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

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ESM OUTREACH UPDATE
Mardy Zimmermann Outreach Coordinator

With schools on summer hiatus, there were no outreach programs this month.

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The Mineralogy of Greenland – Part One
By Harvey Jong

Greenland and its mineral resources have been in the news. The melting ice sheet has been reported as clearing the way for a mineral 'gold rush',[1] while various government and mining entities have expressed interest in developing these resources. So, this article will explore the mineralogy of Greenland starting a brief overview of its mineral occurrences, geological history, and some different types of mineral deposits.

Mineral Occurrences

According to mindat.org, 525 valid mineral species have been found in Greenland.[2] This number includes 86 type minerals listed alphabetically below:

List of Greenland's Type Minerals

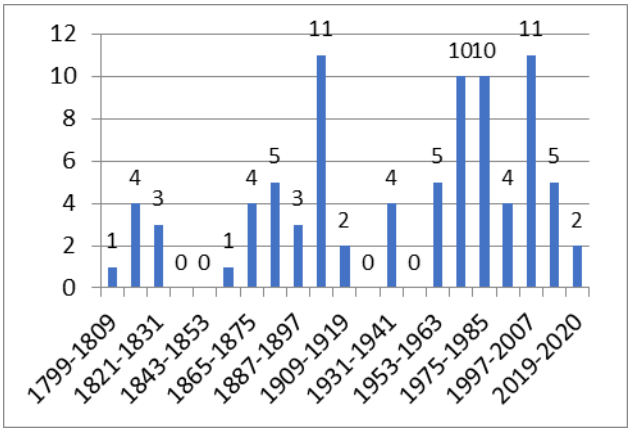
Mineral Name	Year Approved/ First Published
Acuminite	1986
Aenigmatite	1865
Allanite-(Ce)	1812
Ancylite-(Ce)	1898
Arcubisite	1976
Arfvedsonite	1823
Ashcroftine-(Y)	1933
Bohseite	2017
Bøggildite	1956
Bøgvadite	1987
Britholite-(Ce)	1901
Buchwaldite	1977
Carlgieseckeite-(Nd)	2010
Carlsbergite	1971
Chalcothallite	1967
Cordylite-(Ce)	1901
Cryolite	1799
Cryolithionite	1904
Cuprostibite	1969
Dyrnaesite-(La)	2014
Elpidite	1894
Emeleusite	1977
Epididymite	1893
Epistolite	1901
Eskimoite	1977
Eudialyte	1819
Fergusonite-(Y)	1825
Gearksutite	1868
Gustavite	1967
Hydrokenoralstonite	1871
Hydroxylgugiaite	2016
Ikaite	1963

[1] Sam Meredith, "Greenland's melting ice is clearing the way for a mineral 'gold rush'", *Money Report*, January 17, 2025, https://www.nbcnewyork.com/news/business/money-report/greenlands-melting-ice-is-clearing-the-way-for-a-mineral-gold-rush/6111170/

[2] Mindat.org, "Greenland", Accessed July 8, 2025, https://www.mindat.org/loc-1950.html

Ilímaussite-(Ce)	1965
Illoqite-(Ce)	2022
Iron	unknown
Jarlite	1933
Jørgensenite	1995
Kaersutite	1884
Karupmøllerite-Ca	2001
Kentbrooksite	1998
Kochite	2002
Kornerupine	1884
Kuannersuite-(Ce)	2002
Kvanefjeldite	1984
Leifite	1915
Leucosphenite	1901
Lorenzenite	1898
Micheelsenite	2001
Nabesite	2000
Nacareniobsite-(Ce)	1987
Nakkaalaaqite	2020
Narsarsukite	1901
Naujakasite	1933
Neptunite	1893
Nielsenite	2004
Okenite	1828
Orthojoaquinite-(La)	1967
Pachnolite	1863
Polylithionite	1884
Potassic-arfvedsonite	2003
Qaqarssukite-(Ce)	2004
Reyerite	1906
Rinkite-(Ce)	1884
Rohaite	1978
Röntgenite-(Ce)	1953
Sapphirine	1819
Schizolite	1901
Semenovite-(Ce)	1971
Skaergaardite	2003
Skinnerite	1974
Sodalite	1811
Sørensenite	1965
Steenstrupine-(Ce)	1882
Stenonite	1962
Synchysite-(Ce)	1901
Tainiolite	1901
Taseqite	2002
Thomsenolite	1866
Townendite	2009
Tugtupite	1962
Tundrite-(Nd)	1967
Tuperssuatsiaite	1984
Ussingite	1915
Vikingite	1976
Vitusite-(Ce)	1976
Weberite	1938

The list includes either the year in which the mineral was approved by the International Mineralogical Association (IMA) or the first publication date for minerals found before 1959 (year that the IMA was established). Note that due to IMA nomenclature changes many minerals have been renamed with a suffix indicating the dominant rare-earth element in their chemical formula.

