



Arizona Geological Society Newsletter

OCTOBER 2016

October 4, 2016 DINNER MEETING

Who: Hamish Martin will present Geology of the Resolution Cu-Mo Deposit, Superior Arizona

Where: Sheraton Tucson Hotel and Suites, 5151 East Grant Road, (at the intersection of Grant and Rosemont on the North side of Grant in the *PIMA BALLROOM* (enter at northwest corner of the building) and go upstairs to the meeting room.

When: Cash Bar at 6 p.m.—Dinner at 7 p.m.—Talk at 8 p.m.

Cost: Members \$30, Guests \$33, Students Members free with on-line reservation (\$10 without).

RESERVATIONS ARE REQUIRED: Reserve on the AGS website (www.arizonageologicalsoc.org) by **11 a.m. Friday, September 30th**. Please indicate Regular (Achiote Seared Chicken Breast with Roasted Tomatillo Sauce), Vegetarian, or Cobb Salad meal preference. Please cancel by **Friday, September 30th at 11 a.m.** if you are unable to attend - no shows and late cancellations will be invoiced.

The October Dinner Meeting is Sponsored by Montgomery and Associates



The AGS is grateful for Montgomery and Associates' Sponsorship, which helps us offset the increasing costs of our dinner meetings and other activities of the society.

Geology of the Resolution Cu-Mo Deposit, Superior, Arizona

By Hamish Martin, Chief Geologist, Resolution Copper

The Resolution Cu-Mo deposit was discovered under 1,000 meters of Tertiary cover in the mid-1990's by the Magma Copper Company. The Magma mine operated for over 80 years, producing approximately 27 million tons grading 5% Cu, prior to the discovery of Resolution.

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Abstract Continued from Page 1

At Resolution, a major regional ENE structural trend has controlled the emplacement of a hydrothermal breccia–porphyry complex and associated alteration/mineralization. Skarn, breccia and diabase/basalt consistently host copper grades higher than deposit average and are considered favorable host rocks. While the deposit is globally dominated by chalcopyrite mineralization, average copper grades in the chalcocite dominated zone are consistently higher. The highest coherent copper grades are developed almost exclusively in chalcocite (bornite) mineralized hydrothermal breccia. Spatially, most of the elevated copper is related to the partially to completely sericitized (\pm advanced argillic altered) top of the potassic alteration zone. This distinct alteration zone is rooted in the apex of the low-pyrite core to the hydrothermal system. Plus 1% copper was developed in this setting over some 1,500 vertical feet.

Drilling by Resolution Copper Mining LLC, owned by Rio Tinto and BHPB, has outlined an Inferred Resource of 1.766 billion tonnes at 1.51% Cu and 0.035% Mo. Project studies and permitting are ongoing.



Panorama of Resolution Copper Deposit Site (Photo taken by David Briggs in June 2015)



About the October Dinner Speaker

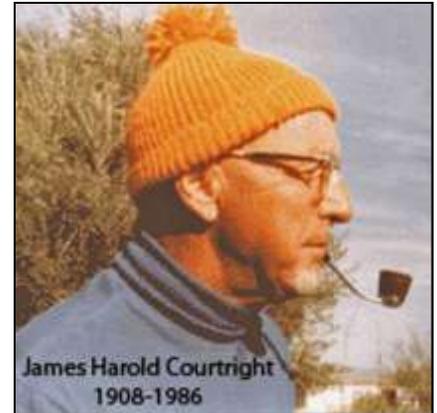
Bladed quartz after calcite was in vogue when Hamish graduated from Auckland University in 1988, so working as an exploration geo in Waihi for Cyprus Gold seemed the natural thing to do. This would prove to be his first and last professional job in New Zealand. The jungles of Papua New Guinea beckoned, exploring for low sulfidation epithermal systems on the Tabar Group and Lihir as well as breccia pipes around Ok Tedi. Exploration for mesothermal gold at Rosebel in Suriname followed, working for a company run by the former defensive lineman for the Edmonton Eskimos. A switch to porphyry copper exploration in the high cordillera ensued when Hamish moved to Argentina, and continued in Iran and Siberia. The globetrotting finally came to an end when he took up the Chief Geologist's role at Resolution Copper in 2008.

Arizona Geological Society Offering Two Scholarships

The Arizona Geological Society is offering two scholarships -- the Courtright Scholarship and the M. Lee Allison Scholarship -- both to be awarded at the December 2016 dinner meeting.

