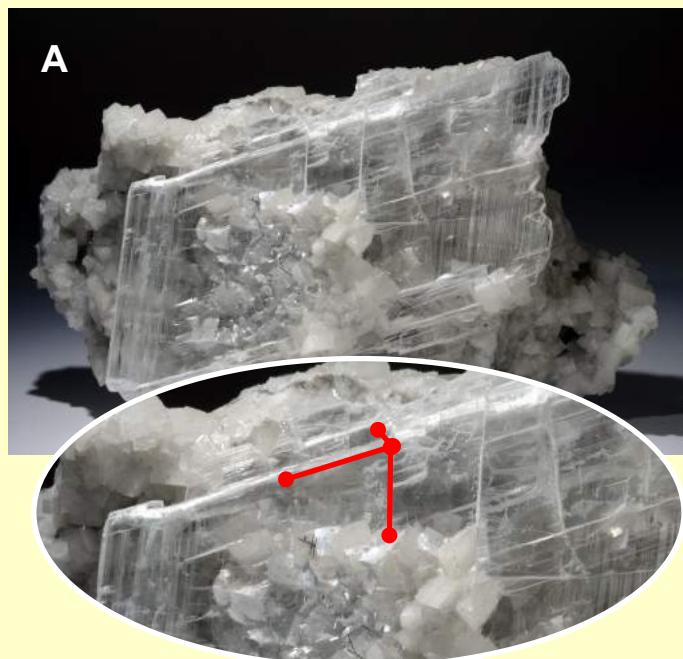
**FIGURE E CLEAVAGE IN THREE DIRECTIONS NOT AT RIGHT ANGLES** Both (A) and (B) are cleavage fragments of calcite. The form resulting from cleavage in three direction not at 90° to each other is called a Rhombohedron (rhombohedral cleavage). (A) is a cleavage rhomb that has been exposed to weathering. The planes of cleavage are also especially vulnerable to weathering, and have been emphasized (and further accented by red lines), making it quite clear how the planes of weakness repeat over and over. (B) is a cleavage fragment of Iceland spar calcite — “clearly” rhombohedral. Look closely at the area to which the arrow points to see the planes repeated.

Go [HERE](#) for a video demonstration.

*Photos by Stan Celestian*

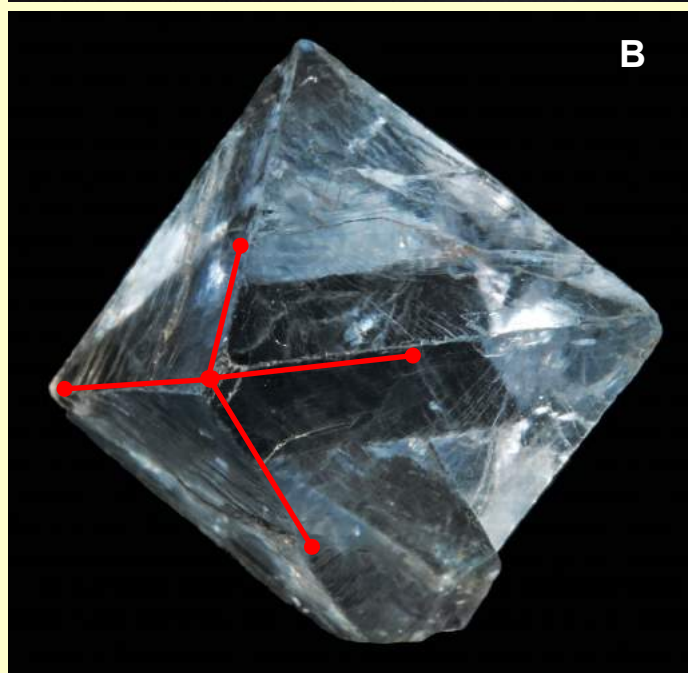
Minutes continued on page 20.,.

