



EARTHQUAKE

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

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March 2021
Volume 10, Issue 3

ESM OUTREACH UPDATE

Mardy Zimmermann, Outreach Coordinator

March brought ESM a welcomed increase in activity in our Outreach Program and included two big projects.

Ray and Cynthia Grant of the Pinal Geology and Mineral Museum (PGMM) in Coolidge have met with educational administrators in Pinal County to determine their needs and service formats. The PGMM will spearhead services to the schools, and ESM Outreach will supply material support including the twenty-four sets of our Teacher Kits (Rocks and Fossils, and Minerals) that I recently assembled. ESM will also supply raw material for a condensed version of our Egg Carton Program that will be available to students and visitors.

The newest request comes from the Pima County Superintendent of Education's Office on behalf of one of their districts. The fourth grade teachers are writing a rock and fossil curriculum and would like sets of our Teacher Kits which include rocks, fossils, and minerals and also student sets with the same materials. We have previously worked with another of the Pima County districts and provided materials for some of their teacher in-service efforts.

With the high material demand for projects Richard and I will be using the rock crusher a lot this summer which is housed at our cabin in cool Forest Lakes. Last fall Lynne Wheeler and I sorted many buckets of raw material.

Lynne will also assist with our two new big projects previously noted.

Lynne & Terry Dyer invited 21 girl scouts and leaders to their home over a two day period. Lynne and Terry will also take their displays to boy scouts in the Estrella Mountain Elementary area in the west valley.

Hopefully this is an indication of renewed interest in geology for scouts.



Scout leaders and girl scouts enjoy learning about rocks and minerals in the Dyer home.

Terry Dyer photo

Famous or Notable Women Honored with a Mineral Named After Them

By Harvey Jong

March is National Women's History Month, a special event to recognize the accomplishments of women. So, this article will observe the celebration from a mineral perspective. Specifically, we will consider some famous or notable women who have been honored with one or more minerals named after them.

Currently, 5,688 minerals have been approved by the International Mineralogical Association (IMA), and this number continues to increase each year (around 150) with new discoveries. Minerals have been named after some characteristic of the mineral, the location where it was found, a mythological figure, or a person. In the case of a person, individuals describing the mineral may name it after themselves or someone that they wish to honor.

An overwhelming majority of the minerals named after a person involve men. This dominance is illustrated by the short, incomplete (and somewhat outdated) list of minerals named after women that appears on webmineral.com. (<http://webmineral.com/help/NameOrigin.shtml>) Oddly, the list includes 96 minerals but is prefaced by a comment that only 81 minerals are named after women.

In reviewing the overall list, 8 minerals were found to be incorrectly attributed to female honorees. This error is probably due to assuming gender based on first names, such as Kim, Marie, and Michele, or improperly assuming the recognition included both husband and wife (curite and liandratite). Checking the IMA status of the remaining 88 minerals revealed the following:

- 75 approved minerals
- 3 discredited minerals
- 1 duplicated mineral

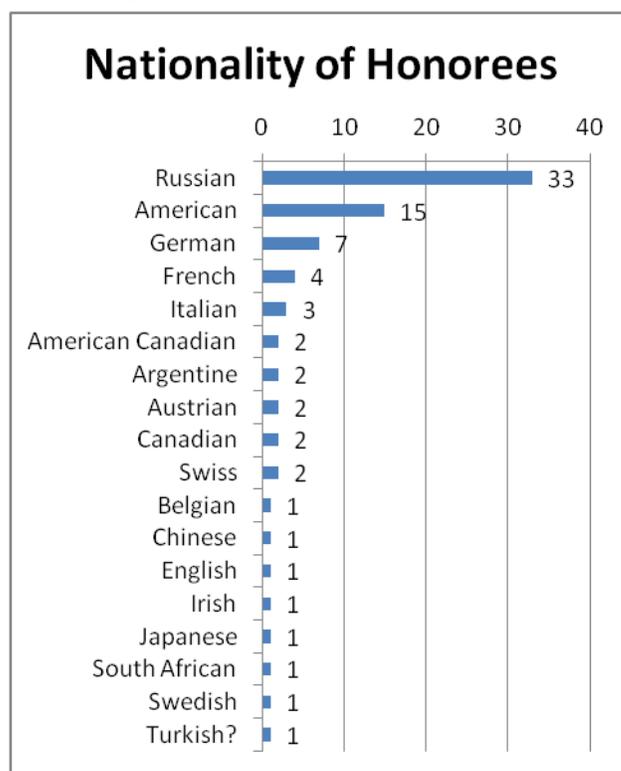
- 5 grandfathered minerals (named prior to 1959 when the IMA was organized)
- 2 polytypes (minerals with the same composition but different crystal structures. The IMA no longer recognizes these occurrences as separate species. However, one mineral was added to account for the root name.)
- 2 unnamed minerals (probably valid, indicates the mineral's approval is pending publication in a peer-reviewed journal.)

Adding one mineral that was discredited but was later renamed due to a nomenclature change, the number of valid minerals honoring women is 84.