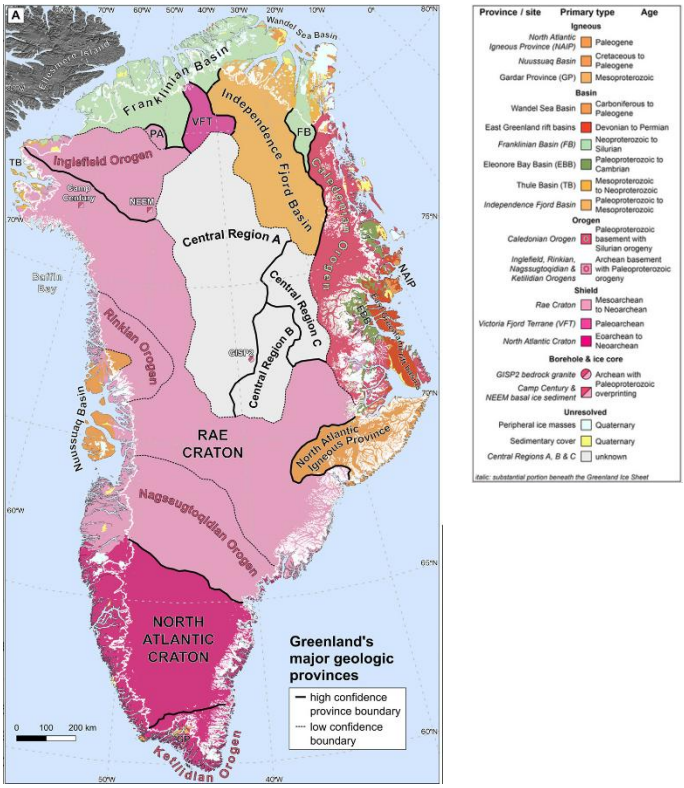


Timeline of Greenland's New Mineral Discoveries

Greenland has a long history of mineral exploration driven by events, such as the Industrial Revolution and the post-World War II uranium boom. This activity seems to be reflected in new mineral discoveries which increased around these periods. The development of mineral resources, however, has been limited by the challenges of Greenland's harsh environment, remote location, undeveloped infrastructure, and political considerations.

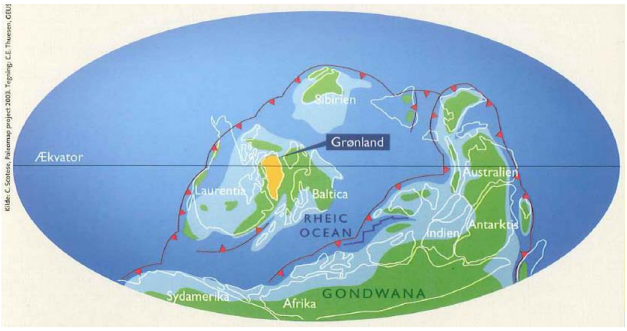
Geological History

Greenland, which is the Earth's largest island, is nearly four billion years old, and 79% of its surface is covered by an ice sheet up to 3.4 km (2.1 mi) thick at the center. Until recently, knowledge about the island's interior geology was extrapolated from studies of rocks exposed along its edge. In 2024, a team of geoscientists performed a comprehensive analysis of seismic, gravity, magnetic, and topography data and produced a new geological map describing provinces beneath the ice sheet (MacGregor et al., 2024).

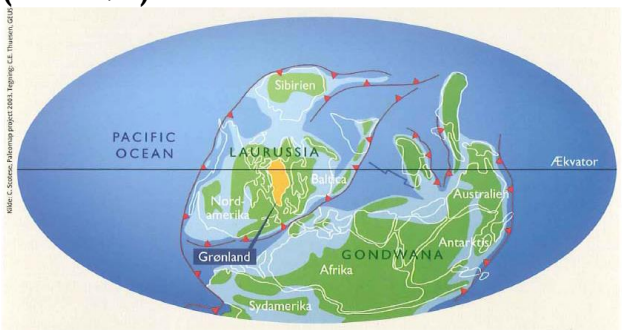


New Geological Map of Greenland
Fig 3a from MacGregor et al., 2024, - PD, via agupubs.onlinelibrary.wiley.com
This new map depicts the geologic provinces below Greenland's ice sheet. The ages are indicated by different colors (see the accompanying legend).

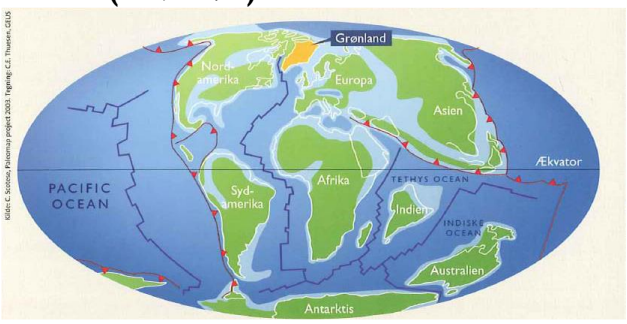
Greenland's geotectonic evolution has involved not only a journey across much of geologic time but also movement across the globe from a tropical region in the southern hemisphere to its current arctic location.



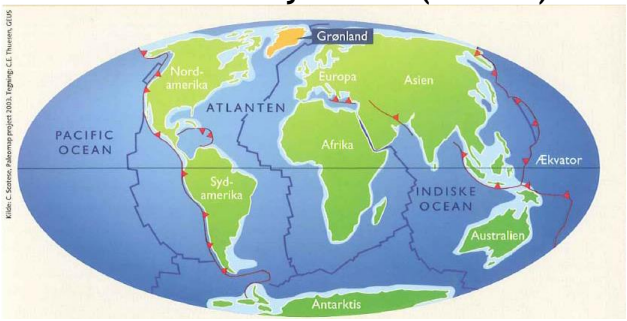
Greenland's Location in the Silurian Period (~425 Ma)



Greenland's Location in the Permian Period (~390 Ma)