....Cleavage continued from page 19



**FIGURE F CLEAVAGE IN THREE DIRECTIONS NOT AT RIGHT ANGLES**

This is another mineral with three non-perpendicular cleavage directions — gypsum. Gypsum has perfect cleavage in one direction and fair cleavage in two directions; but the result is still fairly rhombic fragments. In (A) red lines emphasize the directions. (B) is a gypsum crystal dug out of the soppy muds of the Great Salt Lake. You can see many parallel lines of separation — the crystal is cleaving as it dehydrates.  
 Photos by Stan Celestian

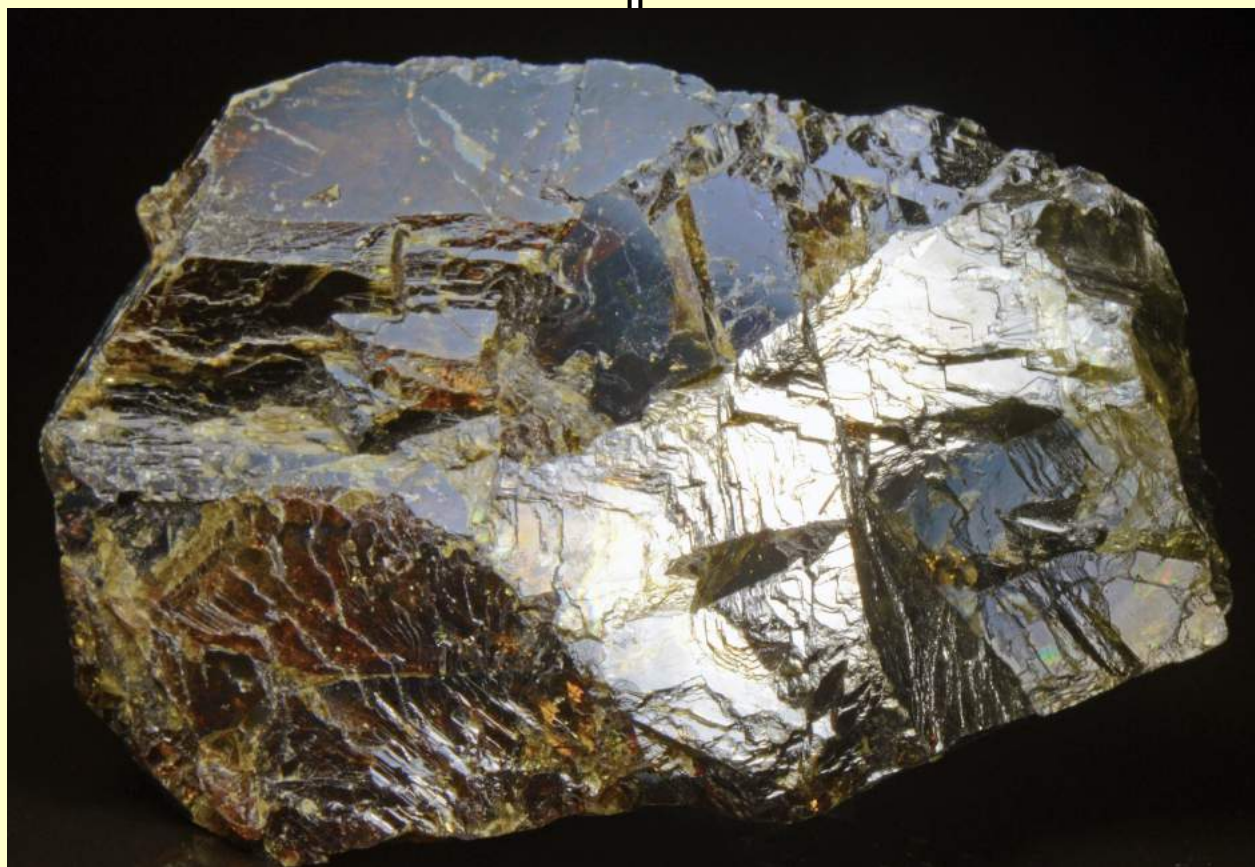


**FIGURE G CLEAVAGE IN FOUR DIRECTIONS**

Both images are of cleavage fragments of fluorite. The four directions define Octahedral Cleavage. In (A) the variously sized octahedrons demonstrates that no matter how often a crystal cleaves, it will always and repeatedly form octahedrons.

It should be noted that you need some skill to produce perfect octahedrons from fluorite. A simple whack with a hammer won't do it. However, should you find some fluorite, you will be able to observe triangular surfaces and multiple planes of cleavage.  
 Photo (A) by Stan Celestian; photo (B) by Géry Parent and licensed by Creative Commons [CC BY-ND 2.0 DEED](https://creativecommons.org/licenses/by-nd/2.0/).