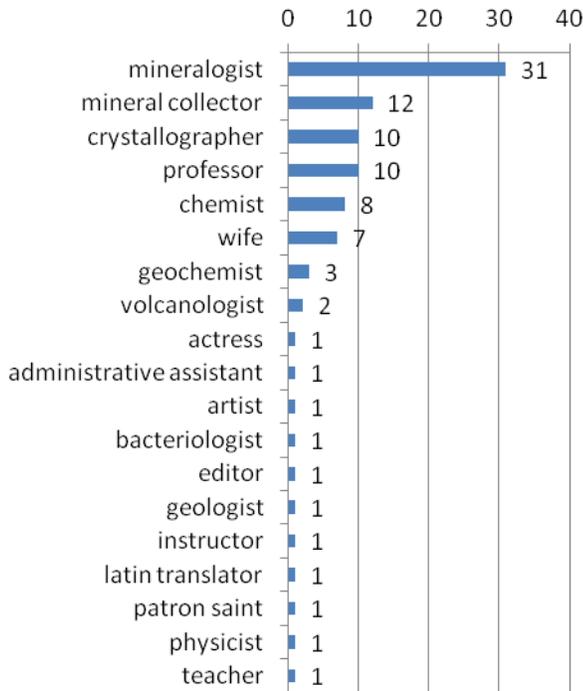
Focusing our attention on the honored women, we find that they were recognized in the following manner:

- 71 as individuals
- 12 as husband and wife
- 1 as father and daughter

Looking at general backgrounds, we arrive at some statistics involving their nationality and occupation/avocation:



Occupation/Avocation of Honorees

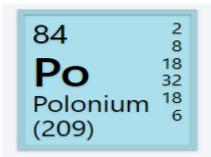
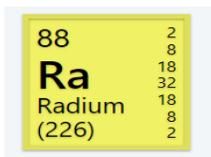


Note the occupation/avocation involves what was cited in the original mineral descriptions and may reflect that honorees may have multiple professional interests.

Some of the women honorees are known internationally, while others have a local Arizona connection. The accomplishments of a few women will be presented along with descriptions of their namesake minerals.

Marie Sklodowska Curie (1867-1934)

Marie and Pierre Curie discovered the elements radium and polonium in 1898.



Henri Manuel photo - PD, via Wikimedia Commons
Marie Sklodowska Curie (1867-1934)
 Circa 1920 photo

Marie Sklodowska Curie is arguably the most well-known female scientist. She was born in Warsaw, Poland and became a naturalized French citizen. She received master's and doctorate degrees in physics and mathematics from the University of Paris. With her husband, Pierre Curie, she conducted pioneering research on radioactivity and discovered two new elements, radium and polonium. She was the first woman to win a Nobel Prize (physics), the first and only woman to win the Nobel Prize twice, and the only person to win the Nobel Prize in two scientific fields (physics and chemistry). In addition, Marie Curie was the first woman to become a professor at the University of Paris.

In studying radioactivity, she developed an interest in the mineral pitchblende (renamed uraninite in 1845) which is more intensely radioactive than pure uranium. She hypothesized that a new substance was responsible for this characteristic and worked on isolating the material, which was the element radium. Pitchblende contains only trace amounts of radium, so Curie along with a lab assistant had to process several tons of ore to produce a tenth gram of radium chloride. This refinement work would expose her to radiation that later resulted in her death due to leukemia.

Two minerals, one directly and one indirectly, are named for Marie Curie. (Note curite is named after Pierre Curie, but sometimes the recognition mistakenly includes Marie Curie.)



RRUFF project photo and specimen

Sklodowskite

Mina las Animas, Santa Eulalia, Chihuahua, Mexico

Sklodowskite is a magnesium uranium oxide that was discovered in 1924 by Alfred Schoep who named it in honor of Maria Sklodowska Curie. The rare secondary mineral was found at the Shinkolobwe Mine in the Democratic Republic of Congo. Its formation

involves the reaction of silica-bearing waters on uraninite and other uranium minerals.



R060570
RRUFF project photo and specimen

Cuprosklodowskite

Musonoi Extension Mine, near Kolwzei, Shaba Province, Zaire

Cuprosklodowskite is a hydrated copper uranium silicate that was described in 1933 by J. P. Vaes based on samples from the Kalongwe deposit in the Democratic Republic of Congo. The name involves a miscommunication about the mineral being a copper analog of sklodowskite. It is an alternation product of other uranium minerals.

Alice Mary Douse Weeks (1909-1988)

Continuing with women honored for their contributions involving uranium minerals, we will highlight the life and work of Dr. Alice Weeks. Alice Mary Douse Weeks was born in Sherborn, Massachusetts in 1909. She attended Tufts University where she received a degree in mathematics and science in 1930. She earned a master's of science degree in geology in 1934 and a doctorate in 1949 from Harvard University.

At this time, women were not widely accepted in the field of geology. Reportedly

she was not allowed to participate in some classes, but had to sit outside the classroom to take notes. In order to collect samples from mines, she had to dress up as a man to get around the superstition against allowing women to enter mines.

In spite of these obstacles, Weeks became a recognized expert on uranium mineralogy. Her research focused on uranium ores found on the Colorado Plateau, and she was involved in describing several new minerals including coconinoite, metatyuyamunite, and navajosite, which were discovered in Arizona.

In 1962, she joined Temple University to establish a geology degree program. She quickly expanded the geology department from one professor and 3 courses to 8 full time faculty members and 12 courses and developed programs for undergraduate and graduate degrees.

Weeks was one of the first female geologists to be listed in the biographical reference *American Men of Science* which eventually changed its name to *American Men and Women of Science*. She was a strong supporter of women in geology and science and was a charter member of the Women Geoscientists Committee of the American Geological Institute.



