EARTHQUAKE

EARTH SCIENCE MUSEUM

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 2024
Volume 13, Issue 2

ESM OUTREACH UPDATE

Mardy Zimmermann, Outreach Coordinator

February Outreach

On February 1st Terry & Lynne Dyer participated in a science fair at Knox Gifted Academy in Chandler. Many students, parents and teachers attended.
Knox Gifted Academy Facebook photo

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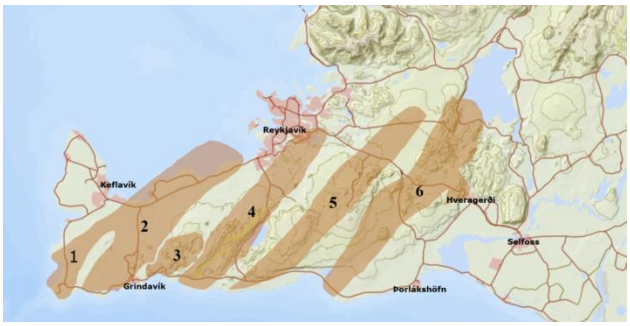
Recent Volcanic Activity on Iceland's Reykjanes Peninsula

By Harvey Jong

Volcanic eruptions in Iceland have recently been in the news, so we'll explore the activity that has been occurring on the Reykjanes Peninsula. The peninsula is located in southwest Iceland and hosts six volcanic systems.



Map of the Reykjanes Peninsula Showing the Region's Volcanic Systems
Based on data from National Land Survey of Iceland map, annotated by Prioryman, ©National Land Survey of Iceland, used with permission, via Wikimedia Commons

1. Reykjanes	**4. Krýsuvik**
2. Eldvörp-Svartsengi	**5. Brennisteinsfjöll**
3. Fagradalsfjall	**6. Hengill**

Iceland's geology involves a continual interaction of the spreading divergent plate boundary between the North American and Eurasian Plates and a deep-seated mantle hotspot. As the plates move apart, stress gradually builds up and is released during rifting episodes. Magma brought up to the surface by the hotspot flows under high pressure into fractures and activates volcanic systems.

A volcanic eruption on the Reykjanes Peninsula has not occurred for 781 years until March 19, 2021 when small fissures appeared within the Fagradalsfjall system.

The fissures were located in the Geldingadalur valley which is only 40 km (25 mi) from Reykjavik, the capital and largest city of Iceland. The site's close proximity and easy access attracted thousands of locals and foreign tourists.

Tourists Viewing the 2021 Geldingadalur Eruption
Berserkur photo, - CC_BY_SA-4.0 International, via Wikimedia Commons

The basaltic effusive eruption involved steady lava flows; lava fountains that reached 100-400 m (328-1280 ft) high; and the formation of several spatter cones.

Screenshot of Webcam Video of the Eruption on May 5, 2021
Ssongg. "400?! meter fire fountain at Fagradalsfjall, (Iceland, 2021)", May 5, 2021, Video, 1:39. https://www.youtube.com/watch?v=K8q-9OXKkF0, accessed February 15, 2024.

It lasted until September 18, 2021 and produced a lava field with a mean thickness exceeding 30 m (98.4 ft) which covered a 4.8 km^2 (1.85 mi^2) area with an estimated volume of 150 million m^3 (5,297 million ft^3) (Pedersen et al., 2022). The lava flow rate ranged from 1-8 m^3 (35.3-282.5 ft^3) per second in March-April and increased to 9-13 m^3 (317.8-459.1 ft^3) per second in May-September. Overall, the eruption's lava filled the equivalent of one Olympic-size swimming pool every 4 minutes!

Map of the Geldingadalur Eruption Lava Flows
Benjamin Hennig/Geovis Lab map, ©2024 Spatial Analysis & Geovisualization Research Group at the Faculty of Life and Environmental Sciences, University of Iceland, geovis.hi.is

This map provides a snapshot of the lava flows as of October 28, 2021.

