



# AGS Newsletter

[www.arizonageologicalsociety.org](http://www.arizonageologicalsociety.org)

## Looking Forward to AGS 2024

Following three years of abridged "Covid-19" activities, 2023 marked a renewal of AGS activities and services. We once again have a full slate of officers who meet monthly, and we regularly publish a newsletter, host and record in-person presentations, and schedule field trips.

In 2024, the AGS Executive Committee – see AGS 2024 Officers & Councilors section – is planning to increase the number of presentations and field trips. In collaboration with the Arizona Geological Survey, we are planning a 2-day field trip to the Big Sandy Valley Formation near Wikieup, Arizona. Plans to select a Fall-2024 field trip are underway.

AGS professional members number 324; student numbers are an anemic 26. We welcome any ideas on how to increase student participation and how to entice those just starting their geoscience careers. Most AGS members reside in the Tucson or Phoenix Metro areas. But we have members in 18 U.S. States, Australia, Canada, Mexico, and the Bahamas.

Last, we rely on our members to fulfill the mission of the AGS. Please see the Acknowledgments section for stand-out members in 2023.

Mike Conway  
AGS President 2023

### Highlight Reel:

- Courtright & Allison 2023 Scholarship Awardees
- Jan 2024 Speaker Series: Jon Spencer, Ph.D.
- Field trip to Patagonia
- AGS: At the Movies
- AGS Membership 2023: By the Numbers
- AGS 2024 Officers & Councilors
- Acknowledgments



Snap Point, AZ





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## Courtright & Allison 2023 Scholarship Awardees

Since 1996 the Arizona Geological Society (AGS) has awarded financial scholarships to outstanding geoscience students at the state's three major universities: the University of Arizona, Arizona State University, and Northern Arizona University.

The 2023 scholarship program drew 9 excellent applicants from Arizona State University, Northern Arizona University, and the University of Arizona. The 2023 Scholarship Committee comprising Mike McCarrel (Chair), Carson Richardson, Sadie Huggler, and Sterling Cook were challenged to select the best applicant for the 2023 Allison Scholarship because the quality of proposals was high. The Committee awarded this year's M. Lee Allison scholarship to, Emilia Caylor (Ph.D. candidate) and Bridgett Holman (undergraduate). Both attend the University of Arizona. Emilia and Bridgett received \$1,500 as their share of the Allison scholarship.

### M. Lee Allison Scholarship Awardees 2023

Emilia Caylor is in the Department of Geosciences at the University of Arizona, where she is studying the impact of tectonics on upper crustal processes, paleo-depositional environments, basin subsidence, and exhumation in Cordilleran-type orogenic systems. A future professional goal is to create a diverse research group of scientists and design curricula that lowers barriers to geoscience education in the field and classroom.

Bridgett Holman is a sophomore majoring in Geology at the University of Arizona. Her proposal focused on her research on the mechanisms of nitrogen cycling through the deep Earth. She'll be conducting high temperature and pressure experiments that simulate conditions of ultramafic-rich melanges in subduction zones. Bridgett aspires to attend graduate school to continue her study of petrology and subduction zones.

### J. Harold Courtright Scholarship Awardee 2023

Benjamin Amundsen is pursuing a Master of Science degree in the School of Earth and Sustainability at Northern Arizona University. Ben's graduate research focuses on the eruptive stratigraphy and petrogenesis of the parental Conejos phase of the volcanic sequence at the Oligocene Platoro Caldera in the San Juan Volcanic Complex of southwestern Colorado. Ben hopes to shed some light on mineralization associated with the regional volcanism.





