



# AGS NEWSLETTER

ARIZONA GEOLOGICAL SOCIETY, INC., AUGUST 2007

## DINNER MEETING, AUGUST 7, 2007

Mike Timmons

New Mexico Bureau of Geology and Mineral Resources

*Late Proterozoic intracratonic deformation and basin formation in southwestern Laurentia: insights from the Grand Canyon Supergroup*

### ABSTRACT –

Our understanding of the geologic history of the Grand Canyon Supergroup begins with John Wesley Powell's historic 19th century river expeditions to the Grand Canyon Region. His observations about the geology of the Supergroup, while not well constrained in geologic time, reflect a good understanding of the relative order of events and the general geologic processes that produced the preserved rock record. The Grand Canyon Supergroup, he recognized, 'rests unconformably upon the crystalline schists' and marks a fundamental break in the rock record. Even without knowledge about the duration of time separating basement metamorphic rocks from Supergroup rocks, Powell did understand that this 'Great Unconformity' was widespread across the southwestern U.S. and marks a unique time in geologic history. Generations of geologists followed Powell to the depths of Grand Canyon to better understand the geology of the West and the Grand Canyon Supergroup's unique and rich record. This presentation will exhibit the latest understanding of the sedimentary and tectonic record preserved within the Grand Canyon Supergroup.

The Grand Canyon Supergroup records at least two distinct periods of intracratonic deformation and sedimentation in

ABSTRACT, continued on page 2

## CALENDAR OF EVENTS

- September 4: AGS Dinner Meeting – Keith Long, U.S. Geological Survey, *Life-Cycle of a Technological System: The Inspiration Copper Mine, Miami, AZ*
- September 24-30: Ores & Orogenesis: Circum-Pacific Tectonics, Geologic Evolution, and Ore Deposits – A Symposium Honoring the Career of William R. Dickinson.
- October 2: NO Dinner Meeting
- November 6: AGS Dinner Meeting – Ralph Stegan, Phelps-Dodge, *Climax or Cerro Verde*
- December 4: AGS Dinner Meeting – Lee Allison, Arizona Geological Survey, *Intelligent Design and the Attack on Science*
- January 6, 2008: AGS Dinner Meeting – Eric Force, U.S. Geological Survey, *Chaco Canyon*
- February 5, 2008: AGS Dinner Meeting – Alyson Thibodeau, University of Arizona, *The Strange Case of the Earliest Extraction of Silver by European Colonists in the New World*
- March 4, 2008: AGS Dinner Meeting – Mark Barton, University of Arizona, *Iron Oxide Copper Gold Deposits: A Cordilleran Perspective*

## Dinner Meeting Schedule — Inn Suites, 475 North Granada, Tucson

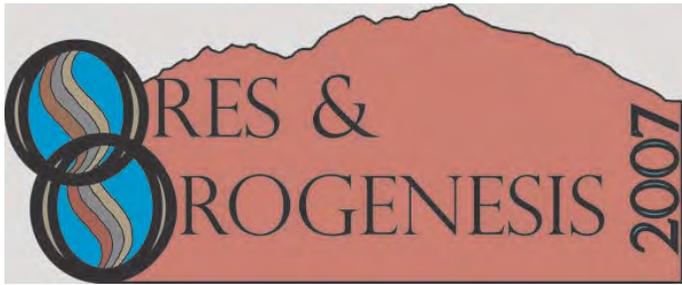
To reserve your place for dinner, call 520-663-5295 before 5 pm, Friday, August 31, 2007. PLEASE cancel if you are unable to attend. For dinner selection, indicate if a low-salt or vegetarian meal is required.

Cost: With reservation: Members \$24, Guests \$26, Students \$10. Without a reservation, \$3 additional.