2022 Eruption

On August 3, 2022, an eruption occurred in the adjacent Meradalir valley where fissures open about 1 km (0.62 mi) north of the previous site.

2022 Meradair Eruption
Drumstick 21 photo, - CC_BY_SA-4.0 International, via Wikimedia Commons

A curtain of lava fountains was observed along a 350 m (1,148 ft) fissure, and the initial lava flow rate was around 20 m^3 (706 ft^3) per second (Krmíček et al, 2023).

Screenshot of Video of 2022 Meradalir Eruption

Airstock. "New Eruption in Iceland 2022 – Meradalir Volcano", August 4, 2022, Video, 0:43. https://www.youtube.com/watch?v=TZCMZ4MCGHk, accessed February 17, 2024.

Activity quickly subsided, and by the second day only 100 m (328 ft) of the original fissure was emitting lava and the flow rate had dropped to about 15 m^3 (530 ft^3) per second. Lava outflows eventually were limited to a main spatter cone where the accumulated thickness varied from 20-40 m (66-131 ft). Activity ceased on August 21, 2022. The total lava volume was estimated to be about 12 million m^3 (424 million ft^3) which is about eight percent of the amount of the 2021 eruption.

Map of the Meradalir and Geldingadalur Eruption Lava Flows

Benjamin Hennig/Geovis Lab map, ©2024 Spatial Analysis & Geovisualization Research Group at the Faculty of Life and Environmental Sciences, University of Iceland, geovis.hi.is

This map presents a snapshot of the Meradalir eruption after two weeks of activity (August 15, 2022) superimposed on the lava flows of the 2021 Geldingadalur eruption.

2023 Eruptions

Volcanic activity continued in 2023 with two different eruptions that were preceded by intense earthquake swarms. Over 12,000 earthquakes were recorded before lava erupted on July 10, 2023 near Litli-Hrútur. This site was located further inland from the previous eruptions and resulted in a large wildfire when fields of moss caught fire. Multiple fissures developed along a 200 m (660 ft) length and eventually extended over 1 km (0.62 mi). A large smoke plume was observed with the eruption.

Satellite View of the Smoke Plume from the Litli-Hrütur Eruption

ESA/Copernicus Sentinel-2 photo, Contains modified Copernicus Sentinel data 2023, - CC BY-SA IGO 3.0, via Wikimedia Commons

The initial lava flow rate was 50 m^3 (1800 ft^3) per second, but dropped to an average of 13 m^3 (460 ft^3) per second in a few days. The lava moved south or southeast towards the Meradalir lava field.

Lava Flowing from the Volcanic Eruption near Litli-Hrútur

Anthony Quintano photo, - CC_BY_SA-2.0, via Wikimedia Commons

Close-up of the Litli-Hrútur Eruption
Anthony Quintano photo, - CC_BY_SA-2.0, via Wikimedia Commons

Lava emissions decreased to 3-4 m^3 (106-141 ft^3) per second by early August, and volcanic activity ended on August 5, 2023. According to the Institute of Earth Sciences of the University of Iceland, the total lava volume was measured at 15.5 million m^3 (547.4 million ft^3) and covered an area of 1.5 km^2 (0.58 mi^2). Average lava thickness was 10 m (32.8 ft), while the greatest thickness of 28-30 m (91.9-98.4 ft) occurred outside the main crater.

Map of the Litli-Hrútur, Meradair, and Geldingadalur Lava Flows
Benjamin Hennig/Geovis Lab map, ©2024 Spatial Analysis & Geovisualization Research Group at the Faculty of Life and Environmental Sciences, University of Iceland, geovis.hi.is

This map compares the Litli-Hrútur eruption after one week (July 19, 2023) with the earlier eruptions in 2021 and 2022.