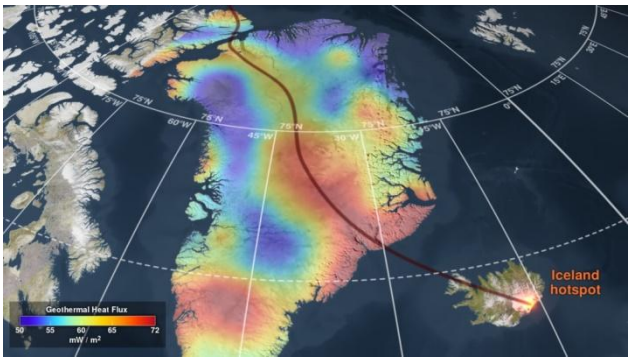
Greenland's Location in the Cretaceous/Tertiary Period (~65 Ma)



Greenland's Location in the Miocene Period (~14 Ma)
Map sequence by Christopher Scotese/PALEOMAP, annotated by Geological Survey of Denmark and Greenland, from (Poulsen, 2015)

As Greenland traveled northward, it passed over a mantle plume or hotspot that is currently situated beneath Iceland.

Greenland Passing Over Mantle Plume 70 Million Years Ago
From NASA Scientific Visualization Studio animation, - PD, via svs.gsfc.gov

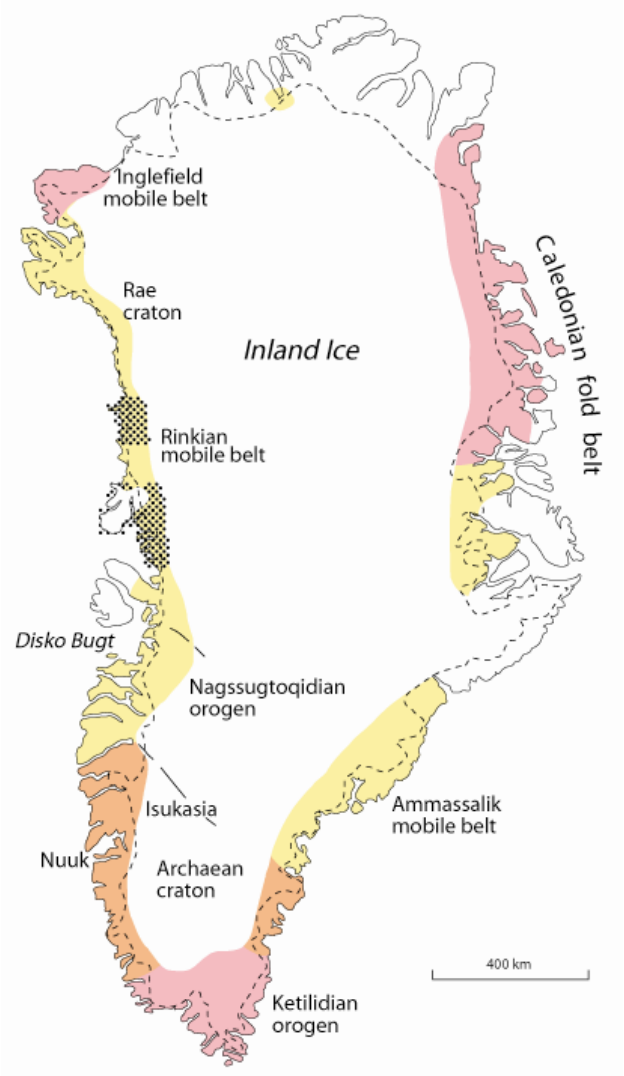


Greenland's Geothermal Heat Flux Map
From NASA Scientific Visualization Studio animation, - PD, via svs.gsfc.gov
Geothermal heat flux (GHF) is the amount of heat flowing outward from the Earth's interior as measured at different points on the surface. Greenland's ice sheet makes it difficult to measure GHF directly, but NASA researchers used the fact that temperature affects how minerals record the Earth's magnetic field to produce this high-resolution GHF map. The red line represents the track of the hotspot through Greenland over the past 100 million years.

Greenland's Rocks

The oldest rocks in Greenland are around 3.8 billion years old, and about 70 percent of the island's rocks are older than 1.6 billion years old. They make up its Precambrian shield which can be divided into three types:

1. Archaean craton (3,100-2,600 Ma)
   This type was largely unaffected by orogenic (mountain building) activity.
2. Orogenic terrane (1,850 Ma)
   This type is associated with rocks that underwent strong deformation and metamorphism during the early Proterozoic.
3. Juvenile terrane (2,000-1,750 Ma)
   This type involved new crust formation from rifting and magmatic activity.



Map of Greenland's Archaean and Early Proterozoic Basement Rocks
Map from (Poulsen, 2015)
- - Archean craton
- - Orogenic terrane
- - Juvenile terrane

The shield provided a stable base for the accumulation of sediments. Subsequent deformation and metamorphism of sedimentary basins along with volcanic activity contributed to the remaining 30 percent of Greenland's rocks.

Mineral Deposits

Greenland hosts a wide variety of geological environments and mineralization processes, and many of the resulting types of deposits are comparable to those found in Canada, Scandinavia, and Australia. High exploration and mining costs, however, have limited development efforts to just a number of key occurrences. Large parts of Greenland have not been explored in detail, but given similarities with known worldwide ore deposits it is believed that the potential for new significant discoveries is high.

