Arizona Geological Society Newsletter

AUGUST 2019

September 10th, 2019 DINNER MEETING

Who: **Kent J. McGrew** is the 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 **SABINO 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 online reservation ($10 without).

RESERVATIONS ARE REQUIRED: Reserve on the AGS website (http://www.arizonageologicalsoc.org/events) by 11 am on Friday, September 6th. Please indicate Regular (Miso Honey Glazed Chicken), Vegetarian (Stuffed Bell Pepper), or Salad (Cobb Salad) meal preference. Please cancel by **Friday, September 6th at 11 am** if you are unable to attend - no shows and late cancellations will be invoiced.

The September dinner meeting is sponsored by:

SKYLINE ASSAYERS & LABORATORIES

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

vpmarketing@arizonageologicalsoc.org

Arizona Geological Survey presents:

In-Situ Recovery Basics

by Kent J. McGrew, P.E.

Continued on Page 2

ABSTRACT

Through the 1970s & 80s, ISR methodology pursued every metal lending itself to dissolution with lixiviants composed of oxidants and a complexing agent. Numerous tools were developed and employed to analyze well field performance. Uranium was the main target of the day. However, extensive efforts to recover gold, copper, and a host of other metals were pursued by the largest and most capable mining companies. Con Rio Australia (CRA) invested heavily in an ISR approach to mine the Australian deep gold leads, the continuation of the oxidized zones of buried placers that fueled the Australian gold rush of the mid-1850s.

This effort recounts the "Lessons Learned" through CRA research and how they apply to current efforts in Arizona to study and bring to fruition In-Situ leaching for the vast oxide copper resources. The resilient nature of the deep leads pushed lixiviant research for gold extraction and well field design and analyses to new levels of understanding. Chemical and physical phenomena that were experienced in the course of the research are reviewed. Long leach path testing was developed during this effort and provided the scientific evidence that eventually led to the abandonment of the CRA project Deep Leads Project.

The chemistry of copper leaching is reviewed along with the chemical reactions that attack the gangue minerals that can lead to fatal contamination of the recirculated leach solution and possible precipitation and plugging of the In-Situ leach ore. There is far more chemistry to be considered than can be realized in beaker or bottle roll testing. An alternate to sulfuric acid is presented, along with a unique recovery method to produce cathode copper from low grade acid copper solutions.

Mr. McGrew recounts the history and presents the lessons learned, humorously and thoroughly. Still involved in the ISR industry, Mr. McGrew makes the point, "There is science in the background of everything we do, whether we pay attention to it or not."

ABOUT THE SPEAKER

Mr. McGrew holds his B.S. and M.S. in an obscure corner of extractive metallurgy, dubbed Mineral Dressing Engineering many years ago by metallurgy professors that didn't want to melt rocks or test the hardness of metals and al-

Continued on Page 3

loys. Along with his formal training in mineral process plant engineering, he supplemented his rock breaking expertise with every chemistry course available at Montana School of Mines.

A burgeoning hydrometallurgy industry soon led him into first ion exchange for metal recovery and then into testing and design for some of the largest copper heap leach operations in Mainland China while working for Fluor Mining and Metals. Mr. McGrew was the project manager for the In-Situ, Inc. effort to develop a chemical system for ISL gold recovery for the deep leads in Australia. He brings to light a wealth of lessons learned from that experience from the late seventies and also innovated the long leach path testing method for evaluating the chromatographic effects experienced while pushing lixiviants through ore bodies.

Mr. McGrew built and operated the Wharf Resources gold recovery plant at the Annie Creek Mine in Lead, SD. He pioneered winter leaching and was the first to apply buried emitters for solution distribution of cyanide solution to the leach heaps.

Driven out of the Black Hills by his cruel mistress, asthma, Mr. McGrew has lived in the Arizona Desert for thirty years. He owned and operated ReagenTech, Inc. treating metal-waste waters from circuit board manufacturing and plating shops around the American West. He has been more or less retired for ten years but stays busy with consulting, writing, and administration of the Congress School District.