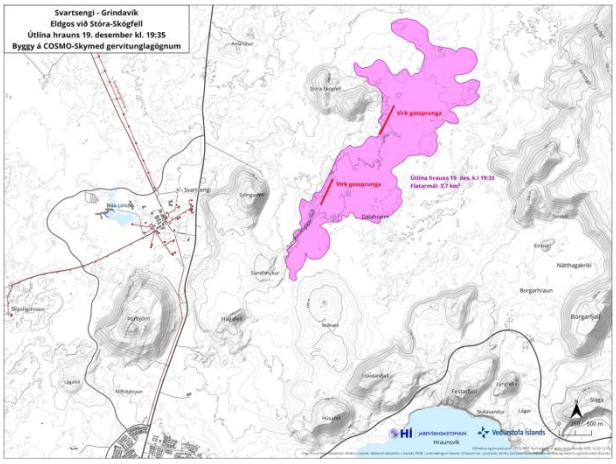
A Second 2023 Volcanic Eruption

Seismic activity started to increase in October, and 20,000 quakes had been recorded by November 10. The tremors along with large-scale subsidence around the coastal town of Grindavik prompted the evacuation of the 3,700 residents. Magma upwelling was observed near the volcanic crater chain, Sundhnúkur, which is located about 3.5 km (2.2 mi) northeast of Grindavik.

On the evening of December 18, lava erupted from a fissure in the Eldvörp-Svartsengi volcanic system. This fissure propagated southward and developed several segments where the total length was estimated to be 4 km (2.5 mi). Lava fountains, rising several hundreds of meters high, supplied lava flows in multiple directions as seen in the following photo.

December Eruption Near Grindavik
Iceland Meteorological Office (IMO) photo, - ©2023 IMO, used with permission, via Wikimedia Commons

High lava flow rates of 100-200 m^3 (3,513-7,063 ft^3) per second were noted during the first two hours of the eruption. Volcanic activity, however, quickly subsided and ended three days later on December 21st.



Map Showing Fissure Locations and Lava Flows on December 19, 2023

Institute of Earth Sciences/Icelandic Meteorological Office map, December 20, 2023, accessed February 22, 2024, via en.vedur.is
This map shows the eruption's location relative to the town of GrindavÍk (bottom left) and to the Blue Lagoon geothermal spa (middle left), a popular tourist attraction, and adjacent Svartsengi Power Station. Red lines denote fissures, while purple indicates the extent of the lava flow.

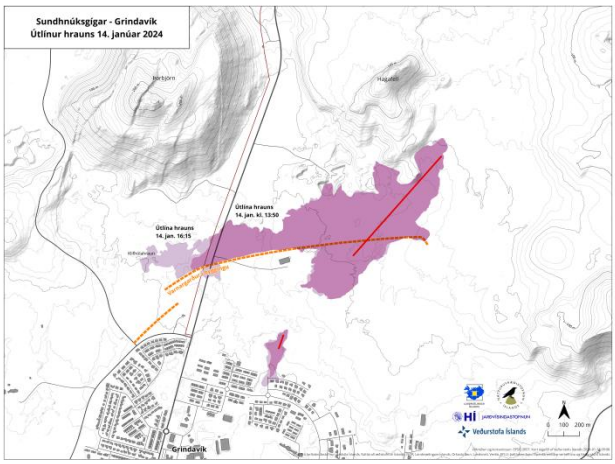
2024 Eruptions

January 14, 2024

Volcanic activity near Grindavik continued with an eruption that started on January 14 at 7:57 a.m.

January 2024 Eruption
Almannavarnadeild ríkislögreglustjóra photo, - PD, via Wikimedia Commons
This image shows the proximity of the eruption to Grindavik (foreground) and Reykjavik (lights in the background).

Lava Flow and Fountains of the January 2024 Eruption
IMO photo, ©2024 IMO, used with permission, via Wikimedia Commons



Map of the Lava Flow on January 14, 2024
IMO map, January 14, 2024, accessed February 20, 2024, via en.vedur.is
This map depicts the extent of the eruption based on measurements by the Icelandic Institute of Natural History and the University of Iceland's Institute of Earth Sciences. The dark purple indicates the lava flow at 1:50 pm, while light purple represents the flow 2.5 hours later. Eruptive fissures are denoted by the red lines.

