



Arizona Geological Society Newsletter

APRIL 2021

Arizona Geological Society *presents*
Dr. Chelsea M. Allison (ASU | Baylor University)



CO₂-charged crystals and the mystery of the
sub-Plinian eruption of Sunset Crater volcano

Tuesday, 13 April @ 6:30 p.m. (ZOOM doors open at 6:15 p.m.)

ZOOM: <https://arizona.zoom.us/j/81314683060> Passcode: 088915

If joining by phone: +16027530140, US (Phoenix) | +16699006833, US (San Jose)

If you are interested in sponsoring future AGS virtual meetings, please contact:

info@arizonageologicalsoc.org

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Member News

The AGS Executive Committee would like to thank Corolla Hoag for their generous donation to the AGS scholarship funds and continued support of the society.

For more information about the J. Harold Courtright Scholarship and M. Lee Allison Scholarship:

<https://www.arizonageologicalsoc.org/Students>

Coming in May 2021 to the AGS' ZOOM Speaker Series

Dr. Ryan Crow (US Geological Survey) ~ The birth and early evolution of the lower Colorado River

Work Opportunities

Gold Rush's Dave Turin is looking to hire a GEOLOGIST to join his mining crew.

Ideally you will have specialized in GOLD mining and have experience of working with placer and/or hard rock deposits.

Applicants must be over 18, eligible to work in the US and happy to appear in a new season of Dave Turin's Lost Mine.

Interested applicants can either apply via link below or can express their interest by getting in touch with Rhys Towse, who is a Producer on the show – rhys.towse@raw.co.uk

Application link:

<https://www.raw.co.uk/takepart/geologist-miners-wanted>

CO₂-charged crystals and the mystery of the sub-Plinian eruption of Sunset Crater volcano

By

Dr. Chelsea M. Allison (ASU | Baylor University)

Abstract: The eruption of Sunset Crater in northern Arizona ca. 1085 CE is the most explosive basaltic scoria cone eruption yet documented. This anomalous sub-Plinian eruption with >20 km high plumes is the most recent of >600 monogenetic scoria cone eruptions over the past ~6 Ma in the San Francisco Volcanic Field along the edge of the Colorado Plateau. Recent study of melt inclusions in olivine phenocrysts from Sunset Crater has found high concentrations of CO₂ and sulfur as well as evidence for an exsolved CO₂ phase in the magma at ~15 km depth prior to the eruption. This exsolved CO₂ phase was critical in fueling rapid magma ascent to produce the highly explosive eruption, perhaps analogous to mechanisms that drive silicic caldera-forming eruptions. While these very large volume silicic eruptions are known to have climatic effects, an explosive basaltic volcano with significant sulfur content like Sunset Crater can impact the atmosphere from eruptions of more modest volumes.



Photo of Sunset Crater; Olivine phenocrysts hosting CO₂-infused melt inclusions.