RRUFF project photo and specimen

Weeksite

Anderson mine, Yavapai County, Arizona

Weeksite is a potassium uranyl silicate hydrate that was first found at the Autunite No. 8 claim in Utah's Thomas Range. Osterbridge et al., 1960 described the mineral and named it in honor of Alice Weeks. It occurs as opal veinlets in rhyolite or as encrustations on sedimentary rocks. The mineral was first noted in 1950; however, its rare, very fine grained occurrence along with being intermixed with other minerals delayed the identification.

Kathleen Yardley Lonsdale (1903-1971)



F.C. Livingston photo, Smithsonian Institution @ Flickr Commons, via Wikimedia Commons

Kathleen Yardley Lonsdale (1903-1971)

1968 photo; Acc. 90-105 - Science Service, Records, 1920s-1970s, Smithsonian Institution Archives

Moving from uranium to benzene and diamonds, our next honoree is Kathleen Yardley Lonsdale who was born in 1903 at

Newbridge, County Kildare, Ireland. She received a Bachelor of Science degree from Bedford College for Women and master's and doctorate degrees in physics from University College London. She was a member of the crystallography team headed by William H. Bragg and pioneered the use of X-ray diffraction in determining crystal structure. Her scientific contributions included measuring and solving the structure of benzene and hexachlorobenzene and working on the structure and synthesis of diamond allotropes.

During her career, she achieved a number of firsts for women:

- First tenured woman professor at University College London
- First of two women elected a Fellow of the Royal Society of London
- First woman president of the International Union of Crystallography
- First woman president of the British Association for the Advancement of Science



Photo from (Ohfuji et al., 2015) - CC-BY_4.0 International, via Wikimedia Commons

Mixture of *Diamond* and *Lonsdaleite*

Popigai crater, North central Siberia, Russia

Lonsdaleite was described in 1967 by Frondel and Marvin based on samples of the Canyon Diablo meteorite. They reported that the tremendous heat and stress of a meteorite impact transforms graphite into diamond, but the resulting diamond retains graphite's hexagonal lattice. They named the hexagonal polymorph of diamond in honor of Kathleen Lonsdale.

Some controversy on the nature of lonsdaleite has emerged with subsequent investigations. Pan et al., 2009 calculated that lonsdaleite is up to 58% stronger than diamond which would make it the hardest natural substance on Earth. This assertion was difficult to prove since available samples involved tiny, mixed grains less than a millimeter in size. In fact, Németh et al., 2014 reported that they were unable to produce or describe it as a separate pure material. They concluded that the mineral is actually faulted, twinned cubic diamond. Krase et al., 2016, however, observed the nanosecond formation of lonsdaleite with laser-driven shock compression of graphite.

Maria Rosa vom Rath (1830-1888)

Maria Rosa vom Rath was the wife of Gerhard vom Rath, the German mineralogist who named the mineral in her honor. Unfortunately, no additional information is known about Mrs. vom Rath. The mineral that is named after her, however, may be known to mineral collectors who specialize in fluorescent minerals.



R060469

1 cm

RRUFF project photo and specimen

Marialite

Mpwa-Mpwa Mine, Uмба Valley, near Arusha, Tanzania

Marialite is a sodium aluminum silicate chloride that Gerhard vom Rath discovered in 1866 at Pianura west of Naples, Italy. It is a member of the scapolite group and forms a solution series with meionite (calcium aluminum silicate carbonate). The mineral typically occurs in metamorphosed rocks, such as marble, calcareous gneisses, and greenschists, but may also be found in skarns, some pegmatites, and ejected volcanic rocks.

“Wernerite” is an intermediate member of the marialite-meionite series. The name, however, was rejected by the IMA and is considered obsolete. It is well known to fluorescent mineral collectors for the very bright yellow to yellow-orange fluorescence under long-wave ultraviolet light.

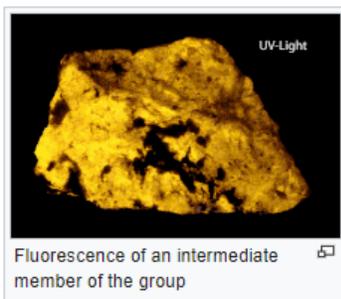


Photo by H. Zell - CC-BY-SA-3.0, via Wikimedia Commons

(Note click on following link to view the fluorescent gif:

https://upload.wikimedia.org/wikipedia/commons/thumb/4/4b/Wernerite_-_Fluorescence.gif/1024px-Wernerite_-_Fluorescence.gif)

Wernerite

Specimen from Brazil

Staatliches Museum für Naturkunde Karlsruhe, Germany

Women Honorees with an Arizona Connection

Several of the honored women and their namesake minerals are connected to Arizona, and we'll explore a few notable individuals.

Jean Arney Bandy (1900-1991)

Jean Arney Bandy was the wife of Mark Chance Bandy, a noted American geologist and mineral collector. She was born in 1900 in Sioux City, Iowa and married her husband in 1929. After Mark retired in 1958, they moved to Wickenburg, Arizona. They translated the original Latin edition of Georgius Agricola's *De Natura Fossilium*, a 16th century text that represents an early attempt to categorize minerals, rocks, and sediments.