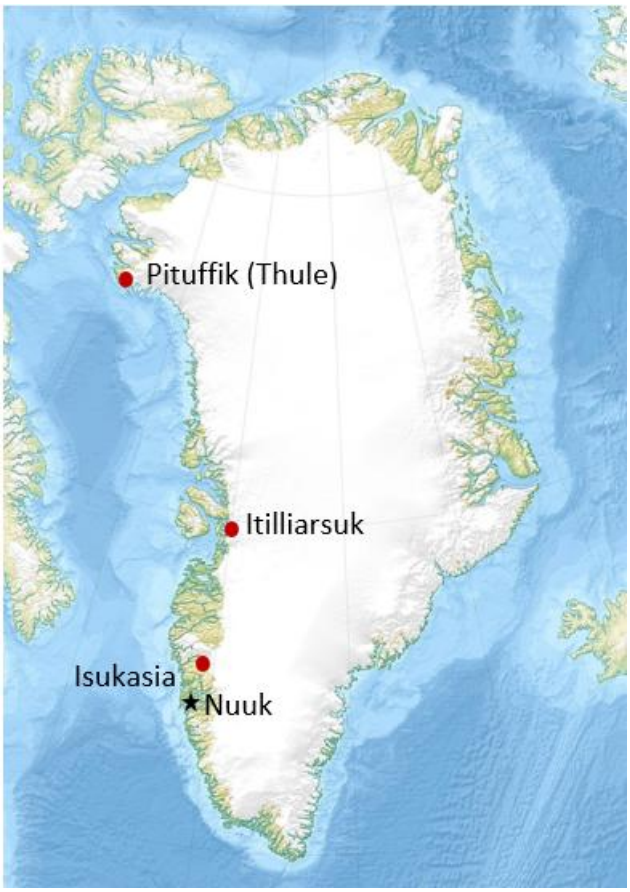
Current information and activities of a few mineral deposits are examined below.

Banded Iron Formation (BIF) Deposits

Banded iron formations are sedimentary deposits that consist of alternating layers of iron oxides and iron-poor chert. Most of these formations are Precambrian in age and are believed to reflect the oxygenation of the Earth's oceans.

Greenland's BIF deposits are located at Isukasia (~3.8 Ga) in southern West Greenland, at Itilliarsuk (~2.85 Ga) in central West Greenland, and at Pituffik (Thule) in north West Greenland. The oldest rocks in Greenland were found in the Isukasia deposit.

Sample from the Isukasia BIF Deposit
James St. John photo, Field Museum of Natural History specimen (FMNH Li 9223), - CC_BY_SA-2.0, via Wikimedia Commons
Isua Supracrustal Belt, southwestern Greenland
The specimen has been dated to 3.8 Ga.



Greenland's Banded Iron Formation Deposits
Uwe Dedering map, annotated based on (Stendal and Thomassen, 2008), - CC_BY_SA-3.0, via Wikimedia Commons

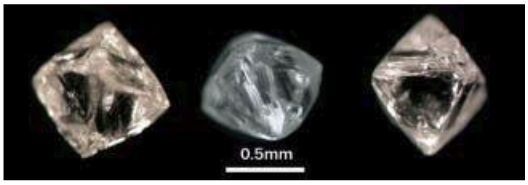
The large BIF deposits are several hundred meters wide with thicknesses varying from 1-40 m (3.2-131.1 ft) and have estimated iron concentrations of 20-35% (Stendal and Thomassen, 2008).

Gemstone Deposits

Occurrences for about 50 gemstones have been reported, and these localities are mainly in western and southern Greenland. Current activities are focused on diamonds and rubies (Secher and Appel, 2007).

Diamond

Since the mid-1990s, diamond exploration has been centered on the 600 Ma old province of carbonatites and ultramafic alkaline rocks in southern West Greenland. Numerous ultramafic lamprophyre and kimberlite dykes have been found. In 2006, drill core samples recovered 35 diamonds, including the largest diamond ever found in Greenland. This diamond weighed 0.122 carats and was found in the Garnet Lake dyke in the Saratoq area. Current activities are still at the exploration stage (Secher and Appel, 2007).

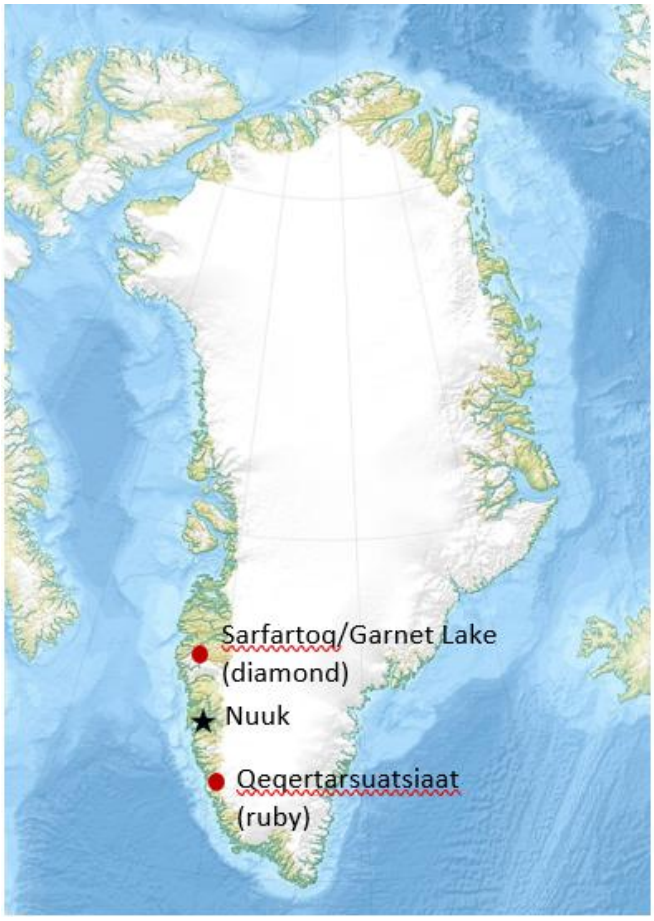


Colorless and Pinkish Diamond Crystals
Photo from (Secher and Appel, 2007)
Garnet Lake, Sarfartoq region, Qeqqata, Greenland

