



# Arizona Geological Society Newsletter

JULY 2015

## July 7, 2015 DINNER MEETING

**Who:** Eric Melchiorre will speak about “The Complex Geological History Recorded by Arizona Placer Gold Deposits: West-Dry Transitions and In-situ Gold Nugget Formation (the little miners did it!)”

**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 \$27, Guests \$30, Students Members free with on-line reservation (\$10 without).

**RESERVATIONS ARE REQUIRED:** Reserve on the AGS website ([www.arizonageologicalsoc.org](http://www.arizonageologicalsoc.org)) by **11 a.m. Friday, July 3rd**. Please indicate regular (Beef Tri-Tip with Aus Jus & Sauce), vegetarian, or Cobb salad meal preference. Please cancel by Friday, July 3rd at 11 a.m. if you are unable to attend - no shows and late cancellations will be invoiced.



**The AGS is Grateful for Our Sponsors, Who Help Us to Offset Dinner Meeting Costs**

## **The Complex Geological History Recorded by Arizona Placer Gold Deposits: Wet-Dry Transitions and In-situ Gold Nugget Formation (the little miners did it!)**

Erik Melchiorre, Professor, California State University, San Bernardino

Placer gold at Rich Hill, Arizona contains trace element distributions, which provide a geochemical “fingerprint” that suggests specific lode sources and history for the placer gold. There are three main placer units at Rich Hill (Kamenov et al., 2013): The lower-most “black placers,” the middle “white placers,” and the

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uppermost “red placers.” In addition, there are remnants of a special fourth unit, called the “potato patch,” which is associated with a paleo-erosional surface. The most prominent geochemical feature of the placer gold is leaching of silver, and enrichment of copper in the outermost rims of gold grains, suggesting long exposure to chemical weathering at the surface. Thickness of these reaction rims increases with increasing distance from the inferred lode source. Gold from the young “red placers” is angular and typical of pulse placers (debris flows), while older “white placer” gold is very rounded suggesting a fluvial environment. Gold from Rich Hill lode deposits have distinctly different lead isotope “fingerprints” from the four placer deposit groups which are more radiogenic. This suggests that the placers formed from a different lode source, or that the gold in the placers has experienced significant geochemical modification. The discovery of gold-metabolizing microbes in biomats within cracks and pits on the “black placer” gold suggests local gold sourcing with subsequent biological remobilization. The “black placer” unit is the stratigraphically oldest, but contains the most radiogenic gold. Placer gold from the La Cholla placers near Quartzsite, Arizona may also form directly within placers, but by abiological means. In some locations, this gold occurs as pyritohedron gold crystals up to 1 cm, within a silicified high-energy gravel. It is unlikely that soft gold crystals would survive for long in an environment capable of forming and transporting well-rounded golf ball to softball-sized quartz clasts. Field and geochemical evidence suggest that this gold formed in-situ when reducing hot springs associated with a range-front fault flowed through a pre-existing placer gold deposit. These fluids locally dissolved placer gold and later precipitated it as crystals. Lead isotope work on these samples is in progress. Placer gold miners in the 1800s often argued that new gold sometimes “grows” within mined-out placers. These accounts were often discounted out of hand, attributed to inefficiencies of past mining and “tall tales.” However, recent work suggests that placer gold may indeed form in-situ by both biological and abiological means.

Kamenov, G.D., Melchiorre, E.B., Ricker, F.N., and DeWitt, E., 2013, Insights from Pb isotopes for native gold formation during hypogene and supergene processes at Rich Hill, Arizona: *Economic Geology*, v. 108, p. 1577-1589.