To prevent lava from reaching Grindavik, barriers were constructed using volcanic rock. Unfortunately, a fissure opened at the edge of town behind the barriers, and several houses were destroyed.

Drone Footage of Houses Set on Fire by the Eruption
The Guardian News channel, January 15, 2024

February 8, 2024

Another eruption in the Eldvörp-Svartsengi volcanic system occurred on February 8th when a new fissure opened north of Mt. Stóra-Skógfell. The fissure was approximately 3 km (1.86 mi) long, and lava fountains reached a height of 50-80 m (164-196 ft). The lava flow didn't cause damage to Grindavik, but it reached the main road to the Blue Lagoon and destroyed a water pipe that disrupted the supply of hot water for more than 20,000 people on the Reykjanes

Peninsula. Eruptive activity ceased on February 9th.

Start of the February 8th Eruption
Björn Oddsson photo, IMO, February 8, 2024, accessed February 8, 2024, via en.vedur.is
Photo from Icelandic Coast Guard surveillance flight around 6 a.m. local time. The eruptive fissure is about 3 km long, and the lava is flowing mostly west. Mt. Stóra-Skógfell appears in the foreground, while the lights of the Svartsengi geothermal power station are in the background.

Satellite View of Reykjanes Peninsula on February 8th
European Union, Copernicus Sentinel-2 imagery, via Copernicus.eu

This image was acquired at 13:04 UTC, less than 10 hours after the eruption began. A smoke plume and lava flow is seen near Grindavik.

Lava Engulfs Road, Forcing Blue Lagoon to Close
The Guardian News channel, February 8, 2024

Potential Future Eruption

According to the Icelandic Meteorological Office (IMO), magma is accumulating in the Svartsengi area and may reach levels similar to prior eruptions. Model calculations indicate that as of February 22nd about 5 million m^3 (176.6 million ft^3) of magma have refilled the magma reservoir. Observations from previous eruptions indicate that the likelihood of an eruption is very high when the volume reaches between 8-13 million m^3 (282.5-459.1 million ft^3). If the magma accumulation continues at the current rate, this level could be reached by the end of February.

IMO scientists believe that an eruption may involve magma flowing from the reservoir beneath Svartsengi towards the Sundhnúkur crater chain. The ascending magma should be associated with a sudden increase in seismic activity. So far, seismic activity around Grindavik has remained minimal with about 20 small earthquakes per day for the past few days.

Several webcams have been set up to monitor volcanic activity around Iceland, so it may be possible to watch a live stream of the next eruption. Here are links to a few webcams around Grindavik:

Þorbjörn
https://www.youtube.com/watch?v=Bqudj0x0POA

Þorbjörn2
https://www.youtube.com/watch?v=VIs83vmfZCk

Grindavik Cam C
https://www.youtube.com/watch?v=aDdw4zXEEz0

Sundhnúkar-Grindavik Cam 4
https://www.youtube.com/watch?v=YAQzsB9ev9Q

References

Krmíček, L., V.R. Troll, M.V. Galiová, T. Thordarson, M. Brabec (2023) Trace element composition in olivine from the 2022 Meradalir eruption of the Fagradalsfjall fires, SW Iceland (short communication). *Czech Polar Reports:* 12(2), 222-231.

Pedersen, G.B.M., J.M.C. Belart, B.V. Óskarsson, M.T. Gudmundsson, N. Gies, T. Högandóttir, Á.R. Hjartardóttir, V. Pinel, E. Berthier, T. Dürig, H.I. Reynolds, C.W. Hamilton, G. Valsson, P. Einarsson, B. Ben-Yehosua, A. Gunnarsson, and B. Oddsson (2022) Volume, effusion rate, and lava transport during the 2021 Fagradalsfjall eruption: results from near real-time photogrammetric monitoring. *Geophysical Research Letters:* 49(13), 2021GL097125.