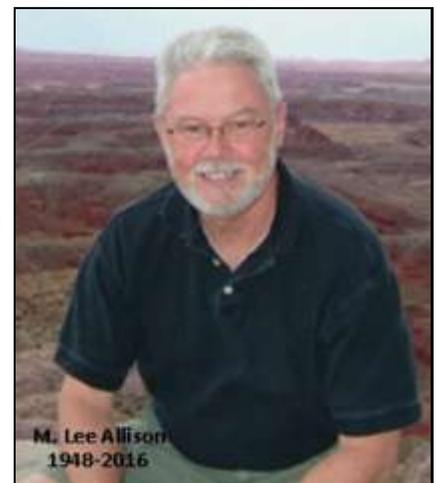
Courtright Scholarship

The Courtright Scholarship, named after J. Harold Courtright, is awarded to a graduate student pursuing a degree in the geological sciences at Arizona State University, Northern Arizona University, or University of Arizona. For this scholarship, the Society is seeking student proposals for work on a field-related project in the North or South American Cordillera. The scholarship fund is designed to promote graduate research in all geology fields, but in recognition of Courtright's skills in mapping and porphyry copper exploration, the Society gives preference to proposals involving economic geology and the study of ore deposits.



M. Lee Allison Scholarship

The M. Lee Allison Scholarship (formerly, the Arizona Geological Society Scholarship) is awarded to a deserving graduate or undergraduate student working toward a degree in the geological sciences at one of the three universities in Arizona. For this scholarship, the Society is seeking applications from individuals who show exemplary performance in and balance among areas of academic achievement, participation in research, and community service. In recognition of Lee Allison's leadership skills and his remarkable community involvement, leadership ability, as demonstrated within the community and/or in the academic/research setting, will be an important consideration in awarding the scholarship.



For both scholarships, the application deadline is Friday, October 28, 2016.

For each of the scholarships, a maximum of \$3,000 will be awarded. Further details and applications forms are available in the attached announcements and online on the [2016 Scholarship Info](#) web page of the Arizona Geological Society where the announcements and application forms are posted.

Help Support Our Student Scholarships

Our ability to award scholarships is dependent on our members' generosity. Donations may be made [online](#), by check or credit card. Donations are fully tax deductible to the extent allowed by law. Your check should be made out to "Arizona Geological Society" and should specify the scholarship/fund name in the check memo, if a preference is desired. Donations should be mailed to:

Arizona Geological Society
Attention: Scholarships
P. O. Box 40952
Tucson, AZ 85717-0952

Don't Miss the AGS Fall 2016 Field Trip

The Peach Spring Tuff, its Source, the Silver Creek Caldera, and Structural Geology across the Transition Zone, Basin and Range Boundary from Kingman, Arizona to Needles, California

Leader: Charles Ferguson, Arizona Geological Survey

Dates/Time - Saturday, October 22 through Sunday, October 23, 2016, (Optional Monday, October 24th)

General Information - This fall's AGS field trip is an overnight excursion to northwestern Arizona including a stay at one of the many motels in Kingman in Mohave County.

The "formal" trip will start at noon on Saturday, October 22nd in Kingman and end at ~2 PM on Sunday October 23rd in the Black Mountains a few miles west of Oatman.

Bracketing the formal trip will be additional stops starting early (7 AM) on Saturday, October 22nd and ending on Monday afternoon, October 24th. This part of the trip will require 4WD vehicles, and for those who want to continue through Monday, a campsite in the Sacramento Mountains, California

about 15 miles southwest of Needles will be used. For Monday night, participants will be asked to provide their own camping equipment, or stay at a motel in Needles that will require them to make a 45-minute drive in the early morning in order to link up with the camping crew.

Where and When - Early bird portion of the field trip begins at 7 AM Saturday, October 22, 2016. The exact coordinates for the early bird meeting place are 35 degrees 8' 45" North, 114 degrees 6' 45" West. **This portion of the field trip will require 4-wheel drive vehicles.**

The first stop of the formal portion of the field trip will begin at noon on Saturday, October 22, 2016. The exact coordinates for the first stop for the formal portion of the field trip are 35 degrees 12' North, 114 degrees 11' West. [Maps showing starting points of the Fall Field can be downloaded here.](#)



View to the west from Sitgreaves Pass on old Route 66 a few miles east of Oatman, Arizona of the Silver Creek Caldera. Gold Road Mine in the middle ground and main components of the caldera-fill depicted in solid colors in the upper view: intracaldera Peach Spring Tuff, Times Granite, and Moss Monzonite Porphyries.

