



Arizona Geological Society Newsletter

JUNE 2012

June 5, 2012 DINNER MEETING

- Who:** Dr. Douglas Kreiner will be our featured speaker. See abstract below.
- Where:** Sheraton Tucson Hotel and Suites, 5151 East Grant Road, (at intersection of Grant and Rosemont on the North side of Grant in the *Oasis Room* (enter at northwest corner of the building) and follow the sign to the meeting room.
- When:** Cash Bar at 6 p.m.—Dinner at 7 p.m.—Talk at 8 p.m.
- Cost:** Members \$24, guests \$27, Students free with online reservation (\$10 without).

RESERVATIONS are REQUIRED: CALL 520.663.5295 by 5 p.m. by Friday, June 1 or reserve on the AGS website (www.arizonaageologicalsoc.org). Please indicate regular (Chinese chicken stir fry with brown rice), vegetarian, or cobb salad meal preference. Please cancel by Monday, June 4 at 8 a.m. if you are unable to attend—no shows and late cancellations will be invoiced. Meals for walk-ins may be available (with a \$3 surcharge), but cannot be guaranteed.

ABSTRACT

Diversity of Intense Acid (advanced argillic) Alteration

By Douglas Kreiner and Mark Barton

Advanced argillic alteration (AAA; leaching of bases by acidic fluids, local Al mobility) occurs in many hydrothermal systems and exhibits considerable variation in mineralogy, geometry, and associated elements. Most studies have emphasized AAA in high-sulfidation epithermal/porphyry systems where S-rich magmatic gases play a key role, and in near-surface settings related to oxidation of H₂S in gases, or pre-existing sulfides to form acid groundwaters. Although these types are most common, our work on Fe-oxide(-Cu-Au) [=IOCG] systems, a comparative study of western US deposits, and a literature review show that AAA exhibits widely varying metal ratios, sulfur contents, and styles—features that reflect contrasting origins and have exploration and environmental significance.

AAA is typically silica-saturated and ranges from low-T (25-250°C) kaolinite-stable to high-T (400-600°C) andalusite-stable assemblages; these features and accessory phases vary with setting. AAA varies markedly in oxidation state, sulfidation state and sulfide contents, ranging from: (1) high-sulfidation, S-rich (5-20% pyrite) in porphyry and epithermal systems, to (2) lower sulfidation S-poor (0-2% pyrite, common hypogene Fe oxides) in several settings including IOCG systems, to (3) sulfate-bearing (typ. alunite) sulfide-poor, oxidized assemblages in near surface systems. Bulk metal contents and ratios vary widely (e.g., Ag:Au in high sulfidation AAA varies from <1 to >100; high to absent As, Hg); in some cases metals are leached or absent (e.g., IOCGs, some pyrophyllite deposits). These characteristics require different fluids and processes—including but not limited to the familiar SO₂-driven (porphyry, epithermal), steam-heated (geothermal), and weathering-related mechanisms.

As is well established, SO₂-rich hydrothermal fluids of magmatic derivation are most common. Yet even they exhibit large differences in element enrichments requiring that other factors be important, including differences in magmatic compositions and vapor vs. brine transport. Low sulfur systems require other acid sources. In IOCG and perhaps other settings this is likely HCl and metal chlorides, factors that in turn will govern distinctive element enrichments. This work was supported by grants from the NSF and USGS MRERP programs.

Read about Dr. Kreiner on page 2.

ABOUT THE SPEAKER

Douglas Kreiner completed his B.S. at Northland College in 2004 with a double major in Environmental Studies and Geosciences. He went on to complete a M.S. in 2006 at Colorado State University where he focused on the environmental impacts of mineral deposits. He completed his Ph.D. under Mark Barton at the University of Arizona in 2011. The title of his dissertation was, “Epithermal Style Iron-Oxide(-Cu-Au) (=IOCG) Vein Systems and Related Alteration.” The focus of his dissertation work was on IOCG vein systems in the Coastal Cordillera of northern Chile. Additional work has focused on understanding the mineralogy of intense acid alteration, the genesis of this style of alteration, and its significance to understanding related hydrothermal systems. Following the completion of his Ph.D. in December of 2011, Douglas joined Bronco Creek Exploration (a wholly-owned subsidiary of Eurasian Minerals). He is currently a Senior Exploration Geologist focused on copper and gold exploration in western North America.