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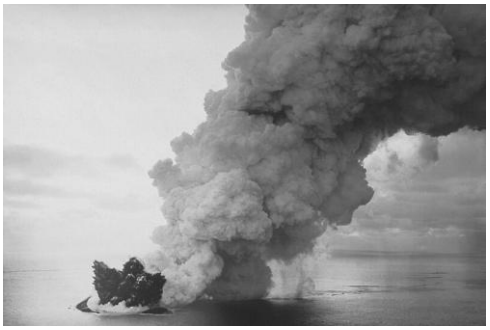
Surtsey

From Wikipedia

Surtsey is an uninhabited volcanic island located in the Vestmannaeyjr, archipelago off the southern coast of Iceland. Surtsey is the southernmost point of Iceland. It was formed in a volcanic eruption which began 130 meters (430 feet) below sea level, and reached the surface on 14 November 1963. The eruption lasted until 5 June 1967, when the island reached its maximum size of 2.7 km^2 (1.0 sq mi). Since then, wave erosion has caused the island to steadily diminish in size: as of 2012, its surface area was 1.3 km^2 (0.50 sq mi). The most recent survey (2007) shows the island's maximum elevation at 155 m (509 ft) above sea level.



Surtsey's ash column rises over the newly forming island. NOAA photo via Wikipedia

The new island was intensively studied by volcanologists during its eruption, and afterwards by botanists and other biologists as life forms gradually colonized the originally barren island. The undersea vents that produced Surtsey are part of the Vestmannaeyjar submarine volcanic system, part of the fissure of the sea floor called the Mid-Atlantic Ridge. It is estimated that Surtsey will remain above sea level until at least the year 2100.

Settlement of life

A classic site for the study of biocolonisation from founder populations, Surtsey was declared a nature reserve in 1965, while the eruption was still in progress. Today only a few scientists are permitted to land on Surtsey; the only way anyone else can see it closely is from a small plane. This allows the natural ecological succession for the island to proceed without outside interference. In 2008, UNESCO declared the island a World Heritage Site, in recognition of its great scientific value.

In the spring of 1965, the first vascular plant was found growing on the northern shore of Surtsey, mosses became visible in 1967, and lichens were first found on the Surtsey lava in 1970. Plant colonization on Surtsey has been closely studied, the vascular plants in particular as they have been of far greater significance than mosses, lichens and fungi in the development of vegetation.

Mosses and lichens now cover much of the island. During the island's first 20 years, 20 species of plants were observed at one time or another, but only 10 became established in the nutrient-poor sandy soil. As birds began nesting on the island, soil conditions improved, and more vascular plant species were able to survive. In 1998, the first bush was found on the island—a tea-leaved willow (Salix phylicifolia), which can grow to heights of up to 4 meters (13 feet).

Bird Life

The expansion of bird life on the island has both relied on and helped to advance the spread of plant life. Birds use the plants for nesting material, but also continue to assist in the spreading of seeds, and fertilize the soil with their guano. Birds first began nesting on Surtsey three years after the eruptions ended. Twelve species are now regularly found on the island.

Marine Life

Soon after the island's formation, seals were seen around the island. They soon began basking there, particularly on the northern spit, which grew as the waves eroded the island. Seals were found to be breeding on the island in 1983, and a group of up to 70 made the island their breeding spot. Grey seals are more common on the island than harbor seals, but both are now well established. The presence of seals attracts orcas, which are frequently seen in the waters around the Vestmannaeyjar archipelago and now frequent the waters around Surtsey.

On the submarine portion of the island, many marine species are found. Starfish are abundant, as are sea urchins and limpets. The rocks are covered in algae and seaweed covers much of the submarine slopes of the volcano, with its densest cover between 10 and 20 meters (33 and 66 ft) below sea level.

Other life

Insects arrived on Surtsey soon after its formation, and were first detected in 1964. The original arrivals were flying insects, carried to the island by winds and their own power. Some were believed to have been blown across from as far away as mainland Europe. Later insect life arrived on floating driftwood, and both live animals and carcasses washed up on the island.

