



Arizona Geological Society Newsletter

JULY 2013

JULY 2, 2013 DINNER MEETING

Who: Lukas Zurcher will be our featured speaker. See abstract below.

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 Room*. The Pima Room is located on the second floor in the northwest corner of the hotel.

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

Cost: Members \$27, Guests \$30, Students are free with an online dinner reservation (\$10 without).

RESERVATIONS are REQUIRED by 11 a.m. Thursday, June 27. Reservations can be made on the AGS website (www.arizonageologicalsoc.org). If you do not have internet access you may call 520-663-5295. Please indicate regular (beef tri-tip and garlic mashed potatoes), vegetarian, or cobb salad meal preference. Please cancel by Thursday June 27 at 11 a.m. if you are unable to attend.

ABSTRACT

Tectono-Magmatic Setting and Distribution of Porphyry Copper Systems in the Central Tethys Region of Turkey, the Caucasus, Iran, and southern Pakistan

Lukas Zurcher U.S. Geological Survey

The rapidly growing body of geodynamic, geochemical, geochronologic, and ore deposits studies across Turkey, the Caucasus, Iran, and southern Pakistan provided a good opportunity to update and review the time and space constraints of geodynamic processes. With a focus on how these processes relate to the diverse continental margin, intra-oceanic, and post-collisional tectonic settings that were generated during the sequential rifting of microcontinental fragments from the passive margin of Gondwana in the south, their northward transport across the Neo-Tethys Ocean, and their eventual collision with the active margin of Eurasia in the north.

Integration of geological, geophysical, and remote sensing information with the 41 porphyry deposits — including the giant Reko Diq (Pakistan), and the world-class Sar Cheshmeh (Iran), Sungun (Iran), and Kadjaran (Armenia) deposits — and 319 porphyry prospects in the region indicate that much of the magmatism and related porphyry copper mineralization can be explained in terms of traditional plate tectonic principles. However, it is also evident that mantle-involved post-subduction processes have also played an important role in localizing world-class porphyry deposits in the region, and that uplift, erosion, subsidence, and burial of mineral deposits, not just their formation, have played a key role in generating the observed distribution of metallogenic patterns.

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ABSTRACT—Continued from Page 1

Twenty five partially overlapping Late Triassic to recent magmatic belts permissive for the occurrence of porphyry copper deposits were identified in the Central Tethys region. Of the 360 known porphyry copper occurrences (the sum of identified deposits and prospects) in the region, about 65% are hosted by the five most favorable belts. Approximately 60% are associated with continental arcs; 20% are related to island arcs or back-arcs; and 20% are linked to post-collisional settings. Of the 41 known porphyry copper deposits, roughly comparable fractions are distributed among the different tectonic settings. The most important deposits, however, occur in continental arc (Reko Diq and Sar Cheshmeh) or post-collisional settings (Sungun and Kadjaran).

The level of exposure is an important factor in the observed distribution of porphyry belts. At the regional scale analyzed, the correlation is remarkable because exhumation and burial processes commonly happen at an order of magnitude smaller time and space scales than magmatic events, and what is observed today is the sum product of several partially juxtaposed exhumation and burial events. Permissive magmatic belts with the highest number of porphyry copper occurrences are underlain by comparable areas of coeval permissive volcanic and plutonic rocks, and lesser cover, reflecting adequate levels of preservation and exposure of porphyry systems. These magmatic belts also host most of the known porphyry copper resources in the Central Tethys region. Fewer porphyry systems are known to occur in magmatic belts where the proportion of coeval permissive volcanic-to-plutonic rocks is too high or too low and the fraction of younger cover is high, pointing respectively to crustal levels that are too shallow or too exhumed, and porphyry systems that may be buried.

Overall, formation of the most important porphyry deposits in the Central Tethys region appear to closely precede the high tectonic gradients produced by the final “hard” continent-continent early Oligocene to late Miocene oblique and diachronous collision between the Arabian Platform and the Eurasian margin, and to closely supersede the sudden southward migration and flattening of the subducted slab along the Makran Trench in the latest Miocene. The highest rates of uplift, erosion, and removal of volcanic rocks that are coeval with causative porphyry intrusions also coincide with these tectonic changes.