Curis Resource Florence Project – Centennial Field Trip Report

by Cori Hoag

AGS and SME members were treated to warm hospitality and a great tour of the Curis Resources Florence in-situ Project on April 21. After morning overview and technical presentations by Curis staff (Dan Johnson, Rustyn Sherer, & Richard Sichling) and trip coordinator, Cori Hoag, the group boarded a motor coach to tour the deposit area located south of Poston Butte on Hunt Highway. The copper oxide mineralization will be extracted by an in-situ dissolution and recovery process. Planning for a 20-well pilot test is underway. Under toasty conditions, the group hiked over to the discovery outcrops at the base of Poston Butte, looked at representative drill core, and enjoyed observations throughout the day from exploration geologists such as Jim Briscoe, Syver More, and others who had previously worked on this fascinating, but well-buried, deposit. Copies of the guidebook will be available at the dinner meetings for \$15 or by mail (contact Cori Hoag at choag@srk.com). She would also like to hear your ideas for a future Centennial Field Trip.



LEFT: Rustyn Sherer, Curis, provides an overview of the project.



RIGHT: Examining representative drill core

See more photos of this trip on page 6.

ANNOUNCEMENTS

FIELD TRIPS

A **Fall Field Trip** will be held at the **Vulture Mine and Anderson Mine Project in the Wickenburg area** on the weekend of **October 6-7, 2012**. We will visit the historic Vulture Mine (led by geologist Mike Smith, Vulture Peak Gold, LLC) and visit interesting outcrops in the surrounding Wickenburg area on Saturday with a cowboy steak barbeque in the evening. The next morning we'll drive 43 miles northwest of Wickenburg to visit Uranium Energy Corp's Anderson Mine Project and hear about the deposit geology and current exploration work from UEC Sr. Geologist, Rick Edge.

A joint **AGS-AIPG Centennial Tour** led by ASU geology professor, Stephen Reynolds, will be held on **Saturday, November 10th**. The tour will focus on urban geology seen in the Phoenix basin.

More details to follow on both trips in the newsletter and posted on the AGS website.

The **Mining History Association** announces it will hold its **23rd Annual Conference** at the Prescott Resort & Conference Center on June 7-9 in honor of the Arizona's 100th anniversary. The Welcome Reception will be held at the Sharlot Hall Museum. The conference features talks on Arizona's mining history, a half-day field trip led by Paul Lindberg to Jerome, and a post-meeting tour of the Bagdad Mine. For the full program, registration and lodging information, go to the following website:

<http://www.mininghistoryassociation.org/PrescottConference.htm>.

Congratulations to AGS member **Hall Stewart**, who recently became a "Certified Professional Geologist" with the American Institute of Professional Geologists (AIPG).

The June dinner meeting will be sponsored by:

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ASSOCIATES

Go to www.clearcreekassociates.com to learn more about how Clear Creek helps their clients with practical solutions in groundwater science.

Thanks to Clear Creek for helping AGS to offset dinner meeting costs!!!

AGS is seeking sponsors for our monthly dinner meetings. Sponsorship helps to offset costs and is a great way to get the word out about your company or organization. For more information, please contact AGS VP of Marketing, Ann Pattison.

Grand Canyon Geology Raft Trip—2013

Alison Jones is planning a Grand Canyon Geology Raft trip on July 29-August 5, 2013 with Hatch River Expeditions as the outfitter. Although the trip is geology-oriented, it is NOT just a trip for geologists. Please call Alison at 520-622-3222 or email her at ajones@clearcreekassociates.com for more information.