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## Courtright & Allison 2023 Scholarship Awardees



Top Left: Emilia Caylor  
Right: Bridgett Holman  
Bottom Left: Benjamin Amundsen





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## 2024 Speaker Series: Tues. Jan 9, 2024

### Cenozoic tectonic extension in the Sonoran Desert region and reconstruction of the initial distribution of porphyry copper deposits

**Jon Spencer, Ph.D.**

Adjunct Researcher, Dept. Geosciences at the University of Arizona,  
(Arizona Geological Survey, retired 2015)

In the past ~30 Ma, severe tectonic extension in the Sonoran Desert region roughly doubled the land area and halved the crustal thickness. Before this time a high mountain range in this area was the source of clastic debris shed southwestward toward the Pacific continental margin and northeastward onto what is now the Colorado Plateau. Extensional demolition and lowering of this mountain range occurred during two episodes. The first episode, at ~30-18 Ma, was characterized by low-angle normal faulting, metamorphic-core-complex genesis, and voluminous felsic magmatism. The second was characterized by high-angle normal faulting, subsidence of deep sedimentary basins, and basaltic magmatism. Evaluation of normal-fault offsets along transects through the Pineleño and Rincon Mountains, and in Tucson basin and the Sierrita Mountains, allow determination of approximate total extension in southeastern Arizona and conceptual restoration of this extension to reveal the late Laramide distribution of porphyry copper deposits. The current distribution of porphyry copper deposits is dominated by two belts, one extending approximately from La Caridad and Cananea (Sonora) through the Sierrita Mountains to Sacaton near Casa Grande. The other extends from Resolution and Miami-Inspiration, through Morenci to Chino in New Mexico. Restoration of extension yields a different geometry, as represented by three belts: (1) La Caridad – Cananea – Sierrita – San Manuel – Ray – Resolution – Miami-Inspiration, (2) Ajo – Silver Bell – San Manuel – Safford – Morenci, and (3) Sierrita – Rosemont – Johnson Camp – Chino – Hillsboro. Some deposits are located at the intersections of Belt 1 with belts 2 and 3. Belt 1 is approximately parallel to the Laramide continental margin. The distribution of porphyry copper deposits in this belt is almost certainly related directly to Laramide subduction geometry and tectonics. The strong alignments in belts 2 and 3, each oriented ~N80°E, are interpreted to represent lithologic and geochemical variations in the deep crust that were inherited from Paleoproterozoic crustal genesis. These belts...

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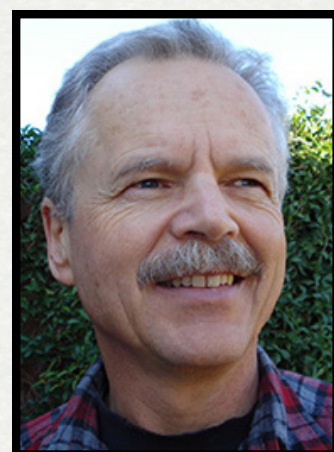
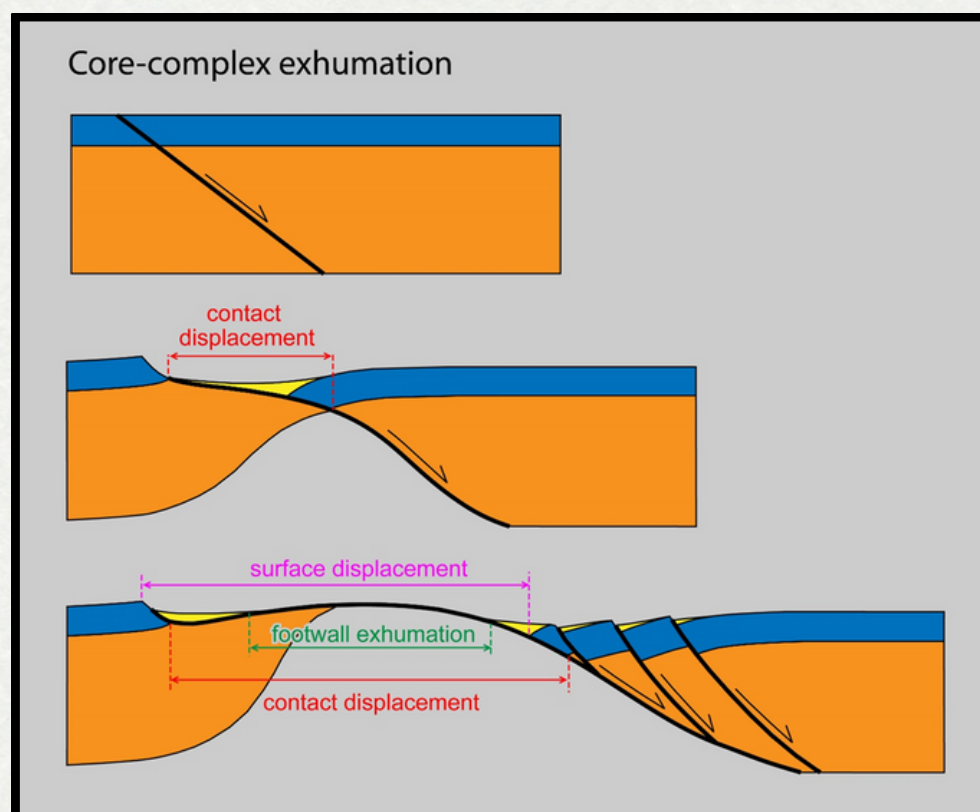