### About the July Dinner Speaker



Erik Melchiorre is Professor of Geology at California State University, San Bernardino, with specialization in stable isotope geochemistry, economic geology, and hydrology. Erik holds a B.S. degree in Geological Science from the University of Southern California, a M.S. degree in Geology from Arizona State University, and a Ph.D. in Earth & Planetary Sciences from Washington University. He has been a guest researcher at Lawrence Livermore National Laboratory in California, and was awarded the SME “Future Leader” award in 2001. He presently serves as chair for the Southern California section of SME. Erik has worked for the Phelps Dodge Morenci and Cyprus Bagdad copper mines in Arizona, and the Sunshine silver mine in Idaho. Erik’s main projects involve geochemistry, including 1) the use of nitrogen and carbon stable isotopes to understand vadose zone copper mineralization 2) geochemical and morphological “fingerprinting” of placer gold to understand placer formation and gold sourcing. Dr. Melchiorre has been awarded a research sabbatical for the 2015-16 academic year, which will undoubtedly be much too short to get everything done.

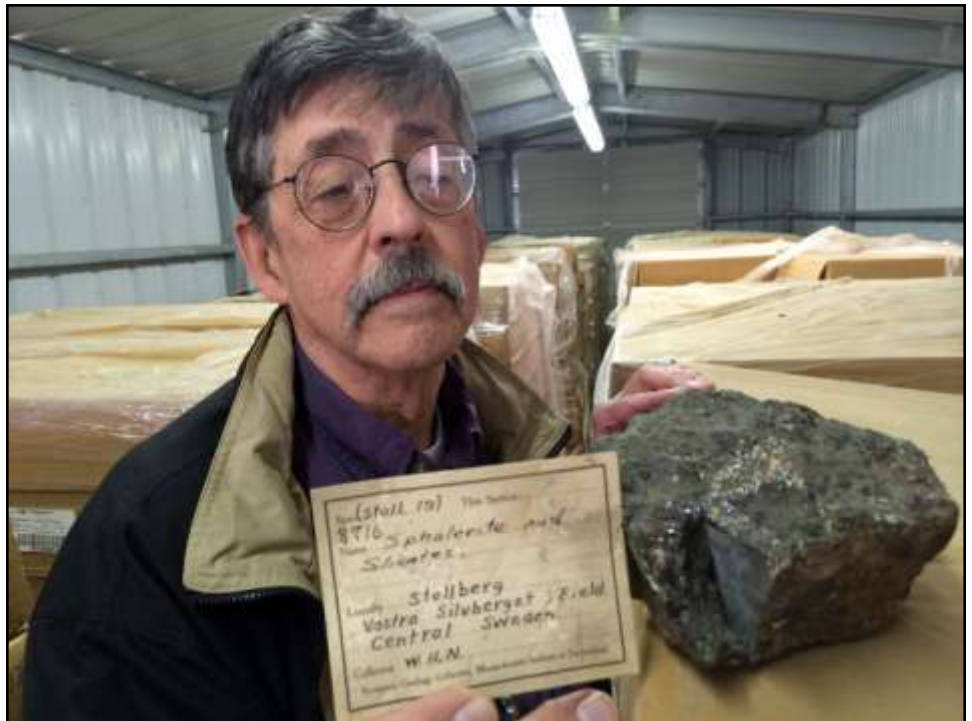
## Update from the Ad Hoc Lindgren Collection Committee

### by Carl Bowser

The status of the Lindgren collection is being addressed by a small committee of AGS members in collaboration with Mark Barton at the University of Arizona. The collection comprises rock and mineral specimens collected through the career of Waldemar Lindgren in his 31 years as a USGS geologist and from 1912 until his retirement, as a professor of geology at the Massachusetts Institute of Technology. The collection of over 10,000 specimens was shipped to Tucson in 2001 with the funding provided by the Arizona Geological Society and the Tucson Gem and Mineral Society. Stored for over 12 years in a federally owned, weather proofed storage building at the U.S. Department of Agriculture Research Center at the University of Arizona, the AGS has begun to explore the fate of the collection and how best it could suit the needs of the geologic community.

A committee comprised of Carl Bowser, Stan Evans, Rachel Feuerbach, Dick Jones, Bob Kamilli, and Bruce Walker recently reported to the AGS Executive committee with suggestions about responsibilities of interested parties, suggested disposition of the collection, and the AGS involvement in bringing the collection to the attention of a larger geologic community.