....Cleavage continued from page 20



**FIGURE H CLEAVAGE MORE THAN FOUR DIRECTIONS** This is a cleavage fragment of sphalerite. How many directions of cleavage can you detect? (The number of cleavage directions in sphalerite is given in the upside down box at the bottom of this page.) *Photos by Stan Celestian*

Note that not all minerals have cleavage, and all minerals with cleavage exhibit it clearly. However, when cleavage occurs, it can be very diagnostic.

Cleavage is one way in which minerals may break. Keep in mind that cleavage is not a reflection of the hardness of a mineral. Even diamonds cleave. So even though the diamond in your ring is extremely hard, if you hit it on a hard surface, it may break (octahedrally)

#### TO TEST/OBSERVE:

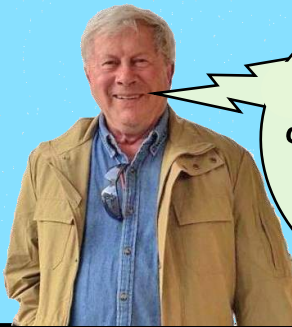
- \* Look for flat (or nearly flat), shiny surfaces. Turn the specimen back and forth in the light to highlight the presence (or not) of cleavage. ALERT: not all flat surfaces are cleavage - some could be crystal surfaces, parting, or vestiges of growth against a flat surface.
- \* The flat surfaces must be repeated over and over — look for stair-step edges.
- \* Determine the angles between the various flat surfaces.

*If you are building a portable field testing kit, you should now have a glass plate and a streak plate. (Both are available from Ward's Science (or VWR International), Amazon, and other suppliers. A note about a glass plate: you can use any clear glass; however, the thicker the better for safety. At this point, that hand lens will be useful for closer inspection of mineral surfaces.*

ANSWER: Sphalerite has 10 directions of cleavage — single form, as does fluorite. It just exhibits lots of intersecting flat surfaces.

## WORDS OF WISDOM

passed along by our own **Bob Evans**



Whatever you do today, do it with the confidence of a 4-year old in a Batman T-shirt

### UPCOMING AZ MINERAL SHOWS

**JANUARY 1-FEBRUARY 28 - Quartzsite, AZ** Desert Gardens, 1055 Kuehn St; Admission: Free.

**FEBRUARY 8-11 - Tucson, AZ** Tucson Gem & Mineral Society; Tucson Convention Center, 260 S Church St; Th-Sat 10-6, Sun 10-4; Admission: \$13. [SEE POSTER PAGE 24](#) For complete schedule of the many pre-main shows in Tucson go [here](#).

**FEBRUARY 23-25 - Clarkdale, AZ** Mingus Gem & Mineral Club; Clark Memorial Clubhouse Auditorium, 19 N 9th St; Fri-Sat 9-5, Sun 9-4; Admission: Free.

**MARCH 2-3 - Anthem, AZ** Daisy Mountain Rock & Mineral Club; Anthem Elementary, 41020 Freedom Way; Sat 9-5, Sun 10-4; Admission: Adults \$5, Seniors, Vets, Students \$4, under 12 free. [SEE POSTER PAGE 25](#)

**APRIL 13 - Gilbert, AZ** Flagg Mineral Foundation: Arizona Mineral Symposium; Southeast Regional Library, 775 N Greenfield; Sat 8-5:30; \$80 mbrs, \$90 non-mbrs. [SEE FLYER PAGE 26](#)

**MAY 4-5 - Kingman, AZ** Mohave County Gemstoners; Mohave County Fairgrounds, 2600 Fairgrounds Blvd; Sat 9-4, Sun 9-3; Admission: Free.

**JUNE 1-2 - Phoenix, AZ** Mineralogical Society of Arizona; Phoenix Shrine Auditorium, 552 N 40th St; Sat 9-5, Sun 10-4; Admission: Adults \$5, MSA members \$3, under 12 free. [SEE POSTER PAGE 26](#)

**JULY 26-28 - Show Low, AZ** White Mountain Gem & Mineral Club; Elks Lodge, 805 E Whipple; Fri-Sat 9-5, Sun 10-4; Admission: Adults \$4, kids free.