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...are also aligned with the strike of generally steeply dipping foliations in Pinal Schist and related units and in lithologic layering in some Paleoproterozoic rock units. The interpretation that Paleoproterozoic lithologic variations in deep crust influenced the formation and distribution of porphyry copper deposits is consistent with previously proposed Paleoproterozoic deep crustal signatures in gold-silver ratios of produced Au-Ag ores (Titley, 2001, ECONOMIC GEOLOGY), Pb isotopic ratios in igneous rocks and sulfide minerals (Bouse et al., 1999, ECONOMIC GEOLOGY), and isotopic and REE indicators of primarily Proterozoic crustal origins of igneous rocks associated with porphyry copper deposits (Anthony and Titley, 1988, GEOCHIMICA...; Lang and Titley, 1998, ECONOMIC GEOLOGY).



## Jon Spencer Bio

Jon Spencer received his Ph.D. in Geology from M.I.T. in 1981. After a year as a USGS post-doc he worked for 33 years for the Arizona Geological Survey (AZGS) as a Research Geologist and then Senior Geologist. He was responsible for the AZGS bedrock geologic mapping program and, largely with joint Federal-State STATEMAP funding, supervised and participated in fieldwork that led to ~70 AZGS geologic maps. He also researched and published articles on metallic mineral deposits, radon and uranium, and the Pliocene Bouse Formation that was deposited when Colorado River water first reached the Mojave-Sonoran desert region. He retired in 2015 but has continued to write and publish articles on the geology of southwestern North America. He lives in Tucson with his wife Margaret.





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## Field trip Guide to South 32 Pb – Ag- Zn deposit

On Friday, 29 September, 25 AGS members joined Vice-President of Field Trips Paul Jensen on a field excursion to South 32's Hermosa (see Field Trip photos). The Hermosa property located in the Patagonia Mountains, about 50 miles southeast of Tucson, Arizona. It comprises the zinc-lead-silver Taylor sulphide deposit (Taylor Deposit), and the zinc-manganese-silver Clark oxide deposit (Clark Deposit). In addition to the Taylor and Clark deposits, Hermosa has a highly prospective broader land package, which includes the copper-lead-zinc-silver Peake exploration target, as well as the Flux prospect (Source: <https://www.south32.net/what-we-do/our-locations/americas/hermosa>). According to South 32, Hermosa has the potential to become a globally significant producer of metals critical to a low-carbon future.

Field trip leaders affiliated with South 32, included: Trip leaders included David Peake, David Morales, Matt Banaszynski, Luke Smith, Matt Wanda, and Robert Wilson. AGS members Peter Megaw and Stan Keith led discussions on the local and regional geology. The illustrated, 18-page field guide includes a 6-page note by Spence Titley (1992) on the Mowry Mine. The field trip guide is available online at TBD .....