The establishment of insect life provided some food for birds, and birds in turn helped many species to become established on the island. The bodies of dead birds provide sustenance for carnivorous insects, while the fertilization of the soil and resulting promotion of plant life provides a viable habitat for herbivorous insects.

The first earthworm was found in a soil sample in 1993, probably carried over from Heimaey by a bird. However, the next year no earthworms were found. Slugs were found in 1998, and appeared to be similar to varieties found in the southern Icelandic mainland. Spiders and beetles have also become established.

Human Impact

The only significant human impact is a small prefabricated hut which is used by researchers while staying on the island. The hut includes a few bunk beds and a solar power source to drive an emergency radio and other key electronics. There is also an abandoned lighthouse foundation. All visitors check themselves and belongings to ensure no seeds are accidentally introduced by humans to this ecosystem. It is believed that some boys who sneaked over from Heimaey by rowboat planted potatoes, which were promptly dug up once discovered. In 2009, a weather observation station and a webcam were installed on Surtsey.

Arizona Rocks 129

Text by Ray Grant

Arizona is famous for copper minerals. The copper starts out as primary sulfide deposits with chalcopyrite (copper iron sulfide) being the most common copper mineral. When these deposits are uplifted and exposed to air (oxygen) and water, oxidation occurs and the minerals desired by collectors are formed. The sulfur in the sulfide minerals forms sulfuric acid and the copper goes into solution, and these solutions move down toward the water table, and when neutralized form new minerals. The result is the oxidized zone found over the copper deposits in Arizona.

There is a rough pattern to the mineral locations in the oxide zones. It depends on a number of things like depth to water table, amount of water in the area, the presence of carbonate rocks that neutralize the acid, and other factors. The top is the iron oxide gossan composed of hematite. Early prospectors determined that these red oxide caps were the places to dig down to the copper deposits below. Below the gossan, chrysocolla (copper silicate) is usually found and then malachite and azurite (copper carbonates), followed below by cuprite (copper oxide) and native copper. If there is phosphate in the solution then turquoise will form.

Solutions that reach the water table will form chalcocite (copper sulfide) and form the enriched zone with a high copper content. The prospectors would start in the gossan and dig to the enriched zone to mine this rich ore.

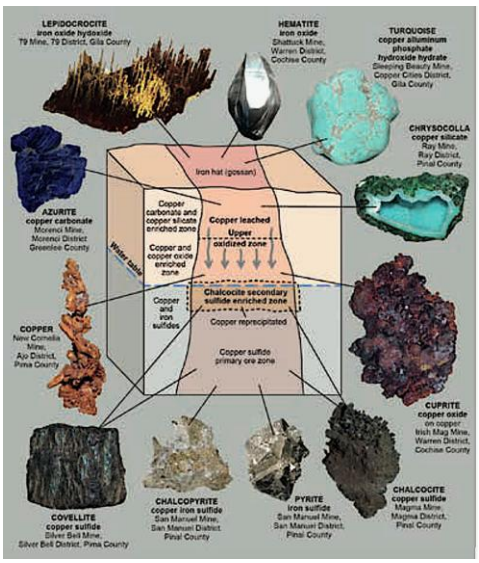
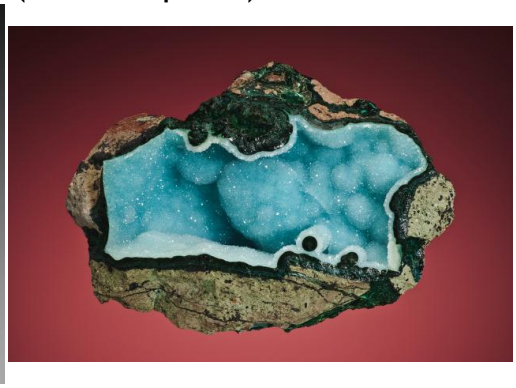


Diagram of zones in an oxidized copper deposit, from the 4th edition of the Mineralogy of Arizona, graphics by John Callahan