RRUFF project photo and specimen

Jeanbandyite

Siglo Veinte Mine (Siglo XX Mine; Llallagua Mine; Catavi), Llallagua, Bustillos Province, Potosí Department, Bolivia

Jeanbandyite is an iron tin hydroxide that occurs in the oxide zone of polymetallic ore deposits. It was discovered in material that Mark Chance Bandy collected from Llallagua, Bolivia. His wife, Jean Bandy, donated the samples along with other specimens in the Bandy collection to the Natural History Museum of Los Angeles County (NHMLAC). Tony Kampf, the Curator of the NHMLAC's Mineral Sciences Department, described the mineral in 1982 and named it in honor of Jean Bandy.

Marjorie Duggan (1927-2002)

Marjorie Duggan was born in 1927 in Cincinnati, Ohio. She was an analytical chemist who worked at the Phelps Dodge laboratory in Douglass, Arizona. She investigated several new minerals and performed the chemical analysis required for the description, publication, and approval of these minerals. Duggan was noted for pushing the limits in extracting data from minute samples. She discovered the first occurrence of hexavalent tellurium (Te^{6+}) in

nature and developed micro-analytical techniques for $\text{Te}^{4+}/\text{Te}^{6+}$ compounds.



RRUFF project photo and specimen

Dugganite

400' level, Empire Mine, Tombstone, Cochise County, Arizona

Dugganite is a lead zinc arsenate tellurate that was found at the waste dumps of the Old Guard Mine, Emerald Mine, and Joe Shaft in Tombstone, Arizona. Sid Williams described the mineral in 1978 and named it in honor of Marjorie Duggan. The rare mineral forms from severe oxidation in acidic water, but quickly dissolves in mildly alkaline water.

Betty Jo Winstanley Williams (1934-)

Betty Jo Winstanley Williams was born in 1934 in Detroit, Michigan. She is a mineral collector who married Sid Williams and helped manage the mineralogical laboratory, Globo de Plumbo Enterprises, in Douglass, Arizona. After Sid passed away in 2006, Betty Jo donated the lab equipment and a mineral reference library to the Hudson Institute of Mineralogy, a non-profit foundation dedicated to mineral research and education. The Institute established a research facility in Peekskill, New York and

named it “The Sid & Betty Williams Laboratory for Mineralogical Research”.



Harvey Jong photo and specimen

Winstanleyite (yellow) on **jarosite** (orange/brown) with **rodalquilarite** (greenish-yellow)

Grand Central Mine, Tombstone, Cochise County, Arizona

Field of view: ~1.3 mm

Winstanleyite is a titanium tellurite that was found at the Grand Central Mine in Tombstone, Arizona. Sid Williams described the mineral in 1979 and named it after Betty Jo Winstanley who collected the first specimens. The very rare mineral occurs in a hydrothermal gold-tellurium ore deposit and is associated with strongly altered, pyritized granodiorite.

References:

Anthony, J.W., R.A. Bideaux, K.W. Bladh, and M.C. Nichols, Eds., Handbook of Mineralogy, Mineralogical Society of America, Chantilly, VA 20151-1110, USA.
<http://www.handbookofmineralogy.org/>
 URLs for the pdf files for the minerals mentioned in the article:
<http://handbookofmineralogy.org/pdfs/cuprosklodowskite.pdf>
<http://handbookofmineralogy.org/pdfs/dugganite.pdf>
<http://handbookofmineralogy.org/pdfs/jeanbandyite.pdf>

<http://handbookofmineralogy.org/pdfs/lonsdaleite.pdf>

<http://handbookofmineralogy.org/pdfs/marielite.pdf>

<http://handbookofmineralogy.org/pdfs/sklodowskite.pdf>

<http://handbookofmineralogy.org/pdfs/weeksite.pdf>

<http://handbookofmineralogy.org/pdfs/winstanleyite.pdf>

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Kraus, D., A. Ravasio, M. Gauthier, D.O. Gericke, J. Vorberger, S. Frydrych, J. Helfrich, L.B. Fletcher, G. Schaumann, B. Nagler, B. Barbrel, B. Bachmann, E.J. Gamboa, S. Goede, E. Granados, G. Gregori, H.J. Lee, P. Neumayer, W. Schumaker, T. Doeppner, R.W. Falcone, S.H. Glenzer, and M. Roth (2016) Nanosecond formation of diamond and lonsdaleite by shock compression of graphite. *Nature Communications*: 7: 10970.

Németh, P., L.A.J. Garvie, T. Aoki, N. Dubrovinskaia, L. Dubrovinsky, and P.R. Buseck (2014) Lonsdaleite is faulted and twinned cubic diamond and does not exist as a discrete material. *Nature Communications*: 5: 5447.

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Outerbride, W.F., M.H. Staatz, R. Meyerowitz, and A.M. Pommer (1960) Weeksite, a new uranium silicate from the Thomas Range, Juab County, Utah. *American Mineralogist* 45: 39-52.

Pan, Z., H. Sun, Y. Zhang, and C. Chen (2009) Harder than diamond: superior indentation strength of wurtzite BN and lonsdaleite. *Physical Review Letters* 102(5):055503.



Arizona Rocks 94

Text by Ray Grant
Photos by Cynthia Grant

Antelope Canyon is a world famous place to visit in Page, Arizona. It is a slot canyon, which means it has steep narrow walls relative to its depth.