Ruby

Gem-quality ruby was discovered in 1966 using information gathered from the native people of the village of Qeqertarsuatsiaat (formerly Fiskenaesset) on Greenland's southwest coast. The ruby deposits of the Qeqertarsuatsiaat area involve contact metasomatic replacements in micaceous anorthosites and have Archean ages (4,000-2,500 Ma). Thirty one occurrences have been confirmed, and one occurrence, Aappaluttoq, is being developed as a potential mining operation.

Faceted Rubies
True North photo from (Secher and Appel, 2007)
Aappaluttoq, Qeqerarsuatsiaat area, Nuuk, Greenland
Largest stone is 0.77 carats



Greenland's Diamond and Ruby Deposits
Uwe Dedering map, annotated based on (Secher and Appel, 2007), - CC_BY_SA-3.0, via Wikimedia Commons

Gold Deposits

Several gold occurrences have been reported in Greenland, and these are all primary lode deposits. No secondary placer deposits have been found (Secher, Stendal, and Stensgaard, 2008).

South Greenland, which is made up mostly of Juvenile Terrane rocks, hosts a number of gold deposits. The gold mineralization occurs in quartz veins and hydrothermally-altered rocks associated with shear zones.

After nearly 12 years of exploration, Greenland's first gold mine, the Nalunaq Mine, was opened in August 2004. The underground mine produced a total of 10.65 tons (375,670 oz) of gold from 2004 to 2013 with an average grade of 15 g per ton (Kolb, 2015). It was decommissioned in 2014.

Main Vein of the Nalunaq Gold Mine
James St. John/Nalunag Gold Mine photo, - CC_BY_SA-2.0, via Wikimedia Commons
This quartz-gold hydrothermal vein (whitish band) was emplaced in a 1-2 m (3.3-6.6 ft) wide shear zone. The mineralization occurred in the late Paleoproterozoic (1,770 to 1,800 Ma).

Under new ownership, redevelopment of the Nalunaq Mine started in 2015. An extensive exploration program along with a new geological model led to an estimate of 355,000 metric tons of ore with average of 28 g/t (320,000 oz) gold, making it one of the highest-grade gold deposits in the world (Roan, 2022). Production resumed in November 2024 which yielded 1.2 kg (42.3 oz) in the first ten hours of operation.[3]

Greenland's Nalunaq Gold Mine
Uwe Dedering map, - CC_BY_SA-3.0, via Wikimedia Commons

Rare Earth Element (REE) Mineral Deposits

Greenland has many geological environments that are favorable for hosting rare earth element (REE) deposits. Consequently, it has attracted exploration activities, and a few projects have reached advanced stages of investigation (Sørensen, Kalvig, and Rosa, 2018).

[3] Gold Flows Again from Greenland's First Gold Mine, *Arctic Review,* Dec. 13, 2024, https://arctic.review/papers/gold-resumes-flow-in-greenland/.

Despite its name, rare earth elements, elements from lanthanum to lutetium, are not rare in nature. Economic deposits, however, are not common given varying mineral concentrations and associated processing costs.

To date, eight REE deposits have been discovered in Greenland, and two occurrences may be among the ten largest deposits in the world. Below is a brief summary of some of these deposits:

South Greenland's Gardar Province hosts three large REE deposits - Kvanefjeld, Kringlerne, and Motzfeldt Sø. The cratonic rift province is made up of sandstones and a variety of volcanic and plutonic igneous rocks. The deposits are associated with alkaline intrusions where layered complexes developed from strongly differentiated magmas, and REE mineralization accumulated on individual layers. The estimated ore totals and grades for Kvanefjeld and Kringlerne are 1,010 Mt @ 1.1% and 4,700 Mt @ 1.8 % respectively, while the REE potential for Motzfeldt Sø is still being evaluated (Sørensen, Kalvig, and Rosa, 2018).

Layered Alkaline Intrusion Complexes at the Kringlerne Deposit
TANBREEZ Mining Greenland AS photo, from (Sørensen, Kalvig, and Rosa, 2018)

The west coast of Greenland includes carbonatite-related deposits: Sarfartôq, Qaqaessuk, and Tikiusaaq. Carbonatites (igneous rocks containing more than 50% carbonate minerals and less than 20% silicate minerals) represent the primary source of the world's light REE (elements from lanthanum to gadolinium) deposits. The ring or layered sheet structures of Greenland's carbonatite complexes often involve late hydrothermal activity with pathways in shear zones. The estimated ore total and grade for the Sarfartôq deposit is 14 Mt @ 1.53 %, while values for Qaqarssuk and Tikiusaaq are currently unknown (Sørensen, Kalvig, and Rosa, 2018).

Outcrop at the Sarfartôq Deposit
Photo from (Sørensen, Kalvig, and Rosa, 2018).