Cash Bar @ 6 pm

Dinner @ 7 pm

Talk @ 8 pm



Ores and Orogenesis: Circum-Pacific Tectonics,  
Geologic Evolution, and Ore Deposits -  
A symposium in honor of William R. Dickinson  
Tucson, Arizona, 24-30 September, 2007

### FEE WAIVER

The Ores & Orogenesis Symposium is offering two field trips for which the conference fee will be waived (to fill the last few spots) if you are interested in attending one of these trips only. The field trips are:

**(1) Orogenic models for the Paleoproterozoic of the southwestern US: Implications for global reconstructions**

Leaders: Ernest Duebendorfer, Karl Karlstrom, Kevin Chamberlain, Michael Williams

Date: Sun., Sept. 23 through Tues., Sept. 25, 2007

Starting & Return Location: Tucson, Arizona



Field photographs from the Cerbat Mountains, northwestern Arizona, Paleoproterozoic Mojave crustal province. Clockwise from upper left: (a) View looking NE at F2 folds (Yavapai orogeny) transposing originally subhorizontal S1 fabric; (b) Typical view of anatectic migmatites formed at 750°C and 6 kbar; (c) Melt-filled shear band showing oblique, dextral-reverse sense motion associated with D2 (Yavapai orogeny). Horizontal view; reverse-sense component present, but not evident in this view; (d) Refolded fold. Pencil points to F1 fold hinge. F1 axial surface is folded into mesoscopic F2 upright folds. Regionally, F1 folds are recumbent; F2 folds are upright.

ABSTRACT, continued from page 1

the late Mesoproterozoic and Neoproterozoic. New age determinations indicate that the Mesoproterozoic Unkar Group was deposited between ca. 1254 and 1104 Ma. New U/Pb ages indicate that the Chuar Group was deposited nearly 300 million years later, between about 800 and 742 Ma.

The Unkar Group is one of the best-preserved remnants of Mesoproterozoic sedimentary rocks in the southwestern United States. It provides an exceptional record of intracratonic basin formation and associated tectonics kinematically compatible with protracted "Grenville-age" NW-directed shortening. Abrupt thickness and facies changes and paleoseismites within the lower Unkar Group indicate syn-sedimentary deformation associated with Precambrian-age NE-striking monoclinial flexures suggesting NW-directed contraction during early Unkar time. A second style of Unkar Group deformation involved the development of half grabens and full grabens that record later NE-SW extension on NW-striking, high-angle normal faults. The two tectonic phases

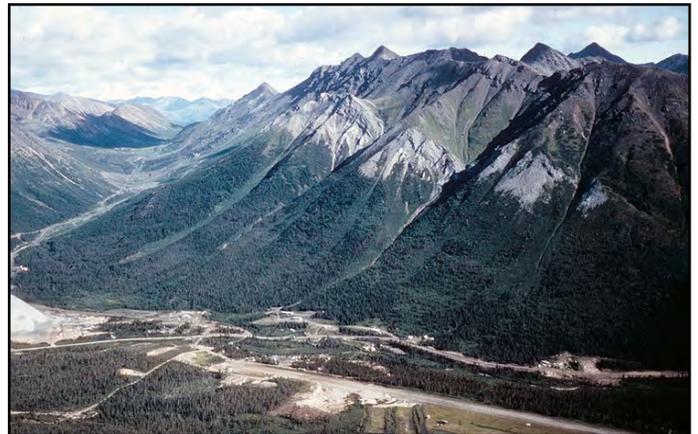
ABSTRACT, continued on page 3

**(2) A transect through the accreted terranes of the northern Canadian Cordillera**

Leaders: Maurice Colpron (Yukon Geological Survey), JoAnne Nelson (British Columbia Geological Survey), and Steve Israel (Yukon Geological Survey)

Date: Wed., Sept. 19 through Mon., Sept. 24, 2007

Starting & Return Location: Whitehorse, Yukon, Canada



A view of the Sylvester allochthon (Slide Mountain terrane) on top of North American carbonates and shales (Cassiar terrane) near Cassiar, B.C., the start of the transect.

### O&O Field Trip Contact Information

Contact [organizers@agssymposium.org](mailto:organizers@agssymposium.org) for instructions on how to register for one of these field trips. The field-trip-registration deadline is fast approaching. Please sign up if you are interested.