Society Announcements

For anyone attending the Geological Society of America national conference in Phoenix this year, the Arizona Geological Society is sponsoring the following GSA 2019 Conference sessions and activities:

Topical Session - Poster Session and Oral Presentations:

Porphyry Copper and Related Mineral Deposits of Arizona, the Basin and Range Province, and Beyond - Hosted by Sarah Elizabeth Baxter and Michael Conway of the Arizona Geological Society

This session focuses on the geology of porphyry copper deposits, their related (and much larger) magmatic-hydrothermal systems, and their temporal evolution within and without the Basin and Range Province.

Field Trip:

Lava and Pyroclastic Flows of the Miocene Goldfield-Superstition Volcanic Province, Central Arizona—Saturday, September 21st - Led by R.V. Fodor of North Carolina State University, Michael T. Mohr, and Brian A. Dombroski.

Examine the volcanic rocks of the Miocene Goldfield-Superstition volcanic province east of Phoenix. Discussions at each field trip stop will include the volcanic geology, petrography, and petrology, and sharing of the most recent geochemical, petrological, mineralogical, volcanic stratigraphy, and geochronological research conducted by the co-leaders over the past decade. Rock types to see and sample during six field stops include rhyolite lava domes, crystal-rich and crystal-poor rhyolite ash-flow tuffs, andesite, basalt, and basement granite and conglomerate.

Register for GSA 2019 Conference here:

https://community.geosociety.org/gsa2019/attend/registration

Society Announcements

AGS Members Leading Post-GSA 2019 Conference Field Trip

Information provided by Eric Seedorf:

On behalf of the Lowell Program in Economic Geology, we take the opportunity to inform you of a unique, one-off field trip we are running as part of the GSA 2019 Annual Meeting in Phoenix, Arizona.

We are running Field Trip 26. Exploring Superimposed Laramide Contraction, Porphyry Copper Systems, and Cenozoic Extension in the Globe-Superior-Ray-San Manuel area, East-Central Arizona from Thursday, 26 September to Saturday, 28 September 2019. The leaders are Eric Seedorff, Carson Richardson, Dan Favorito, Mark Barton, and Roy Greig.

This three-day, post-meeting trip will focus on the well-mineralized segment of the Laramide arc in east-central Arizona. This segment of the Laramide arc includes the GlobeMiami, Pinto Valley, Resolution, Ray, Christmas, Chilito, San Manuel, and Copper Creek deposits, and numerous prospects with potential for future exploration. The key themes examined in this field trip include: Laramide tectonic setting and style/amount of crustal shortening, space-time-composition evolution of the Laramide arc and porphyry copper deposits, post-mineralization Cenozoic normal faults and associated tilting, hydrothermal systems and alteration, supergene processes and dispersion, and the mining life cycle.

This trip, while having some overlap with LPEG fieldtrips run through the Porphyry (± IOCG and Alkalic Cu-Au) December short course, offers a full day that will focus exclusively on the evidence for the style and timing of Laramide contractional deformation and consider its relationship to porphyry copper mineralization, including 4WD forays into the brush to observe key exposures of reverse faults and associated folds that support a basement-cored uplift interpretation. Additionally, while the December field trip usually visits the Ray mine, this trip will visit Resolution for a presentation and an examination of drill core from this deep, high-grade porphyry copper deposit that is currently being developed.

The field trip costs $595/person, which includes all meals, accommodation, and transportation to/from the Phoenix Convention Center. More information is available at

https://community.geosociety.org/gsa2019/learn/field

Click on **Field Trip #26**. The registration deadline is **August 19, 2019**, so register today to reserve your spot!

Society Announcements

Attention AGS Membership!!!