In 1968, a paleoplacer deposit with REE potential was discovered at Milne Land on Greenland's east coast. The deposit formed through the action of water concentrating heavy and weather resistant minerals, such as monazite and xenotime. The potential REE is hosted mainly in monazite, and at one location (Hill 800) the resource estimate indicates 3.7 Mt with 0.5% monazite and 0.03% xenotime (Sørensen, Kalvig, and Rosa, 2018).

Satellite View of Milne Land in Greenland
Screenshot from NASA's *World Wind* software, - PD, via Wikimedia Commons

Greenland's Rare Earth Element Deposits
Uwe Dedering map, annotated based on (Sørensen, Kalvig, and Rosa, 2018), - CC_BY_SA-3.0, via Wikimedia Commons

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MacGregor, J.A., W.T. Colgan, G.J.G Paxman, K.J. Tinto, B. Csathó, F.A. Darbyshire, M.A. Fahnestock, T.F. Kokfelt, E.J. Mackie, M. Morlighem, and O.V. Sergienko (2024) Geologic provinces beneath the Greenland Ice Sheet constrained by geophysical data synthesis. *Geophysical Research Letters*, April 16 2024.

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Sørensen, L.L., P. Kalvig, and D. Rosa (2018) The rare earth element potential in Greenland. *Geology and Ore,* (29), Geological Survey of Denmark and Greenland (GEUS). 12 p.

Stendal, H. and B. Thomassen (2008) Banded iron formation (BIF) deposits. *Exploration and Mining in Greenland Fact Sheet,* (16), Geological Survey of Denmark and Greenland (GEUS), 2 p.

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Arizona Rocks 145

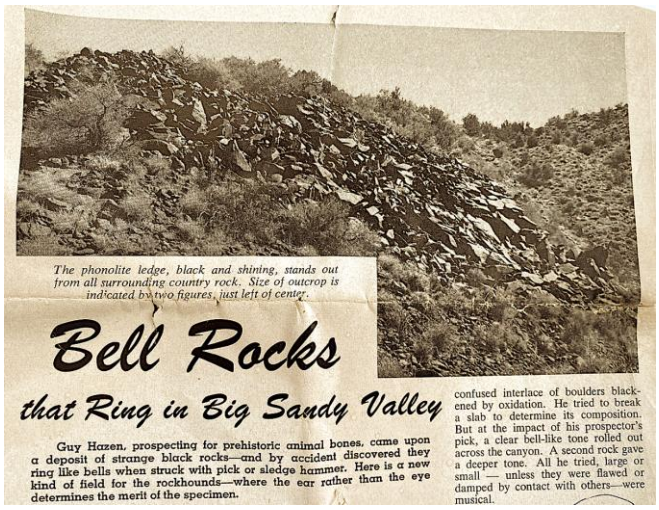
Text by Ray Grant
Photographs and map from May 1955 Desert Magazine

Last month was the singing stone, this month is ringing rocks. In Desert Magazine, May 1955, there is a field trip, "Bell Rocks that ring in Big Sandy Valley" by Harold Weight.

Directions in the article are as follows: go two miles south of the Wikieup post office; here Bronco Canyon crosses the highway; turn west up the wash; 3.4 miles up the wash stay left in main channel; in about 0.2mile more park and climb out of wash to left to reach ringing rocks. I am sure there are changes in highway 93 and I think the thing to do is go up Bronco Canyon for about 3.5 to 4 miles if it is possible.

The rocks are a fine-grained igneous rock called phonolite. Named that because of its ringing property. When hit with a hammer a musical ring happens. The ringing sound varies depending on the size and shape of the rock. Even when sawed into small pieces it rings. Searching for Arizona ringing rocks on the internet, I found only one location given. It is Cocoraque Butte in Pima County.

In Pennsylvania there is a Ringing Rocks County Park, and when I was teaching near there, I would take my classes on a field trip to the park, and after testing with enough people a tune could be played.



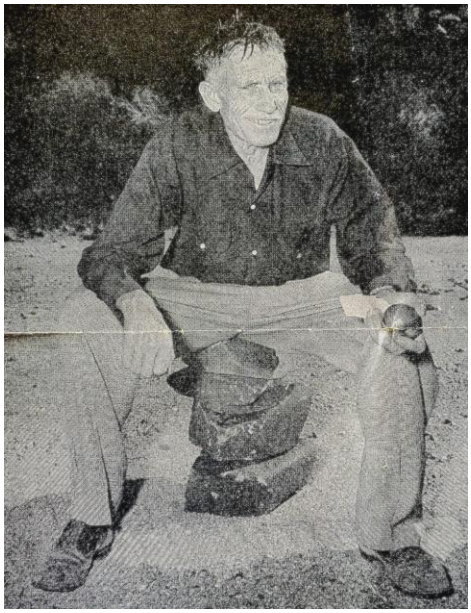
The phonolite ledge, black and shining, stands out from all surrounding country rock. Size of outcrop is indicated by two figures, just left of center.