# Other Geoscience News

## **B** LOGGING

Lee Allison, State Geologist of Arizona, is to be congratulated for creating a very impressive and informative blog site — Arizona Geology. The blog is dedicated to happenings in Arizona Geology and to geology in general as it may pertain to Arizona and Arizona geologists.

Started in mid 2006, Dr. Allison presents information and commentary on a variety of subject and provides a space for reader comments. Archives go back to January 2007 (54 blogs) and he provides links to other interesting professional-geology and geology-blog sites. Dr. Allison keeps the site current. Already he has posted five blogs since July 1. Bookmark the site and visit it often: <http://arizonageology.blogspot.com/>.

ABSTRACT, continued from page 2

affecting the Unkar Group provide new insight into tectonics of southern Laurentia: (1) Laramide-style (monoclines) deformation in the continental interior at about 1250 Ma records Grenville-age shortening and (2) 1.1 Ga detrital muscovite (Ar/Ar) and zircon (U/Pb) indicate an Unkar Group source area in the Grenville highlands during development of NW-striking extensional basins. We conclude that far-field stresses related to Grenville orogenesis (NW shortening and orthogonal NE-SW extension) dominated the sedimentary and tectonic regime of southwestern Laurentia from 1.25 to 1.1 Ga.

The Neoproterozoic Chuar Group (~800-742 Ma) was deposited during east-west extension of the continental interior resulting in normal slip across the N-S striking Butte fault system. The Chuar Group is bounded on the east by the Butte fault and is gently folded into the Chuar syncline. The

## **M**ember News:

Welcome to new AGS members

Laura Davis, Haley & Aldrich, Inc.  
E. Joan Hardaway, Retired Geologist  
Jennifer McNeil, Epic Premier Insurance Solutions  
Erik Wright, Hydrogeophysics, Inc.  
Dennis Dalton, Tombstone Exploration & Mining

Thanks to our newest O&O sponsors for their generous symposium support:

**Coeur d'Alene Mines Corporation — Silver**  
**Montgomery and Associates — Silver**  
**Goldfields Exploration, Inc. — Copper**  
**SWCA Environmental Consultants — Copper**

Chuar syncline is truncated by the Tapeats Sandstone indicating that it is Precambrian in age. Sedimentary studies and geologic mapping suggest that the asymmetric Chuar syncline is a growth feature that was forming during normal sense slip along the Butte fault. Thickness variations of sedimentary facies and abrupt thickness changes indicate that the Chuar syncline and Butte fault system were syn-sedimentary and record intracratonic deformation related to incipient continental rifting. This deformational and sedimentary record is interpreted to represent an intracratonic response to the initiation of the Cordilleran rift margin and ultimate breakup of the Rodinian Supercontinent in the Late Neoproterozoic. The extent of Late Precambrian extensional deformation can be inferred by the inversion of old normal faults by Laramide-age monoclines, suggesting much of the Colorado Plateau country may preserve the scars of failed ancient continental rifting.

### *FREE USGS MAPS NOW AVAILABLE ON THE WEB*

The USGS now has a location on their website where you can download over 60,000 1:24,000 and 1:100,000 scale topographic maps. These are PDF documents that you can view with Adobe Reader. With a large format plotter you can print them at full scale. Go to <http://store.usgs.gov>. When you arrive at the site click the image that says "Map Locator & Downloader."

You can enter a location or NAVIGATE and zoom around the US until you arrive at your destination. When you have your place, you can switch to MARK POINTS and click to mark it. The marker then shows the relevant map(s) and presents an option to purchase or download the map. The quality of the download is very good.

GeoPDF Toolbar is required to view geospatial data in Adobe Reader. It is a free download and if it is not a plug-in you have, the USGS site will take you to the site where it can be downloaded.



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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 389. As always, please keep us up-to-date as you move, change jobs, or change your e-mail address. This is especially important now as a new Membership Directory is in the works.*

## 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: \$40. Full-time students receive free membership (E-mail only). However, a membership application form must be returned to AGS annually to remain on the membership list.

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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.