Left: Turquoise, Ithaca Peak Mine, Kingman, Mohave County, Arizona
Right: Malachite on azurite, Morenci, Greenlee County, Arizona (Jeff Scovil photos)



Left: Cuprite on malachite, Bisbee, Cochise County, Arizona
Right: Chrysocolla, quartz overgrowth, Ray Mine, Pinal County, Arizona (Jeff Scovil photos)

AZ Mining, Mineral & Natural Resources Education Museum Update February 2024

https://ammnre.arizona.edu/

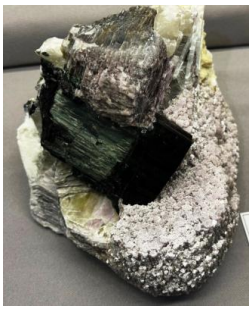
Catie Carter Sandoval
cscarter@email.arizona.edu
703.577.6449

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

Last summer we began the nationwide search for a founding museum Executive Director. We are happy to announce that the University of Arizona has hired accomplished museum professional and non-profit leader Marta Bones to lead us forward. Marta brings with her seventeen years of museum experience and demonstrated experience in strategic planning, fundraising, and redefining visitor experience. She served as the Executive Director for the Pittock Mansion, a historic home in Portland, Oregon for over a decade, and most recently, she served as Director of Development for the Frank Lloyd Wright Foundation in Scottsdale. Marta's expertise and experience is compounded by an appreciation for Arizona and its natural wonders, having spent most of her childhood in our state. This makes her a great fit for our museum and we are very excited to welcome her as our new leader.

In other news, earlier this month we participated in the 2024 Tucson Gem and Mineral Show at the Convention Center with our special exhibit, "Pegmatite Minerals of the Arizona Mining, Mineral and Natural Resources Education Museum Collection." The display included 9 worldwide specimens from our collection and 14 pegmatite specimens from mineral collector Bob Weaver's US collection, which he donated to the museum shortly before passing away on December 29, 2023. We are very thankful for this generous donation and we accompanied the display with a small thank you note to Bob. Some of our favorite specimens in the case included a large single blue Beryl crystal, 11 cm in diameter, from Maricopa Co., AZ – and from Bob's Collection, an exceptional watermelon tourmaline from Haddam Neck, Middlesex Co., CT. It is always fun to participate in the Tucson show and we plan to continue to share our minerals at the show for years to come.

Our display at the 2024 Tucson Gem and Mineral Show, which included 23 pegmatite mineral specimens from around the world



Elbaite and lepidolite from Minas Gerais, Brazil

More updates coming soon about our design-build process as we navigate this process with our new Director Marta. We'll keep you posted, and thank you all for your continued support.

Pinal Museum and Society News

351 N. Arizona Blvd., Coolidge, AZ

Pinal Geology and Mineral Society next meeting

March 20, 2024

Meetings are the third Wednesday at 7pm, doors open at 6:30

Everyone is welcome!

www.pinalgeologymuseum.org

Ray Grant ray@pinalgeologymuseum.org

Through next May, we will have our hours of 10 to 4 Wednesday through Saturday, admission is free.

The March program for the Pinal Geology and Mineral Society, Wednesday March 20, museum open at 6, meeting at 7, will be Ray Grant talking about Arizona Pegmatites. This is a talk that he gave at the recent Tucson Gem and Mineral Show. The talk will start at the Hummingbird claims north of Lake Mead and travel south to the Bountiful Beryl prospect, the questionable Red Lake ruby corundum locality, the Guy Hazen Group, the Rare Metals Mine, the 7U7 Ranch locality searched for by many collectors (but?), the pegmatite mineral Arizonite (named for our state), all the pegmatites around Wickenburg, the aquamarine locality in the Sierrita Mountains, and ending in Cochise County with some pegmatite topaz localities. Everyone is welcome.