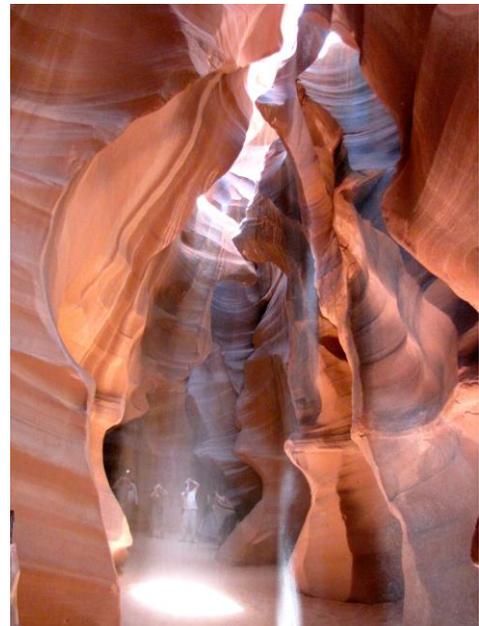
Most slot canyons are formed in sandstone although they may be present in other resistant rocks such as limestone or volcanic rocks. Antelope Canyon and the other slot canyons in the Page area are in the Navajo Sandstone. These canyons form from a crack or fracture in the rock where water will erode down the crack. They do not have permanent streams, but high flow flash floods, carrying rocks and sediment, cause the abrasion carving out the canyon. (Permanent streams will continue over time to erode sideways and form wider canyons.)

Antelope or Upper Antelope Canyon is the most popular slot canyon in Page. It has easy access, is 120 feet deep, and is 660 feet long, making it an easy walk. The photographs taken there are spectacular. It is on the Navajo Reservation and can only be visited with a tour and there are many available in Page. Lower Antelope Canyon also has tours, but is a little more work to visit. A search of the Internet will show many other slot canyons and some that you can visit on your own. A check of the weather is important as flash floods can form upstream and once you are in the canyons it is hard to escape. In August 1997 a number of people were killed in Lower Antelope Canyon in a flash flood.

Antelope Canyon, spectacular rock formation, why it is so world famous



Entrance to Antelope Canyon, guide leading group on a tour



People on tour taking photographs in Antelope Canyon





AZ Mining, Mineral & Natural Resources Education Museum Update March 2021

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

Catie Carter Sandoval
 cscarter@email.arizona.edu
 703.577.6449

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

March 24, 2021 Workday



Catie and the following twelve volunteers from the Museum's Monday Crew (MC), the Cave Creek Museum (CCM) and the Superstition Mountain Museum (SMM); Greg Barnhart (CCM), Roger Camplin (MC, SMM), Charlie Connell (MC), Shirley Cote (MC), Doug Duffy (MC), Bob Flach (CCM), Rick Herrem (MC, CCM), Steve Himmelberger (CCM), Stan Kaminski (CCM), Chuck Messersmith (MC, SMM), Bill Yedowitz (MC), and Joe Zylwitis (CCM), gathered for an outside workday.



Bob's trailer with the (16) cross ties ready to be unloaded.



Greg, Stan and Joe using the incline cart to space the rails before drive the spikes in the cross ties.



We removed all of the old cross ties on the incline lower area



Bob and Greg installing the new cross ties from CCM



Roger getting an early start in the incline cross tie replacement. You can see that the timbers were well aged.

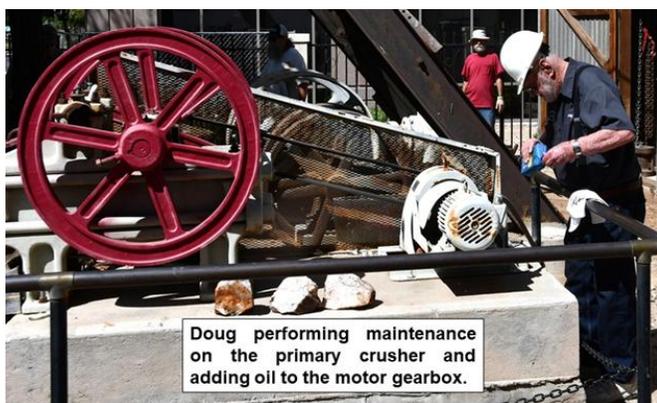
Rotted cross ties



Catie getting ready to install the last spike in the incline



Bill brought his blower in and put it to work. The entire yard was covered with leaves. The blower did an excellent job and saved a lot of raking!



Doug performing maintenance on the primary crusher and adding oil to the motor gearbox.

ARIZONA GEM SHOWS!

Tucson Show dates that have changed for 2021



With the COVID-19 vaccine now being administered in the US and other countries, the decision was made to move some of the Tucson Shows from February to April, 2021. As the show gets closer, more shows will decide on their dates - but there will be shows taking place in April 2021. This change was brought with the anticipation of a lower infection rate, the lifting of some travel restrictions, and fewer restrictions for restaurants and lodging. However, still plan to practice social distancing, good personal hygiene, and wearing masks.

New Show Dates for Some Tucson Shows April 7th - 25th, 2021

RockAndMineralShows.com - For updated Tucson Show Dates

This site has a good list of Tucson shows <https://jogsshow.com/tucson-gem-show-schedule/> with connections to the show sites listed there.

We invite you to join the **Gila County Gem and Mineral Society** on **Saturday April 24th 2021** in **Miami, AZ** for our **2021 Spring Show & Sell**.

This event will be held in the parking lot of Oasis Insurance at 411 W. Live Oak (Highway 60), located in Miami from **10:00am to 2:00 pm**. This is an outdoor event. Masks are required

Come and see what we have to offer for sale, make your own fluorescent sand necklace, grab some popcorn and a drink and visit with other rock hounds and jewelry makers.