If you are travelling, a good source of shows AND clubs is <http://the-vug.com/educate-and-inform/mineral-shows/> OR <http://www.rockngem.com/ShowDatesFiles/ShowDatesDisplayAll.php?ShowState=AZ> OR <https://www.rockandmineralshows.com/Location/?displayShows=true>

**NEEDED: QUALITY MINERALS (or OTHER) DONATIONS WITH LABELS** -- for monthly raffle and silent auction; and for raffle, door prizes, and sales tables at the annual show. If you have specimens to donate, please see Robin Shannon. The Daisy Mountain Rock and Mineral Club is a 501(c)(3) non-profit organization, and will gratefully acknowledge your donation with a Tax Deduction Letter. Thank You!

### NOTE FROM THE EDITOR

Have a geological interest? Been somewhere interesting? Have pictures from a club trip? Collected some great material? Send me pictures - or write a short story (pictures would be great).

Deadline for the newsletter is the 22nd of the month.

Mail or Email submissions to:

Susan Celestian  
6415 N 183rd Av  
Waddell, AZ 85355  
azrocklady@gmail.com



Visit <http://rmfms.org/> for news about conventions, events, and associated clubs. If you are travelling, you might want to contact a club local to your destination. Maybe they have a field trip you could join, while in town.

### NORTH MT OPEN STUDIO

North Mt Visitor Center, 12950 N 7th St, Phoenix, AZ

You are invited to NMVC Studio. Lapidary Classes every Wednesday & Silversmithing Classes on Saturdays — email Shirley Cote for details. For ONLY those people who have taken lapidary or silversmithing classes — Lapidary Open Studio every Monday, and Silversmithing &/or Lapidary Open Studio every Thursday (and designated Saturdays). **Face masks optional.**

**TIMES: from 9:00 to noon with cleanup starting at 11:50.**

Only 4 people can sign up, and must do so for the full three hours that the shop will be open each day. First come, first served. Usage fee is \$8/hour.

**Notice: Please bring your own towels, polishing compounds and buffing wheels as they will no longer be provided.**

Please arrive no later than 8:45 a.m. The center may closed to the public at 10.

**Email your request for the day(s) you are interested in participating ASAP. Email Shirley Cote at: [crystalc17@gmail.com](mailto:crystalc17@gmail.com)**

If more than four people wish to participate on the same day, please expect to be bumped or rotated to another day as efforts to accommodate everyone will be taken (possibly 6 people if 2 are silversmithing only).

**UPCOMING FIELD TRIPS**

**Here is a general list of possible upcoming trips. Details will be emailed to the general membership.**

**February**

- Tucson Show - 3rd Sat - Shopping
- Club Claim - 7th Wed - Mushroom Rhyolite
- Superior - 17th Sat - Apache Tears, Perlite
- Tangle Creek - 21st Wed - Travertine

**March**

- Wendon - 6th Wed - Mable
- San Carlos - 16th Sat - Peridot
- Reserve Bank Mine - 20th Wed - Tour, Copper Minerals
- Dave Haneline Mine - 30th Sat - Barite, Lead Minerals

**April**

- Hewitt Canyon - 3rd Wed - Green/Pink Marble
- Camp Verde - 17th Wed - Lost Onyx Mine

**DATES AND DESTINATIONS SUBJECT TO CHANGE**

**WATCH FOR EMAILS WITH DETAILS**

**\*\*\*\*\* Be sure you do not just show up for a field trip — you MUST RSVP to Bill, either by responding to the announcement email or directly to Bill (after the announcement has been posted). Most trips have a limit, and will have a waiting list once full.**

***FUTURE SPEAKERS***

February - Dr. Barbara Johns, U of Wyoming: Deep Sea Drilling in the Atlantic

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**FACEBOOK**



Visit and join the club page periodically. See what is happening, and boost our visibility on the web. Go to: [The Daisy Mountain Rock and Mineral Club](https://www.facebook.com/daisymountainrockclub/). It is set up so you can post photos of outings or related items. Share with friends!

**AWARD-WINNING WEBSITE**

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

If you have comments, contact Nancy Gallagher.