Critical items that face the committee and AGS are: the establishment of a working relationship with the U of A on the disposition and value of the collection, the need for a formal written agreement with the U of A on potential involvement of AGS in documentation of the collection, establishing the value of the collection to the larger geologic community, and the identification of a timetable for the proposed work and setting of protocols for documentation and making the geologic community aware of the collection.



Bruce Walker with an example of a Mineral Specimen from the Lindgren Collection.

The Lindgren committee is strategizing arrangements with the U of A, and setting documentation protocols, provided the collection is deemed valuable enough to initiate the task of detailed cataloging. If and once the AGS working group decides to proceed with the project the help of volunteers with skills, such as, specimen examination and description, photo documentation, database merging techniques, and web development will be needed.



## Recent Events

From June 14th through the 18th, the Arizona Geological Survey hosted the Association of American State Geologists 107th Annual Conference in Flagstaff, Arizona. The meeting was a great success with just over 100 professional participants from State Surveys, U.S.G.S., professional societies and other science agencies attending.



Participants of the Association of American State Geologists Conference enjoy a field trip to the San Francisco Volcanic Field.

The Arizona Geological Survey and Association of American State Geologists thank our friends and colleagues at the Arizona Geological Society for stepping forward to help sponsor this event.



The Arizona Geological Society has 50 new members from 49 states. As part of our sponsorship of the 107th Association of American State Geologists Annual Conference, we provided one-year free memberships to the State Geologists from all states, excluding Arizona.



**2015 ANNUAL SYMPOSIUM**  
**September 16-19, 2015 • Phoenix**

*Where Did the Water Go?*



### 2015 Arizona Hydrological Society Annual Symposium

- When: September 16-19, 2015;
- Where: Desert Willow Conference Center, Phoenix, Arizona; and
- Symposium webpage link: <http://ahssymposium.org/2015/>

Anyone having any questions about this event please contact: Keith Scoular at (480) 894-5477 or e-mail - [kscoular@acstempe.com](mailto:kscoular@acstempe.com).

### Up-coming Arizona Geological Society Dinner Meetings

Date	Speaker	Title of Presentation
8/4/2015	Dan Lynch	Tecolote: The World's Most Bizarre Volcano, Pinacate Volcanic Field Mexico
9/1/2015	Carl Bowser	The Genesis of the Kramer Borax Deposit, Muroc Dry Lake, Mojave Desert, California: A 50 Year Retrospective
10/6/2015	Caleb King	Eocene Ore Deposits of the Greater Battle Mountain Area, Nevada

### Looking for a Gift for Your Favorite Geologist or Yourself?

**In-print AGS publications** are available for sale at the Arizona Experience Store, located at 416 West Congress Street, Tucson. Copies of current AGS Field Trip Guidebooks and Digests also will be for sale at a reduced price at the July dinner meeting. A list of in-print publications can be found on the [AGS website](#).

### Arizona Geological Society Membership Stats (6/26/2015)

Total Membership	Professional Members	Student Members	Organizational Members
504	357	140	7

## 2015 AGS Member Directory Coming in September

Directory compilation is in progress so submit your company ads and photos to Directory Coordinator, Cori Hoag, [choag@srk.com](mailto:choag@srk.com) through Aug. 15th. [See our website for advertising size/cost details](#) – payment accepted by check in advance, or secure credit card online.

Members – please ensure we have your up-to-date contact info including a correct mailing address. The directory will be sent by bulk mail and will not be forwarded. Thanks to all our Advertising Sponsors for their on-going support of the Arizona Geological Society!

### **Two Recent AGS Field Trip Guidebooks have been Posted on Web Site**

**\*New\*** Shakel, D., 2009, [Tucson Mountain Chaos - Revisited, Guidebook and road logs for Arizona Geological Society Spring Field Trip](#): Arizona Geological Society Spring Field Trip, April 2007, Guidebook, 37 p.

**\*New\*** Hoag, C., 2012, [Field guide to Curis Resources Florence Project](#): Arizona Geological Society Centennial Field Trip #2, April 21, 2012, 34 p. plus 4 p. Curis company insert.

