



# Arizona Geological Society Newsletter

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OCTOBER 2014

## October 7, 2014 DINNER MEETING

**Who:** Harrison H. Schmitt will speak about “A Geological Visit to a Valley on the Moon”.

**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 online reservation (\$10 without).

**RESERVATIONS ARE REQUIRED:** CALL (520) 663-5295 or reserve on the AGS website ([www.arizonageologicalsoc.org](http://www.arizonageologicalsoc.org)) by 11 a.m. by Friday, October 3rd. Please indicate regular (Grilled Fish Tacos), vegetarian, or Cobb salad meal preference. Please cancel by Friday, October 3rd at 11 a.m. if you are unable to attend—no shows and late cancellations will be invoiced.

**The October dinner meeting is sponsored by Clear Creek Associates**



**AGS is grateful for Clear Creek Associates' sponsorship, which helps us to offset dinner meeting costs**

## Abstract

### A Geological Visit to a Valley on the Moon

by Harrison H. Schmitt

In December 1972, the Apollo 17 Mission became the most recent field trip to the Moon by human explorers. This 13-day adventure in space took geologist Harrison Schmitt to the Valley of Taurus-Littrow in the southeastern rim of the 740 km. diameter basin filled by Mare Serenitatis. After 72 hours on the lunar surface, including 22 hours outside the lunar module *Challenger*, the astronauts returned over 250 pounds of samples to Earth.

A number of new insights into the geology of the valley of Taurus-Littrow and surrounding regions of the Moon have resulted from recent synthesis and integration of transmitted field notes, field recollections, and

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**ABSTRACT - Continued from Page 1**

photo-documentation with over forty years of data from sample analysis and geophysical measurements.

Proximity to the Earth, lack of atmosphere, gravity only one-sixth that of the Earth, planetary position as the smallest of the terrestrial planets, and potential life-sustaining resources almost certainly assure a role for the Moon in future lunar activities in support of human exploration, utilization, and settlement of space. The Moon can be considered as a stepping stone towards Mars and beyond and also as the low cost supply depot for deep space exploration and settlement. The first milestone in such an approach would be the development of helium-3 fusion power fueled by lunar helium-3.

**About the October Dinner Speaker**

Harrison Hagan Schmitt, a native of Silver City, NM, has the diverse experience of a geologist, pilot, astronaut, administrator, businessman, writer, and U. S. Senator. Schmitt received his B. S. from Caltech, studied as a Fulbright Scholar at Oslo, and attended graduate school at Harvard. Geological field studies in Norway formed the basis of his Ph.D. in 1964. As a civilian, Schmitt received Air Force jet pilot wings in 1965 and Navy helicopter wings in 1967, logging more than 2100 hours of flying time.

Selected for the Scientist-Astronaut program in 1965, Schmitt organized the lunar science training for the Apollo Astronauts, represented the crews during the development of hardware and procedures for lunar surface exploration, and oversaw the final preparation of the Apollo 11 Lunar Module Descent Stage. He served as Mission Scientist in support of the Apollo 11 mission. After training as back-up Lunar Module Pilot for Apollo 15, Schmitt flew in space as Lunar Module Pilot for Apollo 17 - the last Apollo mission to the moon. On December 11, 1972, he landed in the Valley of Taurus-Littrow as the only scientist and the last of 12 men to step on the Moon.

In 1975, after two years managing NASA's Energy Program Office, Schmitt fulfilled a long-standing personal commitment by entering politics. Elected in 1976, he served a six-year term in the U.S. Senate beginning in 1977. Harrison Schmitt became Chairman of the NASA Advisory Council in November 2005, and served until October 2008. He also consults, speaks, and writes on policy and constitutional issues of the future, the science of the Moon and Planets, history of space flight and geology, space exploration, space law, climate change, and the American Southwest. He presently is Honorary Associate Professor of Engineering, University of Wisconsin-Madison, teaching "Resources from Space." He is on the staff of the Institute for Human and Machine Cognition of Pensacola, Florida. Current board memberships include Orbital Sciences Corporation (lead director) and Edenspace Systems Corporation. In 1997, Schmitt co-founded and became Chairman of Interlune-Intermars Initiative, Inc., advancing the private sector's acquisition of lunar resources and Helium-3 fusion power and clinical use of medical isotopes produced by fusion-related processes. He is the author of, "Return to the Moon" (2006 Springer-Praxis) that describes a private enterprise approach to providing lunar helium-3 fusion energy resources for use on Earth. Schmitt's essays on the Constitution are collected on the "Americas Uncommon Sense" web site <http://americasuncommonsense.com>.