Field Trip photos, clockwise: Photos: AGS members examining core; Core box contents; Peter Megaw speaking with Stan Keith on deck; Stone wall; AGS members walking the outcrop.

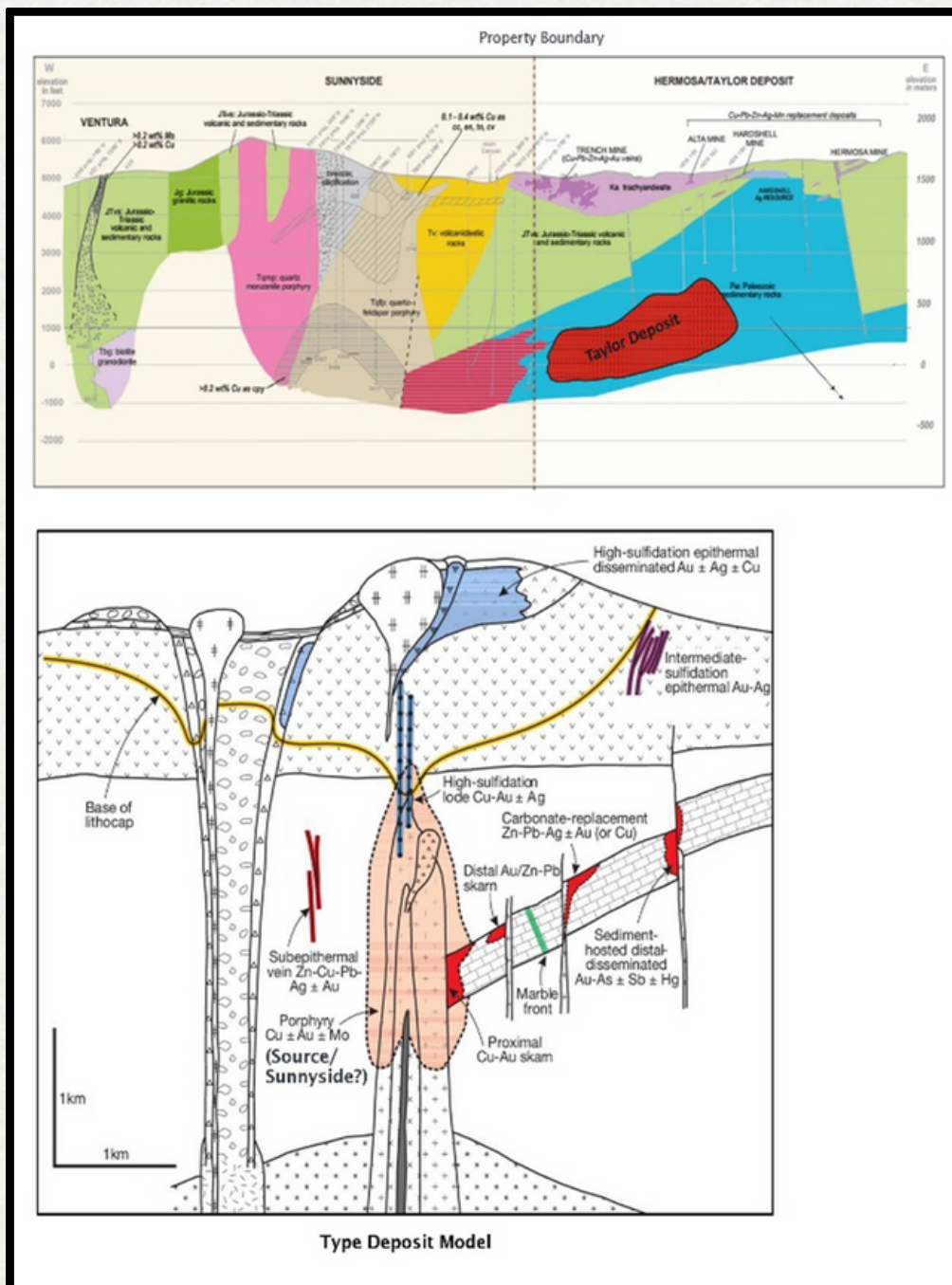




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## Field trip Guide to South 32 Pb – Ag- Zn deposit (continued...)