Bell Rocks

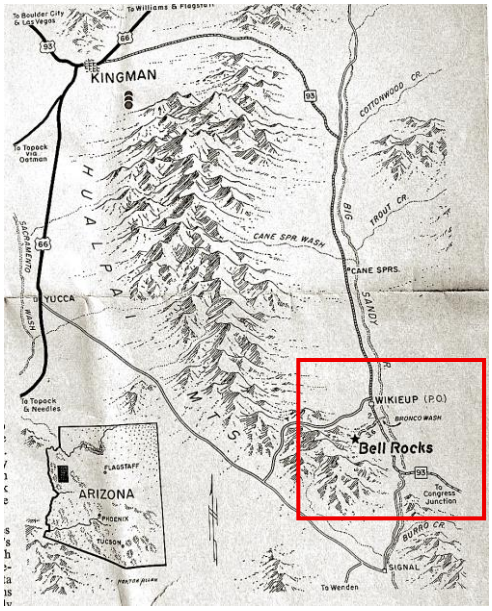
that Ring in Big Sandy Valley

Guy Hazen, prospecting for prehistoric animal bones, came upon a deposit of strange black rocks—and by accident discovered they ring like bells when struck with pick or sledge hammer. Here is a new kind of field for the rockhounds—where the ear rather than the eye determines the merit of the specimen.

confused interlace of boulders blackened by oxidation. He tried to break a slab to determine its composition. But at the impact of his prospector's pick, a clear bell-like tone rolled out across the canyon. A second rock gave a deeper tone. All he tried, large or small — unless they were flawed or dampened by contact with others—were musical.



Guy Hazen, geologist who discovered Bell Rocks with rocks to take home to ring.



Pinal Museum and Society News

351 N. Arizona Blvd., Coolidge, AZ

Pinal Geology and Mineral Society next meeting

September 17, 2025

Meetings are the third Wednesday at 7pm, doors open at 6:00

www.pinalgeologymuseum.org

Ray Grant ray@pinalgeologymuseum.org

Pinal Geology and Mineral Museum
May – September hours are Fridays from 10-3, admission is free.
Groups can arrange special visits please call 520-723-3009.

No club meetings in summer and
museum open Fridays & Saturdays from 10 - 4 until September.

The museum set up a table at both the Imagine School, July 14, and the Coolidge school district, July 21 welcome back teacher's meetings. Teachers were given information about the Museum and an invitation to have a field trip to the Museum.

Teachers at Imagine School welcome back.

AZ Mining, Mineral & Natural Resources Education Museum Update July 2025

https://ammnre.arizona.edu/

Catie Carter Sandoval
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703.577.6449

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

In 2023, we unveiled a new exhibit at the Sun City Mineral Museum, "Rocks and Minerals of Arizona and the Southwest," which featured several collector's pieces, ore specimens, and pieces of lapidary art. That exhibit has ended, and the Sun City Rockhounds have generously offered us the space once again to install a new display, "Minerals of Arizona's Historic Mines and Mining Towns."

The new exhibit illustrates how Arizona has been an important center for mining since its territorial days. While the earliest miners were indigenous peoples, commercial mining gained speed in the 1870s, powering the economy and driving settlement patterns through the early 20th century. The exhibit showcases exceptional specimens originating from early mining towns across the state, including Bisbee, Morenci, Ray, Jerome, Ajo, Miami-Globe, and others. We've included a few of our favorite pieces including a stunning, large native copper with cuprite from the Ray Mine, which has not been on display since the days of the Arizona Mining and Mineral Museum, and a world-class malachite and azurite from the earliest days of the Copper Queen Mine. Along with the mineral specimens are informational displays containing brief histories about a few of Arizona's most famous and productive mines.

Over 150 years later, some of these historic mines are still in production, and Arizona continues to lead the nation in copper production while also producing significant amounts of other important metals and aggregates. Mining remains a vital part of Arizona's identity and economic strength to this day, and we can use our museum's mineral collection to tell that story.

We encourage you to visit the Sun City Mineral and see this exhibit in person, along with the Sun City Rockhounds' other 1000+ specimens on display. The museum, which is celebrating its 35th Anniversary this year, is located in the Sun Dial Recreation Center at 14801 N. 103rd Ave., Sun City.

Sun City Mineral Museum Director Carol with the display, located at the entrance of the museum.

The exhibit includes informational displays about some of Arizona's most famous and productive mines. Molybdenite, New Cornelia Mine

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

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

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

Museum Reopening

By Carol Bankert-George Museum Director

The museum reopened on July 26th after being closed for a month. The museum was painted; but unfortunately, our new cabinets have been delayed in being replaced. For the reopening the museum had a day of celebration with a scavenger hunt and a gift of rock specimens and geology themed stickers. The museum had a wonderful turnout! The celebration was a success.

During our closing we were able to update and rotate some of our specimen displays. Catie Sandavol of the Arizona Mining, Mineral and Natural Resources Education Museum, installed a new display featuring Arizona minerals with an emphasis on the state's rich mining history. Dana Slaughter of the Pinal Geology & Mineral Museum installed a new display, our first from his museum, on minerals from Australia. We are still working on an 'Arizona' room featuring Arizona minerals. Our plan is to have this updated by October 1st.