Welcome New AGS Members

Amelia Willits, Tetra Tech

Denise Levitan, Student at VT/Freeport-McMoRan

Amy Showalter, Student at UA

James Armstrong, Armstrong Design and Consulting

Bruce Walker, CMI Questa Mine

Kathy Long, Copper Triangle Mining Services

Deirdre Labounty, Student at UA

Linda Buczynski, Self-Employed

Whitney Rutherford

About the July Dinner Meeting Speaker

Lukas Zürcher is a research geologist with the USGS. He received a BS in Geological Engineering from the Colorado School of Mines (1985), and a MS and PhD in Geosciences from the University of Arizona in (1994 and 2002, respectively). He worked as an exploration and consulting geologist for the mining industry in Mexico, Cote d'Ivoire, Bolivia, Argentina, and the US (1985-2010), as a postdoctoral fellow in the Department of Lunar and Planetary Sciences (2002-2005), and as Manager of the Lowell Program in Economic Geology (2002-2011) at the University of Arizona before joining the USGS in 2011. He has 25 years of combined industry and academic experience in geologic, alteration, and mineralization mapping, structural geology, igneous and hydrothermal geochemistry, statistical methods, mineral economics, and GIS-based favorability mapping. His research has included local- to regional-scale geologic, geochemical, and metallogenic studies of intrusion-related, impact-generated, and IOCG hydrothermal systems, as well as comparative analyses of favorability mapping methods. With the USGS, he has contributed to the porphyry copper resource assessments of Mexico, Central America and the Caribbean, and the Central Tethys region.



Identify this rock!

The sample is approximately 12 inches tall. If you know the name of this rock and how it was formed, email AGS President Alison Jones (ajones@clearcreekassociates.com). One of the correct answers will be selected at random and the winner will receive a drink — from the bar (courtesy of Alison) at the next dinner meeting.

New Arizona Geological Survey Publications

The publications are available at the AZGS Document Repository

<http://repository.azgs.az.gov/>

GIS data are now available online for Estimated Depth to Bedrock in Arizona, v 1.0 (Richard and others, 2007).

Rauzi, S.L. and Spencer, J.E., 2013, A Brief Overview of the Cretaceous Mancos Shale in Northeastern Arizona and its Hydrocarbon Potential. Arizona Geological Survey Open-File Report, OFR-13-08, 8 p.

Huebschman, R.P., 2013, Stratigraphy of Lower Permian Skarn Protoliths, Southeastern Arizona. Arizona Geological Survey Contributed Report, CR-13-B, 27 p.

Patten, K., 2013, National Geothermal Data System: Transforming the Discovery, Access, and Analytics of Data for Geothermal Exploration. Arizona Geological Survey Open File Report, OFR-13-06, 37 p.

Gootee, B.F., 2013, Geologic Evaluation of Yuma Basin for Carbon Dioxide Sequestration Potential. Arizona Geological Survey Open File Report, OFR-13-04.

Murphy, R.T., Faulds, J.E. and Hillemeyer, F.L., 2013, Preliminary Geologic Map of the North Half of the Union Pass Quadrangle, Mohave County, Arizona. Arizona Geological Survey Contributed Map, CM-13-A, 1 map sheet, map scale 1:24,000.



ANNOUNCEMENTS

Upcoming Field Trip - Get your Geology Kick on Route 66

The New Mexico Geological Society and the Arizona Geological Society are jointly hosting a Fall Field Trip Conference, September 25 to 28, 2013. The trip will shadow the historic Route 66, starting in Flagstaff, AZ and ending in Grants, NM. A pre-conference field trip will take place at the Grand Canyon.

Day 1 will include stops at S-P and Sunset Craters near Flagstaff before continuing on to Meteor Crater.

Day 2 will focus on the geology, archeology and other features of Petrified Forest National Park.

Day 3 will conclude the conference at Mount Taylor, NM.

There will be an optional field trip to the Rio Puerco after the conference. Highlights of this conference will include geology of the Grand Canyon area and the San Francisco volcanic field near Flagstaff, as well as stratigraphy, paleontology, paleomagnetism, archeology and mining endeavors in the Petrified Forest Park area and an update on the volcanic stratigraphy of Mount Taylor.

For more information visit the AGS website, www.arizonageologicalsoc.org.



AGS Digest and Bulletins are available for online purchase at the Arizona Experience Store.