Taylor Deposit illustrations from pg. 5, "History of the Patagonia Mountains and Related Ore Deposits".





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## On the AGS Marquee – 2023

In Spring 2023, the AGS Executive Committee coordinated with Hexagon Mining to host, live-stream, and record our evening presentations. The roughly hour-long presentations are available for viewing at the Arizona Geological Survey's Youtube channel, <https://www.youtube.com/user/azgsweb>. AGS Vice President of Programs, Simone Runyon, Ph.D., organized and coordinated the 2023 AGS program.

### AGS Speaker Series 2023

Dr. Shelby Rader (Indiana University), 5 Dec. 2023, From rocks to stalks: Interpreting the controls on biogeochemical signatures and the applications of trace metals (43 minutes).

Dr. Amanda Hughes (University of Arizona), 5 Oct. 2023, Structural Modelling for Reducing Uncertainty in Geologic Interpretations (58 minutes)

Dr. Virginia McLemore (New Mexico Bureau of Geology and Mineral Resources), 7 Sept. 2023, REE-bearing Cambrian-Ordovician episyenites and carbonatites in southern and central New Mexico, USA (54 minutes)

Dr. Hervé Rezeau, (University of Arizona), 2 May 2023, Lithospheric Controls on the Formation of Porphyry Copper Deposits: What Could Possibly Go Wrong? (65 minutes)

Ralph J. Stegen (Freeport-McMoRan Exploration, retired), March 2023, Magmatism and Characteristics of Supergene and Hypogene Alteration-Mineralization of the Lone Star Porphyry Copper Deposit, Safford District, Arizona (44 minutes)

Brian Gootee, Lisa Thompson & Tawnya Wilson, 6 Dec. 2022, Perspectives on a Carbon Storage Ecosystem from Distributed CO<sub>2</sub> Sequestration Resources in Arizona (70 minutes).

### Arizona Geological Society Literature

Since the 1950s, the Arizona Geological Society has published 22 Digests and ~100 field trip guides. Out-of-print Digests and Field guides are available to members and the general public at the AGS website (<https://www.arizonageologicalsoc.org/PublicationsArchive>). In-print Digests and recent Field guides (2006-2023) require members to log in to the AGS website (<https://www.arizonageologicalsoc.org/>).