**NOTE:** Copies of Harrison Schmitt's book, "Return to the Moon" with a forward by Neil Armstrong will be for sale at this dinner meeting for \$25. Senator Schmitt will autograph any books purchased.



## In Memoriam

**Kim S. Wilson**

**1953-2014**

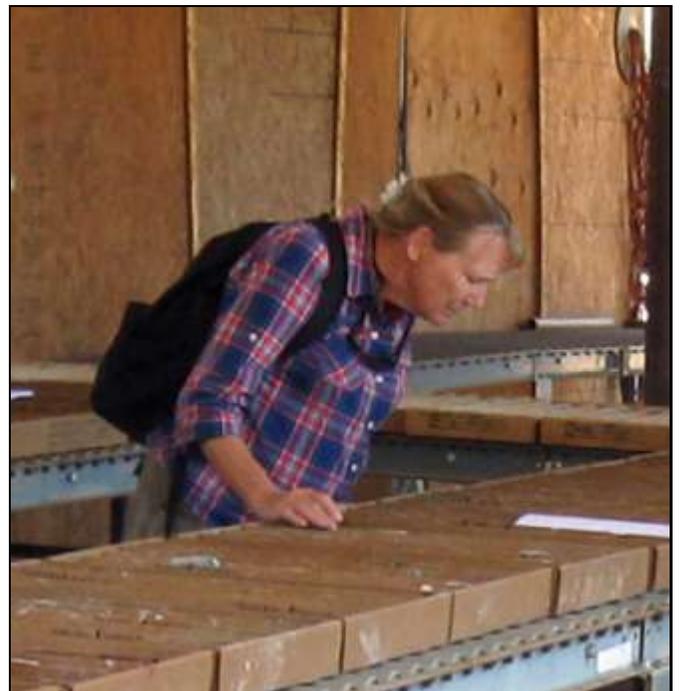
AGS President, Kim Wilson passed away on September 17, 2014 due to illness. Kim served as AGS Vice Treasurer in 2013 and as a Councilor in 2012. She received a Masters degree in Geosciences from the University of Arizona in 1984 and had a successful consulting practice. Since 2010 she worked for Silver Bell Mining, logging core and supervising other geologists in support of Silver Bell's resource evaluation program.

Kim was a talented equestrian, who competed in dressage. She loved her horses and old Fords. She is survived by her husband, Jim Norris, who is also a geologist, her father, and numerous friends and associates, who appreciated Kim's quiet but effective management and communication style.

Kim was very honored to be President of the AGS, and she took the position very seriously. As president, she listened carefully and spoke thoughtfully. She stayed active behind the scenes until shortly before her death.

AGS wishes to convey our condolences to Kim's family, friends, and co-workers. AGS will also feel the loss of this fine geologist, who gave so much to our Society.

Photo Credit: Photos of Kim were taken by Bill Peachey at the AGS field trip to Rosemont in September 2012.



## Announcement

With Kim's passing, the AGS Executive Committee passed a motion for the 2015 President-Elect, Michael Conway to fill the remainder of Kim's term as president. 2015 Treasurer-Elect, Alison Jones will fill the remainder of Mike Conway's term as Treasurer.

## November 2014 Dinner Meeting

The Arizona Geological Society invites everyone to its November 4, 2014 dinner meeting, where Isabel Fay Barton, of the University of Arizona, will present “Ores in synorogenic veins in the Central African Copperbelt: Remobilization or addition?” This event will be held at the Sheraton Phoenix Airport Hotel, located at 1600 South 52nd Street in Tempe, Arizona.

Since we will not have a meeting in Tucson in November, we are currently working to organize car pools to make it more convenient for our Tucson members to attend this event. Anyone who might be interested in driving to Phoenix for this meeting, contact David Briggs at [secretary@arizonageologicalsoc.org](mailto:secretary@arizonageologicalsoc.org).

### How Long Have You been a Member of the Arizona Geological Society?

The AGS is looking to recognize members in good standing, who have maintained continuous membership in the Society for 50 years or more.