48th Annual Forum on the Geology of Industrial Minerals

The 48th Annual Forum on the Geology of Industrial Minerals, co-hosted by the Arizona Geological Society, the Arizona Geological Survey, Arizona Rock Products Association, and the Arizona Mining Association was a success. It was held on May 1-5, 2012 in Scottsdale, Arizona. The annual forum is generally field-trip oriented. Doug Shakel, AGS VP of Field Trips, took on the daunting task of organizing field trips before and after the meeting, and he shared the photos below. Field trip guidebooks will be available online in the coming months.

RIGHT: The first stop on the pre-meeting trip was at the Montezuma Well cenote.



LEFT: The group stayed one night at the HAUNTED Jerome Grand Hotel—formerly the PD Hospital from 1929 thru 1950. Note the 5-foot diameter spider clinging to the third floor corner of the hotel.

RIGHT: Phoenix Cement Senior Mine Engineer, Brian Langford, gave a fine tour of the SRMG facilities at their Clarkdale plant.



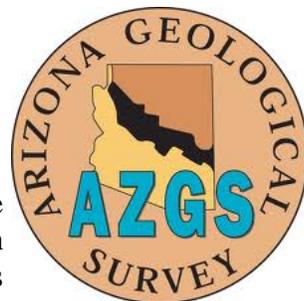
Welcome New AGS Members

Gary Carter, retired, Sun City West, Arizona
 Carmen Arbizo, Inspectorate American Corporation, Sparks, Nevada
 Phuntsho Pelgay, Thimphu, Bhutan
 Zak Smith, University of Arizona, Tucson, Arizona
 Jeffrey Lockridge, Arizona State University, Tempe, Arizona
 Michael Sheehan, Tucson, Arizona
 Linda Sheehan, Tucson, Arizona
 Mike Moune, Arizona State University, Tempe, Arizona
 Kendall Thomas, Schlumberger, Tucson, Arizona
 Amalie Orme, California State University Northridge, Northridge, California

From the Arizona State Geologist's Blog. . .

Mineral Bills in Congress

The U.S. mining industry is lining up support for H.R. 4402, a bill that would force federal agencies to complete their review of strategic and critical minerals within 30 months. The bill went before the U.S. House Committee on Natural Resources on May 16 where it passed by a 27-10 vote. The bill will go next to a floor vote by the full House. Three weeks ago, president and CEO of the National Mining Association, Hal Quinn, testified before members of the House Energy and Mineral Resources Subcommittee in support of Rep. Mark Amodei's, R-Nev., *National Strategic and Critical Minerals Production Act of 2012*, (H.R. 4402). According to an email from NMA, "Mr. Quinn argued that if U.S. mining cannot perform to its potential, our nation will be forced to become even more reliant upon potentially unstable foreign sources of minerals, undermining our ability to compete in the global marketplace."



The American Geoscience Institute's monthly government affairs report offered a summary of the various mineral bills in front of this committee:

- The House Committee on Natural Resources held hearings in April on the Map it Once, Use it Many Times Act ([H.R. 4233](#)), the Federal Land Asset Inventory Reform Act of 2011 ([H.R. 1620](#)), the National Strategic and Critical Minerals Production Act of 2012 ([H.R. 4402](#)), and the Soda Ash Royalty Extension, Job Creation, and Export Enhancement Act of 2011 ([H.R. 1192](#)).
- H.R. 4402, introduced by Representative Mark Amodei (R-NV), defines strategic and critical minerals as minerals necessary for national defense, the nation's energy infrastructure, to support domestic manufacturing, and for the nation's economic security. Any mine that could provide strategic and critical minerals "shall be considered an 'infrastructure project' as described by a March 22 Presidential Order It would limit the total review process for mining permits to a maximum of 30 months unless signatories agree to an extension. H.R. 1192 would extend a reduced royalty rate of 2% for the development of soda ash, which expired in 2011, through October of 2016. The Natural Resources Committee held a hearing on H.R. 4402 and H.R. 1192 on April 26.

Curis Resource Florence Project Field Trip (continued from page 2)

BELOW: Group discussions at the wellfield.



ABOVE: Jim Briscoe discussing ASARCO's early 1960s discovery of the Poston Butte (Florence) deposit.

2012 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 Scholarship Fund.