Sun City Rockhound Mineral Museum
Sundial Recreation Center
14801 N. 103RD Ave.
Sun City, AZ 85351
scrockmuseum@gmail.com
623-428-6442

C. Sandoval photo

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

Sun City Rockhounds ANNUAL ROCK SALE March 9, 2024

8AM-1PM

Mountain View Recreation Center 9749 N. 107th Ave, Sun City AZ. 85351

Located in the parking lot

We are having a moving sale with rock bottom prices! Selling landscape rocks, slabs, petrified wood, unique specimens from private collections, fossils and much more!

We will also be selling egg carton samplers for kids and adults. For one dollar you can hand pick twelve specimens!

Please join us and find your treasure

Find us on: Facebook: Sun City Rockhounds

Arizona Rock and Gem Shows

Daisy Mountain Rock and Mineral Club
Daisy Mountain Rock and Mineral Show
March 2-3, 2024
Sat. 9-5, Sun. 10-4
Adults, $5,
Seniors, Vets, students $4
Children under 12 free with adult
Anthem School
41020 N. Freedom Way
Anthem, AZ

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, 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

DAISY MOUNTAIN ROCK AND MINERAL SHOW

MARCH 2 and 3, 2024

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

THE 4TH

PHOENIX HERITAGE MINERAL SHOW

JUNE 1–2, 2024

PHOENIX SHRINE AUDITORIUM

552 N. 40TH ST, PHOENIX, AZ 85008

Show Hours:
Saturday: 9:00 am to 5:00 pm
Sunday: 10:00 am to 4:00 pm

Admission:
CASH ONLY - ATM Available

$5.00 Adults | $3.00 MSA Members |

FREE 12 years & younger with paying adult
FREE Parking during The Show!

Enter through the Shrine Auditorium's South Entrance.

Café & Cash Bar Hours:
Saturday: 9:00 am - 4:00 pm
Sunday: 10:00 am - 3:30 pm

Apache Junction Rock & Gem Club
Meetings are on the 2nd Thursday
Next Meeting: March 14, 2024, 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 5, 2024, 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
Note: New meeting day
Meetings are on the 3rd Tuesday
Next Meeting: March 19, 2024, 7:00 pm
www.maricopalapidarysociety.com
@ North Mountain Visitor Center
12950 N. 7th St., Phoenix, AZ

Mineralogical Society of Arizona
Meetings are on the 3rd Thursday
(Except December & June)
March 21, 2024, 7:30 pm
Franciscan Renewal Center, (Piper Hall)
5802 E. Lincoln Drive, Scottsdale
www.msaaz.org

Pinal Geology & Mineral Society
Meetings are on the 3rd Wednesday
Next Meeting: March 20, 2024, 7:00 pm
In person meeting
www.pinalgeologymuseum.org
351 N. Arizona Blvd., Coolidge

West Valley Rock & Mineral Club
Meetings are on the 2nd Tuesday
Next Meeting: March 12, 2024, 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 7, 2024, 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 8, 2024, 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 2024, at 6:30 p.m.

BECOME A MEMBER!
Join the Earth Science Museum's

esi: Earth Science Investigation team

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

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.msaaz.org

Payson Rimstones Rock Club

Sossaman Middle School

White Mountain Gem & Mineral Club
www.whitemountain-azrockclub.org

Wickenburg Gem & Mineral Society
http://www.wickenburggms.org
www.facebook.com/pages/Wickenburg-Gem-and-Mineral-Society/111216602326438

West Valley Rock and Mineral Club
http://www.westvalleyrockandmineralclub.com/

Staples Foundation
www.staplesfoundation.org

Anita Aiston
Peter & Judy Ambelang
Stan & Susan Celestian
Russ Hart
Will & Carol McDonald
Debbie Michalowski
Janet Stoeppelmann
Dennis & Georgia Zeutenhorst

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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.

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Editor E-Mail:
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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 2024, at 6:30 p.m.

THANK YOU FOR YOUR CONTINUING INTEREST & SUPPORT!!!

Earth Science Museum
3215 W. Bethany Home Rd.
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