The Geological Society of America is **still seeking sponsors** for the Geological Society of America Annual Meeting & Exposition on 22-25 September in Phoenix, Arizona! **Sponsors play a vital role in supporting the success of GSA's Annual Meeting while gaining productive opportunities to represent their companies, products, and services to our members.**

Some of the benefits for sponsors include:

- **Visibility** to over 7,000 attendees at the main site and beyond (at registration, poster sessions, special events, short courses, field trips, mobile apps, and more)
- **Leadership and recognition**, with 22,000 members witnessing your company fostering the growth of current and future leaders in the geosciences
- **Recruitment opportunities**, with access to the best and brightest geoscience students that make up one-third of the meeting attendance

For more information on sponsorship, visit the Geological Society of America's webpage listed. The webpage contains additional information on what types of sponsorships are available, and other benefits that are offered to GSA Conference sponsors:

https://community.geosociety.org/gsa2019/showcase/sponsors

If you or your company is interested in sponsoring the Geological Society of America Annual Meeting & Exposition 2019, please contact:

Debbie Marcinkowski
303-357-1047
dmarcinkowski@geosociety.org

Society Announcements

Information provided by William H. Wilkinson:

The University of Arizona Department of Geosciences Advisory Board has been working on plans for outreach about the geosciences (geology, mineralogy, volcanology, geophysics, etc.) in local schools in the Tucson area. We are developing some tools that can be used by volunteers in classrooms but we need to get the word out to potential volunteers.

The University of Arizona Department of Geosciences Advisory Board is working on several ideas for outreach to local schools. One of those involves supplying volunteers to go to classrooms and talk to students and teachers about the geosciences (geology, mineralogy, volcanology, geophysics, etc.). **We are looking for potential volunteers with geoscience backgrounds who would be willing to work with the toolkits the Department is developing to represent us in the classrooms.** We think it is important for students to be exposed to people who have worked in the industry, academia or government and can share their passion and experiences.

If you are interested, please contact:

Hannah McCormick
(520)-626-8204
hemccormick@email.arizona.edu

NEW: Directory of Active Mines in Arizona 2019

by Arizona Geology e-Magazine, Arizona Geological Survey

In FY 2019, there were 380 active, full-time mines or development projects in the state of Arizona (Richardson and others, 2019). The new Directory of Active Mines in Arizona: FY 2019, a joint product of the Arizona Mine Inspector's Office and the Arizona Geological Survey, characterizes those active mines.

Continued on Page 9

Arizona typically ranks 2nd to Nevada in non-fuel mineral production annually in the U.S. mining industry. Mined mineral resources in Arizona range from metals, chiefly copper with minor production of gold, silver, iron ore, lead and zinc, to a broad suite of industrial minerals dominated by aggregate (sand, gravel, and building stones) complemented by cement and lime, flagstone, gemstone, cinders, and gypsum, among other mineral resources.

This Directory of Active Mines in Arizona includes a brief report with three figures, seven plates displaying mine distribution across the state and by individual counties, an excel sheet listing the location, ownership, and mineral commodity of active mines, and a KMZ file for illustrating the active mines in Google Earth. Additionally, the data is viewable as a web map at:

https://arcg.is/1KX5nH

This is the first directory of active mines since the Arizona Dept of Mines and Mineral Resources released Directory of Active Mines in Arizona (2007):

http://repository.azgs.az.gov/uri_gin/azgs/dlio/1601

Read the original blog post here:

https://blog.azgs.arizona.edu/blog/2019-08/new-directory-active-mines-arizona-2019

Please contact AZGS's Carson Richardson (carichardson@email.arizona.edu) or Mike Conway (fmconway@email.arizona.edu) with questions or concerns.

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

Freeport-McMoRan has sponsored student dinners for the 2018-2019 AGS monthly meetings.

AGS MEMBERSHIP APPLICATION OR RENEWAL FORM

YOU CAN RENEW OR SIGN UP as a new member and pay online. Please go to our website, arizonageological soc.org. Or use the form below if you are more comfortable with the old school approach.

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)

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.