## AGS Member Directory is in the Mail!

You should be receiving your 2014 Member Directory very soon. Owing to the generous support of the 24 advertisers listed below, the production costs were completely offset with the proceeds going to support our student members. Please let our advertisers know you appreciate their support. Thanks also to those who submitted photos and to David Briggs, Secretary for his assistance in preparing the member list. Please keep us posted if you have a change in contact info so the Directories are up-to-date. Cori Hoag, AGS Directory Coordinator

ALS Global	hydroGEOPHYSICS
Archaeological Consulting Services	Independent Mining Consultants
Baroid Industrial Drilling Products	Major Drilling
Boart Longyear Company	Mintec, Inc.
Cascade Drilling	National EWP
Clear Creek Associates	Hudbay Rosemont Project
Copper Triangle	Ruen Drilling
Errol L. Montgomery & Associates	Skyline Assayers & Laboratories
Fine Mineral Shows	Southwest Exploration Services
Geosystems Analysis	SRK Consulting
Geotemps	Tonatec Exploration, LLC
Golder Associates, Inc.	Yellow Jacket Drilling Services

**Arizona Geological Society Fieldtrip – Fall 2014**  
**Debris flows shape the Sabino Canyon landscape – look out below!**  
**Ann Youberg and Phil Pearthree**  
**Arizona Geological Survey – Environmental Geology Section**

Saturday, November 15, 2014

In July, 2006, southern Arizona experienced a rare five day series of storms generated from monsoonal moisture mixing with a persistent low-pressure system centered over northwestern New Mexico. These increasingly wet storms culminated on July 31, 2006, with floods of record levels occurred on several larger drainages, and triggered numerous debris flows in the Santa Catalina Mountains and elsewhere in southeastern Arizona mountain ranges. Over 500 failures occurred on steep slopes in the Santa Catalina Mountains alone. These slope failures coalesced into large debris flows in five canyons along the range front. These debris flows did a remarkable amount of geomorphic



work in a very short time, eroding hill slopes and channels and transporting very coarse sediment that garden-variety 100-year floods likely will not move. On this field trip to Sabino Canyon, we will consider the mechanisms responsible for triggering debris flows, the damage they can do, how frequently they may occur, and the importance of these extreme events in shaping the mountain landscapes of Arizona.

Numerous debris flows occurred in Sabino Canyon, and damage to U.S. Forest Service facilities there was extensive. The tram road was blocked by debris in at least 6 different places, the bridge across Rattlesnake Creek was plugged by boulders and the approach was washed away, and facilities at tram stops 8 and 9 were nearly obliterated. The canyon was temporarily closed due to road damage, and millions of dollars were spent to rebuild the tram road and related facilities. Although the road and facilities were repaired by the end of 2008, there is still plenty of evidence of the impact of the 2006 debris flows on the landscape and human structures and infrastructure. We plan to



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## Fall Field Trip - Continued from Page 4

use the Sabino Canyon Shuttle to access several sites where large debris flows impacted the road or facilities. We will make short excursions away from the road to investigate relatively undisturbed debris flow deposits.

Debris flows are slurries of sediment and water that move rapidly down channels. Sediment in debris flows are typically very poorly sorted, ranging from clay-size particles to very large boulders if they are available. The finer particles, clay, silt and sand, form a dense matrix that can support and transport large boulders, making these flows very destructive due to impacts of large transported material or burial of existing infrastructure. Debris flows can be initiated when pore pressures in soils on steep slopes reach a threshold and fail, often due to intense or prolonged rainfall. This was the situation in the 2006 debris flows. Alternatively, debris flows can be generated by intense runoff from steep watersheds on slopes that have been denuded by fire. Debris flows have occurred after all of the large wildfires in Arizona that have occurred in the past few decades. As debris flows move downslope they deposit boulder levees that keep the flow confined and moving forward. Debris flows often have a bouldery snout at the front, followed by the main body of liquefied debris, and a tail, or recessional flow, which is a sediment-charged flood. We will see examples of these features at each of our field trip stops. Debris flows commonly terminate where either slopes decrease substantially or lateral confinement decreases, or both. In the case of the large debris flows in the Catalinas, they either terminated along larger, more gently sloping channels (as we will see in Sabino Creek) or where the channels leave the mountains and lateral confinement diminishes (for example, Solder Creek where the Catalina Highway begins its ascent into the mountains).

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### Logistics:

- Day / Date      Saturday, November 15, 2014
- Time             8:40 a.m. for 9:00 a.m. start
- Location        5900 N Sabino Canyon Rd, Catalina Foothills, AZ  
                      Meet at the Sabino Canyon Visitor Center patio;
- Expenses       \$5.00 parking / \$8.00 Tram ticket
- Fieldtrip Guide provided by the Arizona Geological Survey
- Bring water, snack, and appropriate footwear for moderate hiking – most of our walking is on the tram road.
- Return via the tram or down the Telephone Line Trail, about a 3-mile walk.