Arizona's Christmas Mine 1880s to 1982

Arizona Geology Blog

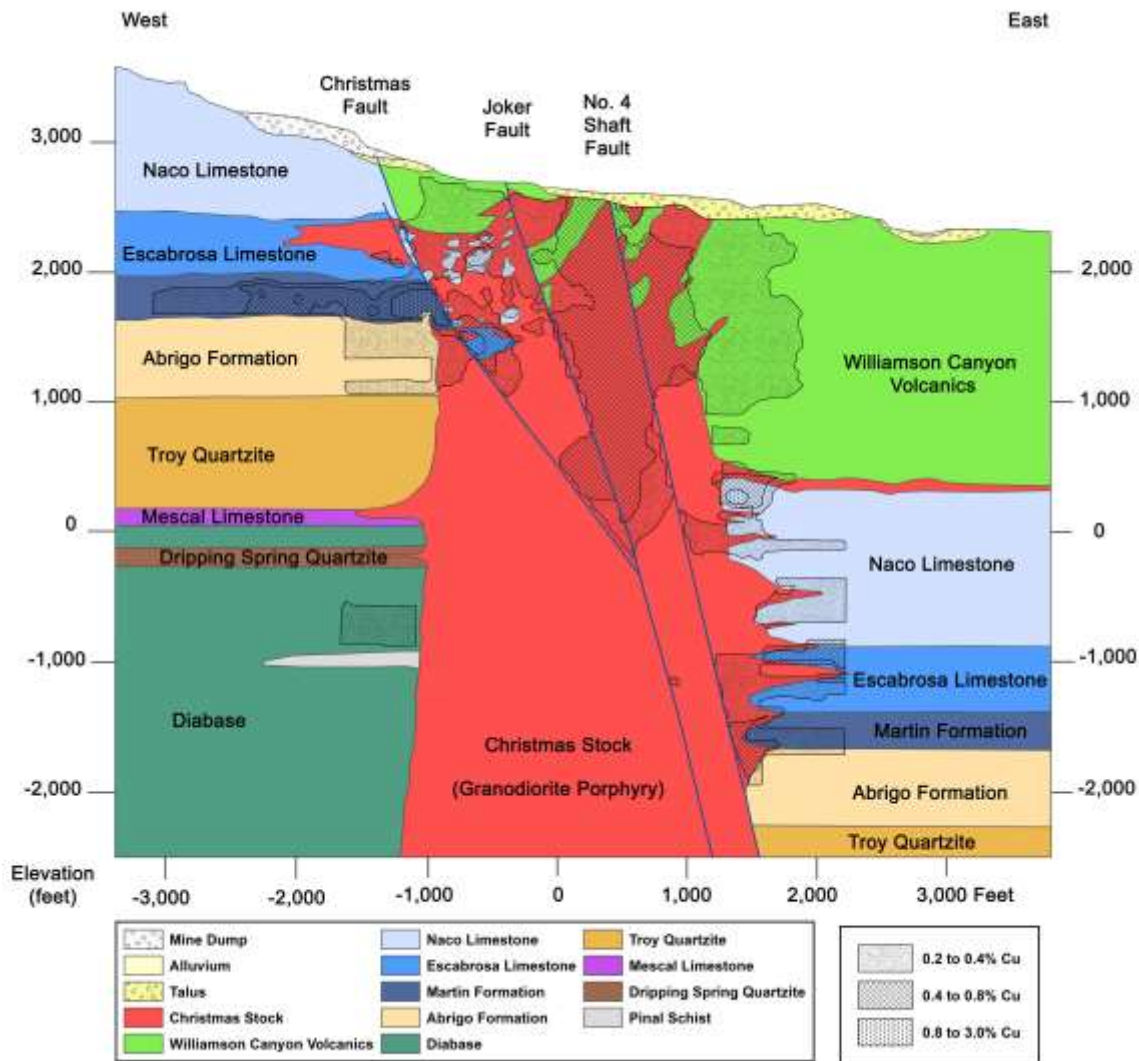
24 March 2021

David Briggs newest contributed report, '[History of the Christmas Mine, Gila County, Arizona](#)', details the geology and the history of mineral exploration and mining at this small porphyry copper deposit 75 miles north of Tucson.

The 45-page report includes 22 figures and a table of mine production data showing that 25.8 million tons of ore were extracted from 1905 to 1981. The ore yielded 362.9 million pounds (181,950 tons) of copper, 55,000 ounces (3,437 pounds) of gold, and 2.15 million ounces (134,375 pounds) of silver. Copper ranged from 0.2% to 3.0% grade.

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Copper ore was first discovered at Christmas in 1880, but mining operations did not begin until August 1905. The remote setting, poor roads, and the absence of a reliable source of coke to fuel the Christmas smelter hampered early development. A rail spur constructed in 1911 and commissioning of ASARCO's Hayden Smelter resolved the most pressing logistics; mining operations began in earnest in 1916. Over the next half-century, production mirrored the peaks and valleys of the national and international copper market. By 1966 unstable underground workings forced the owners to shutter the mine in favor of an open pit mine method. Copper mining at the Christmas Mine was suspended in January 1982.



Geologic cross section (W-E) through the Christmas Mine porphyry copper deposit.

Metallic ore was hosted in the Paleocene Christmas Granodiorite Porphyry, the Cretaceous Williamson Canyon Volcanics, and Paleozoic limestones – Martin, Escabrosa, and Naco Limestone. Mobilization of ore-bearing fluids was controlled in part by the Christmas, Joker, and No. 4 shaft faults.

The mine is now owned by Freeport McMoRan (FMI). As recently as several years ago, FMI had a small exploration drilling program going to better quantify copper reserves.

Citation: Briggs, D.F., 2021, [History of the Christmas Mine, Gila County, Arizona](#). Arizona Geological Survey Contributed Report CR-21-A, 45 p

Other recent mining histories by David F. Briggs

Briggs, D.F., 2020, [Helvetia-Rosemont: Arizona's Hardscrabble Mining Camp](#). Arizona Geological Survey Contributed Report CR-20-B, 65 p.

Briggs, D.F., 2018, [History of the Verde Mining District, Jerome, Arizona](#). Arizona Geological Survey Contributed Report CR-18-D, 85 p.

Briggs, D.F., 2017, [History of the Silver Bell Mining District, Pima County, Arizona](#). Arizona Geological Survey Contributed Report CR-17-B, 26 p.

Briggs, D.F., 2017, [History of the Ajo Mining District, Pima County, Arizona](#). Arizona Geological Survey Contributed Report, CR-17-A, 16 p.

Briggs, D.F., 2016, [History of the Copper Mountain \(Morenci\) Mining District](#), Greenlee County, Arizona. Arizona Geological Survey Contributed Report CR-16-C, 77 p, 2 appendices.

Briggs, D.F., 2015, [Superior, Arizona - An Old Mining Camp with Many Lives](#). Arizona Geological Survey Contributed Report, CR-15-D, 13 p.

Briggs, D.F., 2015, [History of the Warren \(Bisbee\) Mining District](#). Arizona Geological Survey Contributed Report CR-15-b, 8 p.

Blog Post: <https://blog.azgs.arizona.edu/blog/2021-03/arizonas-christmas-mine-1880s-1982>



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Please mail check with membership form to: Arizona Geological Society, PO Box 40952, Tucson, AZ 85717

Dues (check box) 1 year: \$35; full-time student (membership is free)

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All newsletters will be sent by email. If you do not have an email address, we will mail a hard copy to you, but we cannot guarantee timeliness.

If registered geologist/engineer, indicate registration number and State: _____

Enclosed is a _____ tax-deductible contribution to the J. Harold Courtright or the M. Lee Allison Scholarship Funds.