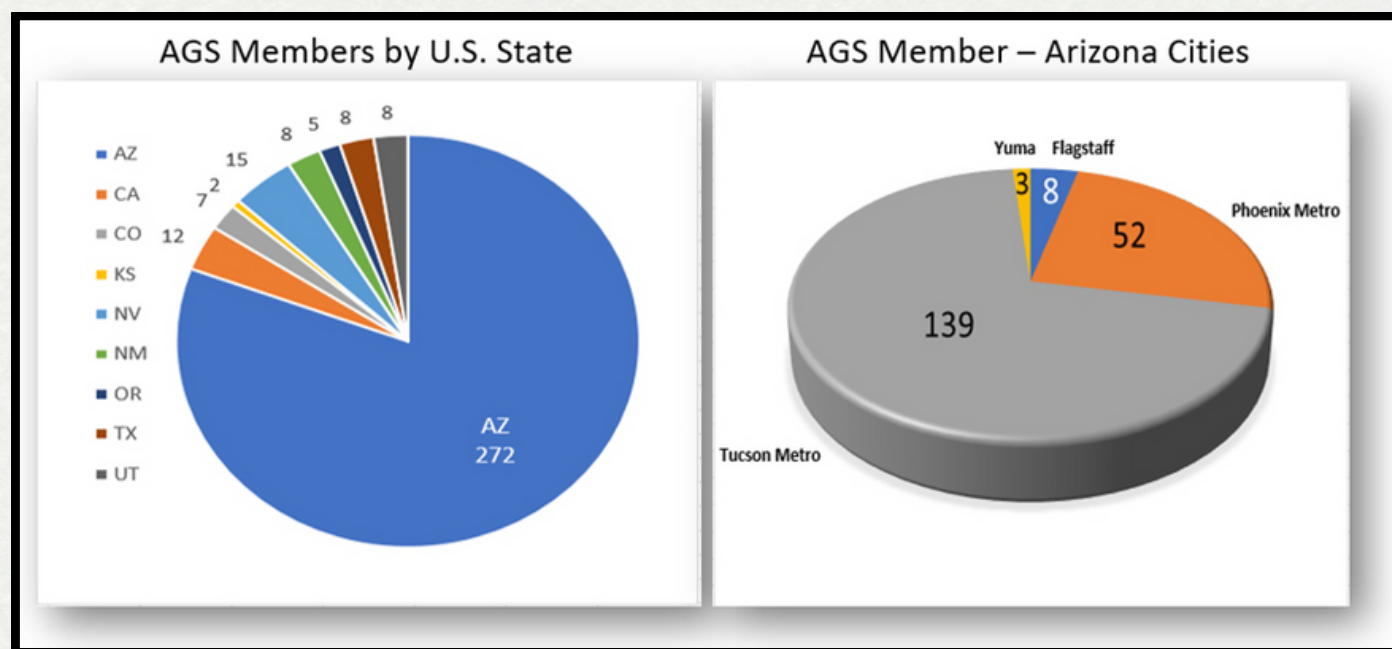


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## AGS Membership – Professional & Student: By the Numbers in December 2023

AGS currently has 324 professional members, 26 student members, 8 life members, and 7 organizational members. These numbers are comparable to 2022 member numbers. AGS members from Arizona total 272; 139 members reside in the Tucson Metro Area. Oddly, student members declined from 67 to 25 between Sept. and Oct. 2023. A handful of members are from countries other than U.S., including: Australia, Canada, Mexico, Bahamas.



Active members by U.S. State (left) and Arizona City/Metro Area (right).





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## Arizona Geological Survey Slate of Officers and Councilors 2024

In November 2023, more than 60 AGS members voted to adopt the 2024 Officer/Councilor slate proposed by the AGS Executive Committee. We thank the 2023 Nominating Committee, Eric Seedorff and Ralph Stegen, for pulling together the slate.

**President:** Mike Conway, Arizona Geological Survey, Retired

**VP Programs:** Phil Pearthree, Arizona Geological Survey

**VP Field Trips:** Paul Jensen, Consultant

**VP Marketing:** Aaron Conley, Freeport

**Secretary:** Mike McCarrel, Bronco Creek Exploration

**Vice-Secretary:** Jen La Sure, Freeport

**Treasurer:** Benedek Gál, Faraday Copper

**Vice-Treasurer:** Sadie Huggler, Ivanhoe Electric

### Councilors

Ralph Stegen, Consultant

Eric Seedorff, University of Arizona

Sterling Cook, Consultant

Sean O'Neal, Rio Tinto Exploration

Chad Kwiatkowski, Arizona Geological Survey

Elijah Mullins, University of Arizona





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## Acknowledgments

The 2023 AGS Executive Board thanks the following for their support over the past year.

Richard (Dick) Jones, (AGS member since 2001 ) Senior Exploration Geologist (Retired). Dick made a substantial \$1,000 donation to the M.L. Allison Scholarship fund again this year.

David (Dave) Briggs (AGS member since 1979 and former AGS President) has maintained the AGS website for the past several years. Thanks, Dave!

Cori Hoag (AGS member since 1983 and former AGS President) has managed AGS book & map sales since 2016. This involves addressing map & book orders from our distributor, Rio Nuevo Books. Monies from these sales funds the ~\$1,200 annual AGS storage locker fee.

Becky Egly and the staff of Hexagon Mining Corp. for generously providing a venue for the AGS Speaker Series.

The staff at South 32 for an excellent field trip this past September, including: David Peake, David Morales, Matt Banaszynski, Luke Smith, Matt Wanda, and Robert Wilson.