



# AGS NEWSLETTER

ARIZONA GEOLOGICAL SOCIETY, INC., FEBRUARY 2007

## DINNER MEETING, FEBRUARY 6, 2007

David John, U.S. Geological Survey, Menlo Park, California

### *Hydrothermal Alteration, Volcano Hazards, and Epithermal Systems by High Cascades Volcanoes, Northwestern USA*

**ABSTRACT** — Hydrothermally altered rocks are present on many active volcanoes in the High Cascades arc in the Pacific Northwest, most notably on Mount Rainier near Seattle, WA. Hydrothermal alteration can result in severely weakened volcanic edifices that may be susceptible to failure and catastrophic landslides. This alteration also is similar to that related to high sulfidation epithermal Au-Ag and porphyry Cu deposits in arcs worldwide. Recent studies of Mount Rainier have shown the important role that hydrothermal alteration played in development of long-traveled debris flows (lahars) and the need to better understand the distribution and origin of hydrothermally altered rocks on Mount Rainier and other active volcanoes in order to make better assessments of future volcano hazards. For example, the 5600 ybp Osceola Mudflow formed by collapse of the upper 1000+ m and north side of Mount Rainier that was weakened by hydrothermal alteration. The collapse was triggered by a small phreatic-magmatic eruption (F tephra). The resulting 3.8 km<sup>3</sup> clay-rich debris flow traveled more than 120 km downvalley into the Puget lowlands covering more than 550 km<sup>2</sup>. Clasts in the Osceola Mudflow allow study of deep, high temperature alteration underlying Mount Rainier. Mineralogy and stable isotope compositions of altered rocks in the Osceola and other Holocene debris flows from Mount Rainier are consistent with formation in several distinct alteration environments, including (1) steam-heated (opal-kaolinite-natroalunite), (2) “magmatic steam” (fumarolic) (natroalunite-natrojarosite), and (3) several assemblages of magmatic-hydrothermal alteration, including widely distributed smectite-pyrite alteration, and more restricted, higher temperature assemblages characterized by combinations of quartz, cristobalite, natroalunite/alunite, kaolinite, dickite, pyrophyllite, illite, topaz, anhydrite, and pyrite. Alteration is most intense in the core of the volcano and decreases in intensity outward to narrow zones of smectite-pyrite alteration along dikes peripheral to the central conduit. Steam-heated opal-kaolinite alteration is presently forming near the summit in post-Osceola lavas. Despite the presence of advanced argillic alteration characteristic of high-sulfidation gold-silver deposits and the upper parts of porphyry copper deposits, it is unlikely that potentially economic deposits are forming beneath Mount Rainier due to its deep magma chamber,  $\geq 8$  km, as indicated by earthquake focal depths and dissolved gas contents of melt inclusions.

Integrated studies of hydrothermal alteration on Mt. Adams, Mt. Baker, and the Lassen Peak area also are underway by the USGS to characterize active and recently active hydrothermal systems on these volcanoes and facilitate more complete assessments of volcano hazards and mineral resources in the Cascades and to better understand hydrothermal systems related to active arc volcanoes.

## Dinner Meeting Schedule — This Month Only the Meeting is at the Four Points by Sheraton, University Plaza, 1900 E. Speedway Blvd., Tucson

Cost: With reservation: Members \$20, Guest \$22, Students \$7 Without reservation \$2 additional. Please call 520-663-5295 by 5 pm before February 2. Indicate if a low-salt or vegetarian meal is required. Please cancel if you are unable to attend.

Cash Bar @ 6 pm

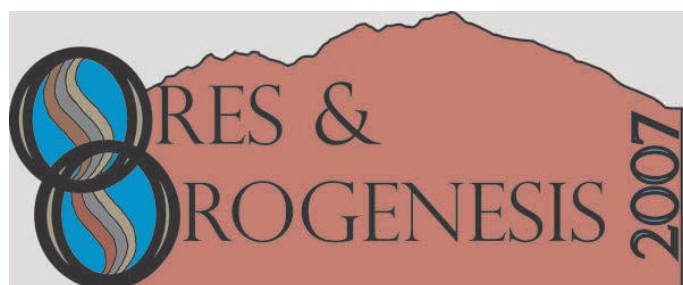
Dinner @ 7 pm

Talk @ 8 pm

## CALENDAR OF EVENTS:

- February 8 - 11, 2007  
Tucson Gem and Mineral Show  
Tucson Convention Center
- March 6: AGS Dinner Meeting – Karen Wenrich, *Arizona Breccia Pipe Uranium Deposits: The Highest Grade Uranium in the USA*
- April 3: AGS Dinner Meeting – Bob Powell, U.S. Geological Survey, *Basins and Landscapes Coevolution*
- May 1: AGS Dinner Meeting – Speaker TBA
- June 5: AGS Dinner Meeting – Speaker TBA

## Other Geoscience News



The countdown is under way for the AGS Ores & Orogenesis Symposium — 24-30 September 2007. There is still much work to be done and many committees could use help. Please get involved.

The next O&O Committee meeting is scheduled for 5:30 pm, Wednesday, February 21, at E.N.R.B, Room 335 on the UA campus.

See Page 3 for a list of pre- and post-meeting field trips. Visit the Symposium web site for an updated list of talks, posters and activities – <http://www.agssymposium.org/>.

— Mark Your Calendar —  
**THE MANY FACES OF COPPER**  
A new exhibit opening at the  
Flandrau Science Center in early February.



The Miners' Story Project will preserve and share stories about life in the mines and mining communities in the Southwest U.S. The project will collect photographs, artifacts and interviews into a vital collection that is designed to be shared. The project is looking for miners, their families and friends, to share their stories. Make a reservation, do an interview, and they will send you home with a copy on a CD. The recorded stories will live and inform generations to come.