Come check out our club. We offer classes for our members. i.e.: silversmith, wire wrapping and lapidary.

Would you like to learn how to do basic wire wrap jewelry? If you have a stone or a crystal you would like to wrap bring it with you and we will teach you. You are welcome to bring in your own wire or wire will be available. There is no charge but you're welcome to leave a donation.

For more information or to reserve a table contact President, Jodi Brewster (623)8109780 or jodibrewster66@gmail.com

Parent/Teacher Resource Page 1

<https://blog.azgs.arizona.edu/blog/2021-03/new-nps-geologic-resources-tonto-national-monument>

Arizona Geology Blog: NEW - NPS Geologic Resources of Tonto National Monument, Arizona

The National Park Service (NPS) just released a 100-page, illustrated report detailing the geologic resources of the Tonto National Monument of central Arizona. See today's [Arizona Geology blog](#), for details and links to review or download digital data products.

Katie Kellerlynn authored the report as part of the NPS' Geologic Resources Inventory program. A cohort of geologists with knowledge of the monument reviewed the report, which includes illustrations, GIS data, and a geologic map poster showcasing the geologic mapping of AZGS' Jon Spencer, Steve Richard (both retired), Charles Ferguson and W.G. Gilbert.

Citation: KellerLynn, K. 2020. [Tonto National Monument: geologic resources inventory report](#). Natural Resource Report NPS/NRSS/GRD/NRR—2020/2212. National Park Service, Fort Collins, Colorado.

Evaluating Arizona's geologic setting, mineral resources, and geologic hazards.



ARIZONA GEOLOGY
e-MAGAZINE

Home - NEW NPS Geologic Resources Of Tonto National Monument

NEW NPS Geologic Resources of Tonto National Monument

/ 18 March 2021 / [0 Comments](#)

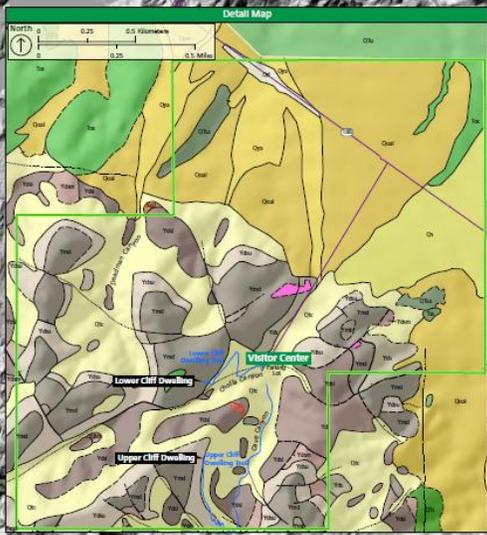
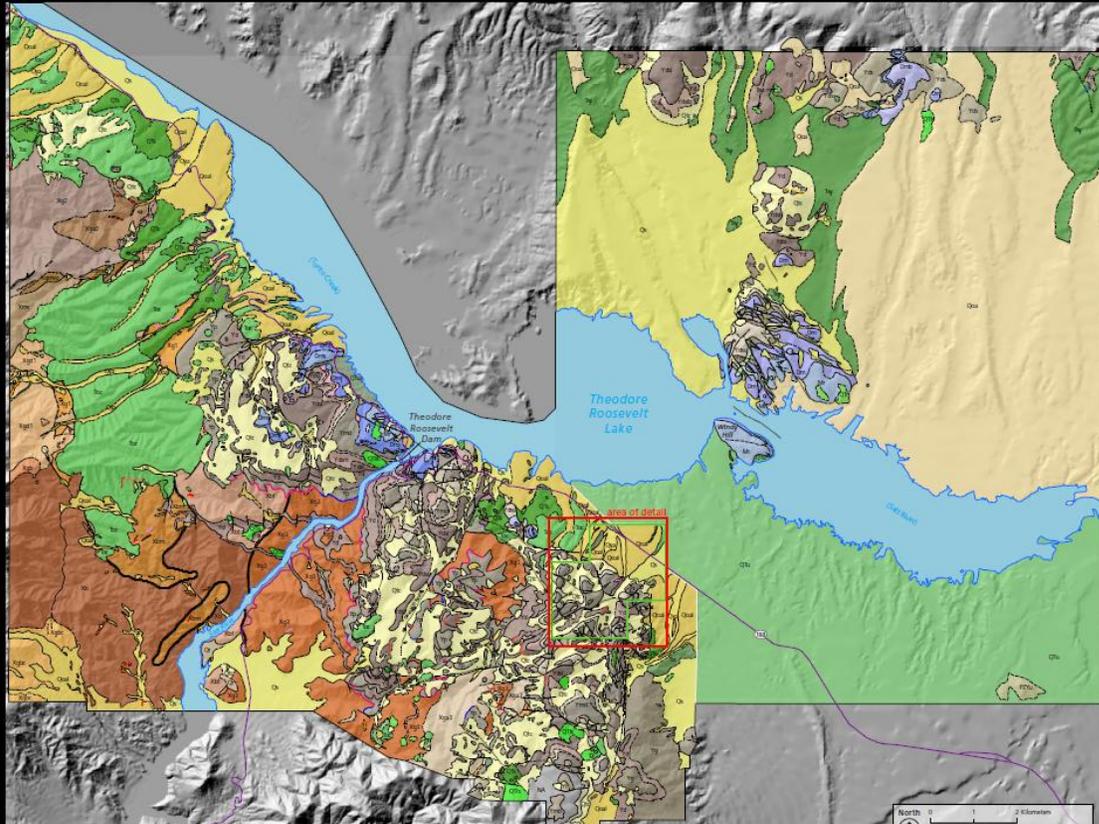
The National Park Service (NPS) just released a 100-page, illustrated report detailing the geologic resources of the Tonto National Monument of central Arizona. Katie Kellerlynn authored the report as part of the NPS' Geologic Resources Inventory program. A cohort of geologists with knowledge of the monument reviewed the report.