Field trip: We'll catch the 9:00 a.m. tram and take it to Rattlesnake Wash. Here and elsewhere along the tram road, we'll investigate debris flow deposits that formed in 2006. The final stops will be at the top or NE end of the Tram Road, elevation approximately 3,300 feet.

## Announcement from the Institute for Mineral Resources

Dave Lowell has written a book, which the UA Press has just published. It's available at <http://www.uapress.arizona.edu/Books/bid2494.htm> and in the UA bookstore, where the IMR is planning a book signing on Nov. 7.

The Lacy Lecture is also Nov. 7, at 5 PM in Aries Auditorium (College of Law, at the corner of Speedway and Mountain). The speaker is Goldcorp CEO Charles Jeannes. Everyone is welcome to attend.

## 2014 STUDENT SCHOLARSHIP ANNOUNCEMENT

The Arizona Geological Society is offering two scholarships in 2014. The J. Harold Courtright Scholarship is intended for graduate students undertaking field-oriented studies related to ore deposits in the North or South American Cordillera. The Arizona Geological Society Scholarship is intended to recognize geoscience undergraduate or graduate students, who show a balance between academic achievement and participation in research and who demonstrate leadership ability in those areas or within a broader community. Scholarship awards of as much as \$3,000 are intended to help cover expenses for earth sciences studies at any of the Arizona universities. Applications and letters of support are due by Friday, October 24, 2014. Announcements, requirements, and application forms for the scholarships are now available online at <http://www.arizonageologicalsoc.org/page-1692015>.

## Arizona Geological Survey News Brief



[Arizona Mining Review](#) e-Video Magazine – 24 September 2014

The Changing Geoscience Workforce – what does the future hold? With the American Geosciences Institute's Chris Keane (Communications Director)  
The latest in Arizona mining with Nyal Niemuth

Arizona Mining Review - The September episode will be broadcast at 10:00 am MST on LiveStream (<http://new.livestream.com/accounts/2496466/azminingreview>). Immediately thereafter, it will be available on our [AZGS YouTube Channel](#), along with episodes from January 2013 through August 2014.

### New Publications

Cave, S.R., 2014, Geologic Map of the Sentinel-Arlington Volcanic Field, Maricopa and Yuma Counties, Arizona. Arizona Geological Survey Contributed Map CM-14-A, 1:100,000 map scale, 11 p. [http://repository.azgs.az.gov/uri\\_gin/azgs/dlio/1587](http://repository.azgs.az.gov/uri_gin/azgs/dlio/1587)

Conway, M. and Davis, R, (eds.) Arizona Geological Survey Annual Review – 2013, AZGS Open-file Report OFR-14-01. [http://repository.azgs.az.gov/uri\\_gin/azgs/dlio/1585](http://repository.azgs.az.gov/uri_gin/azgs/dlio/1585)

Spencer, J.E. et al., Geologic map of the Bouse and Ibex Peak 7.5' Quadrangle, La Paz County, Arizona, AZGS DGM-107, 1:24,000 scale. [http://repository.azgs.az.gov/uri\\_gin/azgs/dlio/1586](http://repository.azgs.az.gov/uri_gin/azgs/dlio/1586)

### AZGS Backpages

AZGS staff geologists made presentations at the AIPG-AHS Annual Meeting in Prescott on the week of 15 September. Phil Pearthree, Joe Cook and Mike Conway are presenting at the Assn of Environmental and Engineering Geologists (AEG) in Scottsdale on the week of 22 Sept.

## ANNOUNCEMENTS

### Welcome New AGS Members

Eric Brown	Sergio Gelcich	Sean O'Neal
Michael Doe	Nathanial Hendler	Daniel Portner
Chloe Fandel	Gloria Jimenez	Vishnu Reddy
Daniel Favorito	Carl Job	Alexander Schauss
John Fleming	Pilar Lecumberri-Sanchez	Eckart Spalding
Edith Fuentes	Amy-Jo Miles	Thomas Watkins

**Arizona Geological Society is grateful to Freeport-McMoRan Copper and Gold for their generous support of our student members!**



**Freeport-McMoRan is sponsoring student dinners for the 2014 AGS monthly meetings.**

### 2014 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 Scholarship Fund.