C. Sandoval photo

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

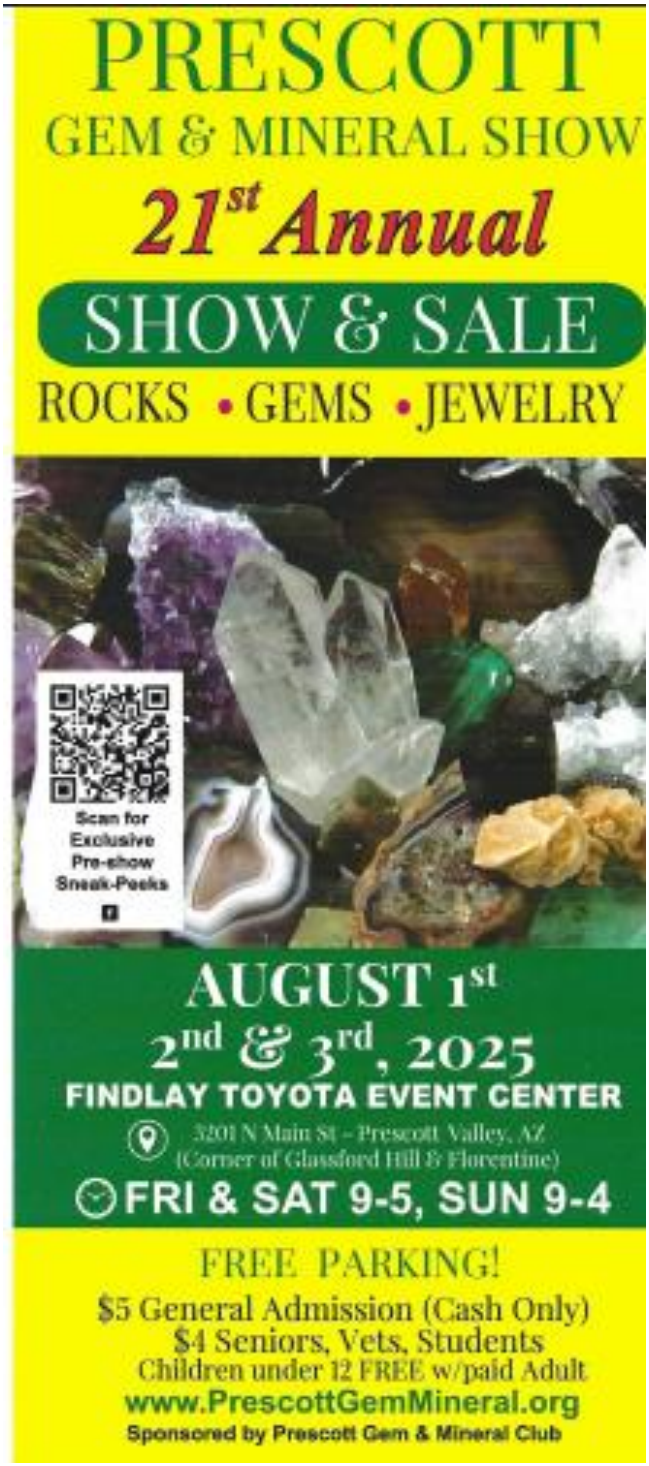
New display in our hall window courtesy of Catie Sandoval of Arizona Mining, Mineral, Natural Resource, Education, Museum. Along with her is our museum' newest intern, Ferris Luna. The new display highlights mines of Arizona and minerals associated with these mines.

Dana Slaughter, acting curator of the Pinal Geology and Mineral Museum, is working with our museum to ensure our specimens are labeled correctly.

Club members' Karin Schardt & Geri Thacker working on a display & retail inventory

New Display from Pinal Geology and Mineral Museum courtesy of Dana Slaughter acting Museum curator

Arizona Rock and Gem Shows



West Valley Rock and Mineral Club
October 10-12, 2025
Annual show
Fri. 9-5, Sat. 9-5, Sun. 9-4
Adults $ 3
Kids 10 and under free
Buckeye Equestrian Center
10300 S Miller Rd, Buckeye, AZ

Apache Junction Rock & Gem Club
Meetings are on the 2nd Thursday
Next Meeting: September 11, 2025, 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: September 2, 2025, 6:30 p.m.
www.dmrmc.com
@ Anthem Civic Building
3701 W. Anthem Way, Anthem, AZ

Maricopa Lapidary Society, Inc
Meetings are on the 3rd Tuesday
Next Meeting: August 19, 2025, 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 June & December)
Next Meeting: September 18, 2025 @ 6:30
@ Franciscan Renewal Center, (Piper Hall),
5802 E. Lincoln Drive, Scottsdale, AZ
www.msaaz.org

Pinal Geology & Mineral Society
Meetings are on the 3rd Wednesday
Next Meeting: September 17, 2025, 7:00 pm
www.pinalgeologymuseum.org
351 N. Arizona Blvd., Coolidge

West Valley Rock & Mineral Club
Meetings are on the 2nd Tuesday
Next Meeting: August 12, 2025, 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 September 4, 2025, 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: September 12, 2025, 7:00 pm
www.wickenburggms.org
@ Coffinger Park Banquet Room
175 E. Swilling St., Wickenburg, AZ

ESM's Meeting Notice

ESM's next meeting will be at North Mountain Visitor Center, 12950 N. 7th St., Phoenix, on Tuesday, TBA 2025, at 6:30 p.m.

BECOME A MEMBER!
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Please renew today! ☺☺☺

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ESM Earth Science Investigation Team Membership Form

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_____ 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.msaaz.org

Payson Rimstones Rock Club
https://www.rimstonesrockclub.org/

Sossaman Middle School

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

Sun City Rockhound Club & Mineral Museum
https://suncityaz.org/recreation/clubs/rockhound-club-mineral-museums/

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

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

Staples Foundation
www.staplesfoundation.org

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

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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 2025, at 6:30 p.m.

THANK YOU FOR YOUR CONTINUING INTEREST & SUPPORT!!!

Earth Science Museum
3215 W. Bethany Home Rd.
Phoenix, AZ 85017