To access/download the [Tonto National Monument: Geologic Resources Inventory Report](#). To retrieve the [geospatial data](#) and/or the [Tonto National Monument map poster](#).

Geologic Map of Tonto National Monument

Arizona

National Park Service
U.S. Department of the Interior
Geologic Resource Inventory
Natural Resource Stewardship and Science



Unit Boundary	Thin black line	Geologic Unit	Color swatch
Transportation	Thick black line (highway), thin black line (road)	Geologic Unit	Color swatch
Geologic Point Features	Small black dots	Geologic Unit	Color swatch
Linear Cliffs	Thin black lines with various patterns	Geologic Unit	Color swatch
Linear Geologic Units	Thin black lines with various patterns	Geologic Unit	Color swatch
Faults	Thick black lines with various patterns	Geologic Unit	Color swatch
Deformation Areas	Thin black lines with various patterns	Geologic Unit	Color swatch
Geologic Contacts	Thin black lines with various patterns	Geologic Unit	Color swatch

This map displays geologic map data compiled by the National Park Service Geologic Resource Inventory.

It is not a substitute for site-specific investigations.

Sources: 1. S.M. Ishard, C.A. Ferguson, and W.G. Gilbert. 1999. Preliminary bedrock geologic map and cross-section of the Winkler Hill 7.5' Quadrangle, Gila County, Arizona. Scale 1:24,000. Open-File Report OFR 99-12. Arizona Geological Survey, Tucson, Arizona. <http://repository.azgs.gov/azgs/azgs/geology/d01045>

2. Spencer, J.E., and M. Richard. 1969. Geologic map and report for the Theodore Roosevelt Dam Area, Gila and Maricopa Counties, Arizona. Scale 1:24,000. Open-File Report OFR 99-06. Arizona Geological Survey, Tucson, Arizona. <http://repository.azgs.gov/azgs/azgs/geology/d01045>

Source Scale: 1:24,000. According to US National Map Accuracy Standards, features are within 1/2 (60) ft of their true location.

Poster Layout: Georgia Hyatt and Jake Sun (Colorado State University) Poster Date: September 2020

All Geologic Resource Inventory geologic map data and publications are available at <http://azgs.wr.usgs.gov/geology/azgs>

Parent/Teacher Resource Page 2

<https://blog.azgs.arizona.edu/category/geoevents>



ARIZONA GEOLOGY
e-MAGAZINE

Home - GeoEvents

INTRODUCTION

For those looking for a gift with geologic overtones, we've compiled a list of some of our favorite geologic books, field trips guides, and maps that are in-print or free as digital downloads.

Best wishes finding precisely what you need.

CATEGORIES

- i. Geologic Literature of Arizona – for the non-specialist
 - a. Arizona Geological Survey Down-to-Earth series
 - ii. Geologic Maps
 - iii. Arizona Field Trip Guides
 - iv. Arizona Mines and Mining Histories
 - v. Technical Geologic Reports and Papers
-



ARIZONA GEOLOGY
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Home - Arizona's Christmas Mine 1880s To 1982

Arizona Geology Blog presents 'History of the Christmas Mine, Gila County, Arizona'

The March 24, 2021, blog (tinyurl.com/AZ-XmasMine) presents David Briggs', *History of the Christmas Mine, Gila County, Arizona*. The 45 page Contributed Report (AZGS CR-21-A) includes 22 figures, annual ore production data, and details of the geology and the history of mineral exploration and mining at this small porphyry copper deposit in the Dripping Spring Mountains 75 miles north of Tucson.

Images: Christmas Mine working viewed from AZ-77; Christmas Mine mid-century; core from mineralized skarn deposit of Christmas.

To go directly to the report: http://repository.azgs.arizona.gov/uri_qin/azgs/dlio/1977

Earth Science Week Adds Geoscience to Earth Day



Educators and young people worldwide will celebrate Earth Day 2021 on April 22 with activities, experiments, and investigations exploring how our world works — and those in the know will tap the wealth of education resources available through Earth Science Week.

EARTH SCIENCE WEEK UPDATE

Although Earth Science Week won't take place until October, the program offers education materials, information, and tools throughout the year. This year, for example, Earth Science Week provides education tools highlighting the theme of "Water Today and for the Future," including learning activities focusing on water science.

The Earth Science Week website offers hundreds of free classroom activities, Spanish-language resources, videos, visualizations, webcasts, local events and organizations, competitions and awards, and careers information. Learn more about [Earth Science Week](#).

And help us spread the word that there is no better way to honor Earth Day than by celebrating the geosciences. Share the crucial message of our #EarthScience4EarthDay hashtag campaign on social media platforms such as Twitter, Facebook, and Instagram!