The AGS Publications Committee is in the process of scanning and uploading AGS Digests, Bulletins, and Guidebooks to the AZGS online book store. Digest and Guidebooks are also available at the monthly dinner meeting.

<http://store.azgs.az.gov/product-type/books/arizona-geological-society>

Arizona Mining Review



Join host Lee Allison, Arizona State Geologist, for Episode 6

Arizona Mining Review video magazine – Live!

Day: Wednesday, 26 June

Time: 10:00 – 10:30 a.m. (MST - PDT)

Where: Streaming online at the Arizona Mining Review Live Stream Channel

(<http://new.livestream.com/accounts/2496466/azminingreview>)

Arizona Mining Review is a live, online video magazine from the Arizona Geological Survey exploring and reviewing mining in Arizona -- its challenges and successes. From potash to copper to gold, from mineral exploration to policy development, tune in to see experts from industry, academia, research, and politics discuss the current state and future of mining in Arizona.

June 26 Topics

- **Mining News & Update.** Lee Allison and Nyal Niemuth explore the newest developments and trends in Arizona mining.
- **Dr. Mary Poulton**, Director Lowell Institute for Mineral Resources – IMR (Univ. of Arizona), discusses game-changing solutions to modern mining challenges.
- **Bob Broscheid**, Arizona Natural Resources Review Council (NRRC) and Special Asst. to the Director of the Arizona Game and Fish Department, discusses land management issues and potential impact on the mining community.
- **Steve Rauzi**, AZGS Oil and Gas Administrator, on the Mancos Shale of northern Arizona – potential shale oil and shale gas target?

Subscribe to the Arizona Mining Review listserve (<http://azgeology.azgs.az.gov/newsletters/amr>) for regular reminders of upcoming episodes.

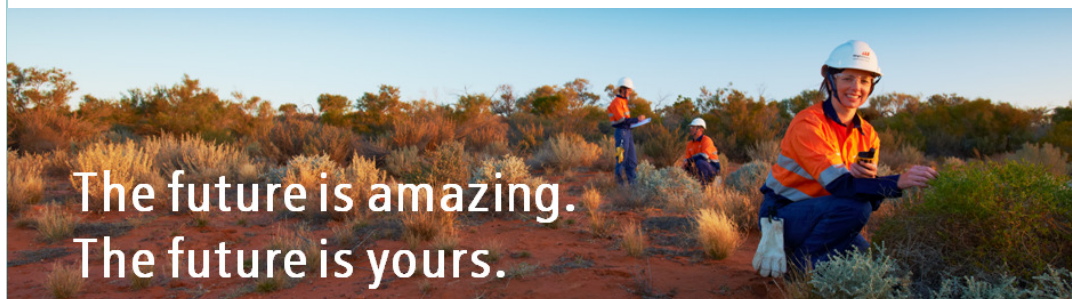
The Arizona Mining Review, a product of the Arizona Geological Survey, is broadcast live and recorded for later viewing at the AZGS YouTube Channel (<http://www.youtube.com/user/azgsweb>).

**Our thanks to Jim Briscoe
for his recent generous
donated to the
Courtright Scholarship Fund**

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
(msgeo81az@yahoo.com).**

Attention Student Members: AGS is pleased to provide free meals for student members with a dinner reservation. Please keep in mind that these meals are paid for with a generous gift from BHP Billiton. If you make a reservation and do not attend, AGS must still pay for the meal. If you are unable to attend, please cancel your reservation by 11 a.m. on the Thursday before the meeting. If the cost of no-shows continues to be a problem, the AGS Executive Committee may consider charging for unclaimed student meals, as we do for regular members.



**AGS is grateful to
BHP Billiton for
their generous
support of our
student members!**

Sustainability

In BHP Billiton, we achieve sustainability when everyone builds and maintains meaningful, long-term relationships with internal and external stakeholders.

That is why we are proud to sponsor the student dinners of the Arizona Geological Society.

Careers.bhpbilliton.com



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 you are a registered geologist/engineer, indicate your registration number and State: _____

Enclosed is a _____ tax-deductible contribution to the J. Harold Courtright Scholarship Fund.

Enclosed is a _____ tax-deductible contribution to the AGS Scholarship Fund.

Enclosed is a _____ tax-deductible contribution to the AGS Greatest Needs Fund.