### **Lunch Time Presentation at USGS Tucson Office**

Erik Melchiorre will give a lunch time talk on July 7 at 12:10 PM in the Environment and Natural Resources (USGS) Building in room 353 (Park Avenue and 6th street). Park in the 6th street garage. The title of his talk will be "Stable Isotope Evidence for the Conditions of Formation for Secondary Copper Carbonates (and Copper Nitrates too!)." For more information contact Bob Kamilli at (520) 670-5576 or e-mail - [bkamilli@usgs.gov](mailto:bkamilli@usgs.gov).

### **Geology in the News – with emphasis on Southwestern U.S.**

The Arizona Geological Society Newsletter is piloting a "Geology in the News" column to showcase recent, important geology, mineral resource and mining articles on the southwestern U.S. to our readers.

Freeport McMoRan's Morenci mine profiled in June's Engineering and Mining Journal, p. 54-59. <http://emj.epubxp.com/i/525639-jun-2015>

New studies re-examine how major copper deposits form – processes involving porphyry copper deposits. <http://www.earthmagazine.org/article/studies-re-examine-how-major-copper-deposits-form>

Today's mine permitting crawl can adversely impact the value of a U.S. mine by more than 30%. [Permitting, Economic Value and Mining in the United States](#) (SNL Metals & Mining)

Forget the Hype, in the global rush for energy-critical elements, our region can't compete. [Why rare-earth mining in the West is a Bust](#). High County News. June 16, 2015

[Bill introduced to overturn Resolution copper mine land exchange](#). Arizona Geology blog of the State Geologist of Arizona, June 20, 2015



## Arizona Geological Survey News Brief

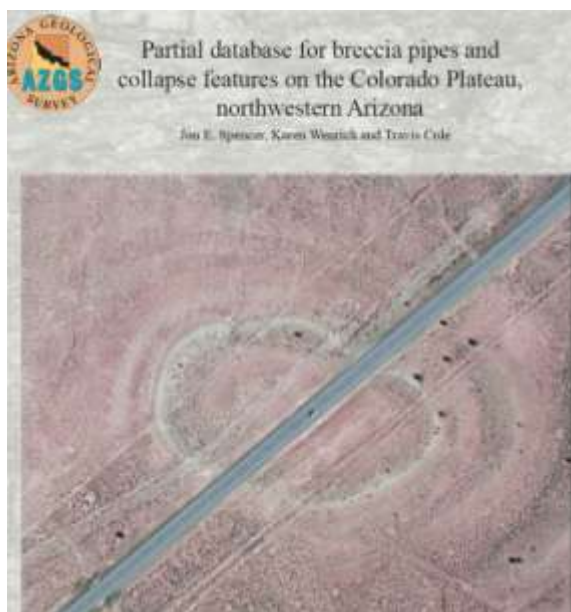


### [Arizona Mining Review \(AMR\)](#) e-Video Magazine – 6/24/2015

The June episode of the [Arizona Mining Review](#) (AMR) is now online at Youtube:

- Arizona copper production in 2014 with Nyal Niemuth
- New map compilation indicates thousands more breccia pipes in NW Arizona – Jon Spencer & Karen Wenrich's new report has details accompanied by GIS data.
- George Love talks U.S. mineral resources – filmed at the Assn. of American State Geologists 107 annual meeting, Flagstaff, Arizona.

### New Publications – Online at the AZGS Document Repository



Spencer J.E., Wenrich, K. and Cole, T., 2015, [Partial database for breccia pipes and collapse features on the Colorado Plateau, northwestern Arizona](#). Arizona Geological Survey Digital Information, DI-42, 5 p., 1 map plate, shape files, and Excel Workbook.

Importantly, this report suggests that there are 1000s of undiscovered breccia pipes in NW Arizona, and by simple extrapolation more mineralized pipes.

# ANNOUNCEMENTS

## Welcome New AGS Members

Katherine Henrichs	Adam Piatkowski
Vincent Leblanc	Dana Slaughter
Michael Pagel	Sathiyaseelan Subburaj

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



**Freeport-McMoRan is sponsoring student dinners for the 2015 AGS monthly meetings.**

### 2015 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  Arizona Geological Society Scholarship Funds.