GET INVOLVED WITH ART FOR NATIONAL FOSSIL DAY

To celebrate the 12th annual National Fossil Day during Earth Science Week 2021, the National Park Service is hosting an art contest celebrating fossil resources and paleontological heritage.

Open to U.S. residents of any age, the contest focuses on the theme "Prehistoric Life from our National Parks and Monuments." You will need to do a little research to learn about fossils from a particular national park. You can pick any fossil, specific prehistoric organism, prehistoric reconstruction, and/or a collage of the above from any of the 279 National Park Service areas that have fossils.

All submissions must be received by mail or email by 5 p.m. EST, October 1, 2021. The artwork will be judged by a panel on originality, creativity, quality and, most importantly, relevance to the topic. Winners are selected among entrants age 8 and under, 9-13, 14-18, and 18 and over. Four top entries in each age group will be selected including 1st Place, 2nd Place, 3rd Place and Honorable Mention. Read guidelines and download an entry form on the [contest website](#).

WEBCAST DETAILS 'FOCUS DAYS' OF EARTH SCIENCE WEEK

What does Earth Science Week 2021 have in store for you? Each day during the week, you can focus on a different area of Earth science. Go online today to view a webcast about the "Focus Days" of this year's celebration:

- International EarthCache Day (Sunday, October 10)
- Minerals Day (Monday, October 11)
- Earth Observation Day (Tuesday, October 12)
- National Fossil Day (Wednesday, October 13)
- Geoscience for Everyone Day (Thursday, October 14)
- Geologic Map Day (Friday, October 15)
- International Archaeology Day (Saturday, October 16)

This free webcast provides an overview of opportunities, activities, and resources available. The roughly four-minute tutorial includes a wealth of online links, which viewers can click during the presentation to review available resources. To view the webcast, visit [online](#). In the coming months, look for additional webcasts on Earth Science Week 2021: "Water Today and for the Future." Learn more about Earth Science Week's [Focus Days](#).



Pinal Museum and Club News

351 N. Arizona Blvd., Coolidge, AZ
 Pinal Gem and Mineral Club meeting
April 21, 2021, live on YouTube

www.pinalgeologymuseum.org
 Ray Grant 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. Here is the Tertiary Mammals exhibit.



We are also working on the mineral exhibits including one on Pinal County minerals; here is recent donation of native silver from the Magma Mine in Pinal County from Mark Hay.

ALL ARIZONA CLUB MEETINGS ARE LIKELY CANCELLED DUE TO HEALTH CONCERNS!



Apache Junction Rock & Gem Club
Meetings are on the 2nd Thursday
Next Meeting: 2021, 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: April 6, 2021, 6:30 p.m.
Please go to their website for more info
www.dmrmc.com
@ Anthem Civic Building
3701 W. Anthem Way, Anthem, AZ



Maricopa Lapidary Society, Inc
Meetings are on the 1st Monday
(unless a Holiday then 2nd Monday)
Next Meeting: May 3, 2021, 7:00 pm
www.maricopalapidarysociety.com
Zoom Meeting
@ North Mountain Visitor Center
12950 N. 7th St., Phoenix



Mineralogical Society of Arizona
Meetings are on the 2nd Thursday
(September meeting on the 3rd Thursday)
Next Meeting: April 8, 2021, 7:30 pm
www.msaz.org

Zoom Meeting - Register on MSA website



Pinal Gem & Mineral Society
Meetings are on the 3rd Wednesday
Next Meeting: April 21, 2021, 7:00 pm on
YouTube go to their website for more info
www.pinalgemandmineralsociety.org
@ Artisan Village
351 N. Arizona Blvd., Coolidge



West Valley Rock & Mineral Club
Meetings are on the 2nd Tuesday
Next Meeting: April 13, 2021, 6:30 pm
Zoom meeting
www.westvalleyrockandmineralclub.com
@ Painted Desert Academy
2400 S. 247th Ave., Buckeye, AZ



White Mountain Gem & Mineral Club
Meetings are on the 1st Sunday
(unless a Holiday then 2nd Sunday)
Next Meeting: 2021, 1:00 pm
www.whitemountain-azrockclub.org
@ VFW Hall
381 N. Central, Show Low



Wickenburg Gem & Mineral Society
Meetings are on the 2nd Friday
(February & December on the 1st Friday)
Next Meeting: 2021, 7:00 pm
www.wickenburggms.org
@ Coffinger Park Banquet Room
175 E. Swilling St., Wickenburg

ESM's Meeting Notice

ESM's next meeting will be at North Mountain Visitor Center, 12950 N. 7th St., Phoenix, on Tuesday, TBA 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
- Friends of the AZ Mining & Mineral Museum
- Maricopa Lapidary Society
<http://maricopalapidarysociety.com/>
- Mineralogical Society of AZ
www.msaz.org
- Payson Rimstones Rock Club
- Sossaman Middle School
- White Mountain Gem & Mineral Club
www.whitemountain-azrockclub.org
- Wickenburg Gem & Mineral Society
<http://www.wickenburggms.org>
www.facebook.com/pages/Wickenburg-Gem-and-Mineral-Society/111216602326438
- Staples Foundation
www.staplesfoundation.org
- Anita Aiston
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We're on the Web!

Visit us at:

www.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.

NOTICE:

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

THANK YOU FOR YOUR CONTINUING INTEREST & SUPPORT!!!

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