Fall Field Trip Continued from Page 4

Accommodations - Sandwiches, cookies, bottled water and sodas will be provided for lunch on Sunday. Overnight accommodations and all other meals, including dinner on Saturday night and breakfast on Sunday morning in Kingman will be the responsibility of each participant. [Contact Info for Motels and Restaurants in the Kingman Area.](#)

Level of Difficulty -The level of difficulty for the formal trip, starting at noon on Saturday, will be quite easy.

All of the stops except for the last one on Sunday will be essentially road cuts or places where people only have to walk 50 yards on easy trails. The last stop on Sunday can involve some scrambling for more intrepid souls, but also is designed for those who only want to walk a few dozen yards or so. It will be a series of old mines right on the road with two examples of depositional contacts that are a bit harder (200-500 meters distance <50 meters climbing) to get to that I don't think everyone will want to do - at the same time there are plenty of things to look at right on the road. This will be a fairly long stop for those who want to do a little scrambling, and less so for those who are more challenged meaning that after 30 minutes to 40 minutes some people might just want to hit the road.

Field Trip Highlights - The main focus of the field trip is tracking the Peach Spring Tuff's outflow sheet starting at its surrogate type locality in Kingman, through its source caldera near Oatman, Arizona, and across the Colorado River into a highly extended fragment of the caldera connected to well-known exposures of its outflow sheet in the Sacramento Mountains, California. The trip's route will, in effect, mimic the strongly south-southwesterly extension vector Ferguson et al. (2013) and Ferguson and Howard (2014) have documented across the Colorado River Extensional Corridor. This direction differs significantly from the west-northwesterly direction proposed and supported by many others (eg. McQuarrie and Wernicke, 2005). The low-sulfidation quartz-calcite-adularia epithermal Gold Road vein along old Route 66 near Oatman will be the only stop on the main field trip that will involve mineralization and economic geology. [See Map of Planned Field Trip Stops.](#)

The purpose of the morning phase of the trip on Saturday, October 22nd is to examine new and old aspects of the Laramide McConnico mineral district southwest of Kingman, and an important outcrop of Peach Spring Tuff that is part of a controversy regarding how the Peach Spring Tuff was erupted; a recent paper that has received a great deal of global attention (Roche et al., 2016) suggests that the pyroclastic flow was slow-moving and that it may have been possible to "outrun it on a fast bicycle". The presence of lithic blocks not from the caldera in the outcrop we will visit on Saturday morning challenges this interpretation.

Stops on Sunday night near the campsite in the Sacramento Mountains and on Monday will focus on the geometry of the extended caldera fragment and the nature (unconformity versus detachment) of at least two gently dipping contacts near Eagle Peak and Flattop Mountain that have long been interpreted as detachment faults. An additional contact that had been interpreted as a detachment and then re-interpreted as an unconformity (Simpson et al., 1991) will be discussed and looked at from Eagle Wash Sunday evening on the way to the campsite, but is too hazardous to visit.

Contact Info - If you have additional questions about the Fall Field Trip contact Charles Ferguson at (520) 444-8905 or at caf@email.arizona.edu.

References - [See Event Announcement for list of References.](#)

Geology in the News

[New Zinc-Lead-Silver Mineral Deposit Discovered in SE Arizona](#) by Jonathan Duhamel, Arizona Daily Independent, September 18, 2016.

[San Carlos Apache, Environmentalists Fight Drilling Plan near Superior](#) by Emily Bregel, Arizona Daily Star, September 17, 2016.

[EPA Adds Colorado Gold Mine to New Superfund Pollution Sites](#) by Cecilia Jamasmie, Mining.com, September 8, 2016.

[Uncharted: Exploring One of America's Fastest Faults](#) by Donyelle Davis, U.S. Geological Survey, September 7, 2016.

[Pawnee Earthquake Officially the Largest in State History](#) by Tiffany Liou, News 9, September 5, 2016.

[Video Appears to Show Tourists Destroying Popular Oregon Rock Formation](#) by Camila Domonoske, National Public Radio, September 6, 2016.

[How Does America Keep Finding Vast Stores of Energy?](#) by Daniel Gross, Slate, September 13, 2016.

[Mine Tales: Jerome's 'Crookedness' Railroad Dates Back to 1894](#) by Wiliam Ascarza, Arizona Daily Star, September 19, 2016.

[Forest Official OKs Work for Proposed Arizona Copper Mine](#) by Associated Press, Washington Times, August 25, 2016.