To arrange for an interview or check trailer locations -

Phone: 1-866-40-MINER (1-866-406-4637)

Email: [info@minersstory.org](mailto:info@minersstory.org)

Address: Miners' Story Project

Flandrau Science Center

The University of Arizona

PO Box 210091

### 53<sup>rd</sup> Annual Tucson Gem and Mineral Show™ February 8 – 11, 2007

Australia – Minerals From Down Under

Tucson Convention Center  
260 S. Church Avenue  
Tucson, Arizona 85701

Thursday through Saturday, 10 am – 6 pm  
Sunday, 10 am – 5 pm

Admission: \$6.25 plus a \$.75 TCC ticket tax  
Children 14 years and under free with a paying adult.

Saturday, February 10, 2007 is "Military Appreciation Day" and all active and retired military and their dependents with military ID are admitted free of charge.

Mr. Len Cram will be the guest lecturer at the Wednesday evening TGMS Reception on February 7, 2007. At the conclusion of the lecture he will also be available to sign his new book, *A Journey with Colour, History of Queensland Opal*. Reservations will be taken starting January 2, 2007 by calling the Tucson Gem and Mineral Society at 520-471-0499. Cost is \$25.00 per person.

### Member News:

Many thanks go to Robert Clayton, our newest Molybdenum Sponsor, for his generous symposium support.

Welcome to new members Elizabeth Miksa, SW Petrographic Specialists, and Ronald L. LaPoint, retired.

We have 378 AGS members, as of mid January 2007.

**February 14, 2007**  
**Happy Valentine's Day**



# Ore & Orogenesis Symposium Field Trips

Area	Trip Focus	Leaders
Japan	Epithermal gold deposits in southern Kyushu, Japan	Yasushi Watanabe
Australia	Tectonic and metallogeny of the Ordovician Lachlan	David Cooke
Chili	Super Enrichment in Chilean Porphyry Systems	William Chavez
U.S. - Arizona	Arizona porphyry copper life cycle project	Eric Seedorff, Bob Kamilli, Mark Barton
U.S. - Arizona	Proterozoic ore deposits and structure of Arizona	Paul Lindberg & others
U.S. - Arizona/New Mexico	Leached capping and enrichment in porphyry	Spence Titley, Ralph Stegen
US- Arizona	Roots of a pluton and porphyry copper system, Pima District, Arizona	Bill Stavast
US- Arizona	Porphyry copper systems of southern Arizona	Fred Graybeal
Mexico- Sonora	Porphyry copper deposits of Sonora	Ramon Ayala
Mexico- Chihuahua	Pb-Zn deposits of Chihuahua, Mexico	Peter Megaw
Mexico- Zacatecas	Ore deposits of Zacatecas, Mexico	Peter Megaw
US- Nevada	Gold deposits and tectonics of Nevada	Geologic Society of Nevada
US/Mexico	Gold deposits of Sonora, Mexico and western Arizona	TBA
Canada - Yukon, BC	A transect through the accreted terranes of the northern Canadian Cordillera	Maurice Colpron, JoAnne Nelson, Steve Israe
US/Mexico	Middle Jurassic arc to Late Jurassic-Early Cretaceous rift assemblages of the SW Cordillera	Tim Lawton & others
Mexico- Sonora	Miocene structural and magmatic history, southern Basin and Range extensional province, Sonora, Mexico	Phil Gans, Ian MacMillan, Martin Wong
US - Arizona	Constraints on global reconstruction from the Arizona paleoproterozoic and a process-oriented examination of heterogeneity and rheology of the 5-15 km deep middle crust	Ernest Duebendorfer, Karl Karlstrom, Kevin Chamberlain, Michael Williams
US - Arizona	Structural geology of the Santa Catalina metamorphic core complex, Arizona	Jon Spencer
US - Arizona	Geology and remediation at the San Manuel Mine, Arizona	Cori Hoag
US - Arizona, California	Assembly and emplacement of plutons: perspectives from the Colorado River corridor, White-Inyo Mountains, and Sierra Nevada	John Bartley, Drew Coleman, Allen Glazner, Calvin Milelr
US - Arizona	Laramide deformation, calderas, and porphyry copper mineralization in the northern Santa Rita Mountains	Charles Ferguson, Brad Johnson



ARIZONA GEOLOGICAL

P.O. Box 40952  
Tucson, AZ 85717-0952

Phone: 520-663-5295  
www.arizonageologicalsoc.org

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For information on ordering AGS  
publications, visit  
www.arizonageologicalsoc.org.

AGS books and maps are also sold at the dinner  
meeting and by the  
Arizona Geological Survey.



*Current membership stands at 378. As always, please keep us up-to-date as you move, change jobs, or email addresses. Thanks to all our wonderful Membership Directory Sponsors for a great directory.*

## 2007 AGS MEMBERSHIP APPLICATION OR RENEWAL FORM

Please mail check with membership form to: Arizona Geological Society, P.O. Box 40952, Tucson, AZ 85717  
Dues (circle one): 1 year: \$15; 2 years: \$30; 3 years: \$45; full-time student: (membership is free but form must be returned)

Name: \_\_\_\_\_

Position: \_\_\_\_\_

Company: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

Street

City

State

Zip Code

Work Phone: \_\_\_\_\_ Home Phone: \_\_\_\_\_

Fax Number: \_\_\_\_\_ Cellular Phone: \_\_\_\_\_

E-Mail: \_\_\_\_\_

Please send the newsletter by E-mail only  by regular mail only  by E-mail AND regular mail

If registered geologist or engineer, indicate registration number and state: \_\_\_\_\_

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

Enclosed is a \_\_\_\_\_ tax-deductible contribution for the 2007 AGS Symposium.