**INSTAGRAM**



Follow the club on Instagram. Go to <https://www.instagram.com/daisymountainrockclub/> and follow today. Share with friends!

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Meetings are held the **1st Tuesday of the month** at the **Anthem Civic Building**, 3701 W Anthem Way, Anthem, AZ 85086. General meeting at 6:30 pm. We **do not meet in July or August.**

[DMRMCLUB@GMAIL.COM](mailto:DMRMCLUB@GMAIL.COM)

**Membership Dues:**

- Juniors (under 18) - Membership is free; one time fee of \$10 for name badge**
- Adult - First year \$35, then \$25 per Person**
- Couple - First year \$55, then \$35 per Couple**

**Meeting Dates for 2024**

Jan 2, Feb 6, Mar 5, Apr 2, May 7, June 4, Sept 3,

The Tucson Gem and Mineral Society Proudly Presents:

THE 69TH ANNUAL  
TUCSON GEM & MINERAL SHOW®

# PEGMATITES

Crystals  
**BIG**  
& Beautiful



fibrous tourmaline - Mount Gemini, Brazil. Photo: Resnick collection. KJFS.com photo



**February 8 - 11, 2024**  
**Tucson Convention Center**

for more information, visit: [www.tgms.org](http://www.tgms.org)

Scan code for  
information on  
our Tucson Gem &  
Mineral Show®





# DAISY MOUNTAIN ROCK AND MINERAL SHOW

## MARCH 2 and 3, 2024



Stilbite on Stalactitic Quartz

**ANTHEM SCHOOL 41020 N. FREEDOM WAY**

SATURDAY 9 TO 5 PM

SUNDAY 10 TO 4 PM

ADULTS \$5, SENIORS, VETS, STUDENTS \$4

CHILDREN UNDER 12 FREE WITH ADULT

ROCKS, CRYSTALS, FOSSILS, JEWELRY, METEORITES, BEADS

RAFFLE EVERY HALF HOUR !

DR ROCK FOR ROCK IDENTIFICATION

KID'S ROW - LOTS OF ACTIVITIES FOR KIDS INCLUDING OUR RENOWNED EDUCATIONAL  
EGG CARTONS FILLED WITH 50+ SPECIMENS!!

FOR MORE INFORMATION GO TO: [www.dmrmc.com](http://www.dmrmc.com)

## 31st Annual Arizona Mineral Symposium

**When:** April 13, 2024  
8am to 5:30pm  
**Where:** Southeast Regional Library  
775 N. Greenfield Rd.  
Gilbert, AZ 85234

A series of speakers, highlighting field collecting, includes the following:

**Karen Wenrich, Ph.D.** - *The Sweet Home mine, Alma, Colorado*

**Mark Hay** - *Fluorite from the Oatman District, Mohave Co., AZ*

**Mark Pecha** - *Where did that turquoise come from?*

*A case study of the turquoise deposit from Bisbee, Arizona*

**Anna Domitrovic** - *Field Collecting & Collectors at the Desert Museum*

**Jeff Smith** - *The Peculiar Geodes of the Trancas Station, Chihuahua, Mexico*

**Erin Delventhal** - *A rediscovery of epidote pseudomorphs after orthoclase from the Orogrande district, Otero County, New Mexico*

**Phil Richardson** - *Collecting Contemporary Utah*

**Mike Sanders** - *Three decades of Collecting Adventures in the Hansonburg Mining District, Socorro County, New Mexico*

There will be several dealers including the premiere by Shannon Family Minerals of a 10,000 piece collection of micromounts and thumbnail specimens.

A final agenda will be posted on the Flagg Mineral Foundation website, [flaggmineralfoundation.org](http://flaggmineralfoundation.org), by mid-January.

Payment may be made by cash, check or Zelle.  
Cost is as follows:

\$80 for members

\$90 for non-members

Symposium program,  
lunch and refreshments  
will be included.



[flaggmineralfoundation.org](http://flaggmineralfoundation.org)



## Flagg Mineral Foundation



MINERALOGICAL SOCIETY OF ARIZONA  
PRESENTS

## THE 4TH PHOENIX HERITAGE MINERAL SHOW



JUNE 1ST & 2ND, 2024  
SAT 9A-5P & SUN 10A-4P