[The Geology Behind Italy's Catastrophic Quake](#), by Erin Blakemore, Smithsonian.com, August 24, 2016.

[Freeport-McMoRan Announces Agreement to Sell its Deepwater Gulf of Mexico Properties](#), Freeport-McMoRan News Release, September 12, 2016.

[Six of the Most Significant Open Pit Mines in the World](#), by Dale Benton, Mining Global, August 24, 2016.

Arizona Geological Society Membership Stats (9/21/2016)

Total Membership	Professional Members	Student Members	Organizational Members
459	386	66	7

Up-coming Arizona Geological Society Dinner Meetings

Date	Speaker	Title of Presentation
11/1/2016	Alexander Schauss	Minerals, Trace Elements and Human Health
12/6/2016	-	To be Announced
1/3/2017	Dave Sawyer	Regional Aquifer Hydrogeology and Petroleum Geology of the Central Rio Grande Rift, Northern New Mexico

Arizona Geological Survey News Brief

AZGS Status Report. AZGS is moving forward with our geologic responsibilities as recently refined in S.B. 1530: geologic mapping in USGS State Map program, geologic hazard assessment, and outreach and extension. Since Nyal Niemuth retired in June 2016, the AZGS economic geology program has been on-hold. Filling the position of Economic Geologist is a priority, but the tenuous nature of our funding complicates the matter greatly.

Long-time AZGS Geologist Phil Pearthree has stepped up to assume the role of interim director until such arrangements can be made by the Arizona Board of Regents for the selection of a new State Geologist and AZGS Director.

Museum News! The Arizona Mining, Mineral and Natural Resources Education Museum (MM-NREM) concept is in the embryo stage. Discussions with chief administrators at University of Arizona's College of Science and others on the best way forward are underway. We are in the initial throes of identifying financial support and we now have a museum account with the University of Arizona Foundation.

[You can pledge your tax deductible support through the University of Arizona Foundation](#)

Interested in learning more? Contact AZGS' MMNRE coordinating team – fmconway@email.arizona.edu



[Great Arizona ShakeOut](#) (10:20 a.m. MST; 20 Oct. 2016): AZGS and the Arizona Department of Emergency-Management and Military Affairs are inviting Arizonans to join us in the Great Arizona ShakeOut. This 2-minute 'Drop, Cover & Hold On' drill prepares you for the ground shaking that accompanies a modest to large earthquake. So far, more than 45,000 Arizonans have registered for the event. Our target audience are schools, health institutions, business and local, county, state and federal government offices.

To register online: <http://shakeout.org/arizona/>

Publications

Released online:

Leighty, R.S. and Huckleberry, G., 1998, [Geologic Map of the Hedgpeth Hills 7.5' Quadrangle](#), Maricopa County, Arizona (map & report). Arizona Geological Survey, Open-File Report 98-18.

Bezy, J.V., 2004, [A Guide to the Geology of Sabino Canyon and the Catalina Highway](#). Arizona Geological Survey Down to Earth, DTE #17, 56 p.

Bezy, J.V., 2005, [A Guide to the Geology of Saguaro National Park](#). Arizona Geological Survey Down to Earth, DTE #18, 47 p.

For fresh e-mail addresses and phone numbers of AZGS staff : <http://www.azgs.az.gov/staff.shtml>. For general information, or to reach out to our staff, please call 520.621.2470, from 8am – 5pm weekdays.

Announcements

Welcome New AGS Members

Wyatt Bain	Brendan Fenerty	Kojo Plange	Tim Stockhausen
Joan Barry	Barry B. Hanan	Sam Romberger	William Tinnell
Dave Bertuch	Derick Hoffman	Tony Sawyer	
Michael Bierwagen	Jonathan King	Seymour Sears	

Arizona Geological Society is grateful to Freeport-McMoRan, Inc. for their generous support of our student members!



Freeport-McMoRan sponsors student dinners for the 2016 AGS monthly meetings.

2016 AGS MEMBERSHIP APPLICATION OR RENEWAL FORM

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

Dues (check box) 1 year: \$20; 2 years, \$35; 3 years: \$50; full-time student (membership is free)

NEW MEMBER or RENEWAL? (circle one) Date of submittal _____

Name: _____ Position: _____

Company: _____

Mailing Address: _____

Street: _____ City: _____ State: _____ Zip Code: _____

Work Phone: _____ Home Phone: _____

Fax Number: _____ Cellular Phone: _____

E-mail: _____ Check this box if you do not have an email address

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.