



Arizona Geological Society Newsletter

NOVEMBER 2011

November 1, 2011 DINNER MEETING

Gordon B. Haxel will be our featured speaker. See abstract below.

Where: Sheraton Four Points Hotel, Wild Cat Room, 1900 E. Speedway Blvd. in Tucson
When: Cash Bar at 6 p.m.—Dinner at 7 p.m.—Talk at 8 p.m.
Cost: With reservation, members \$24, guests \$27, Students \$10 (students FREE with online reservation).
Without a reservation, a \$3 surcharge will be added (if the hotel is able to accommodate you).

RESERVATIONS: CALL 520.663.5295 by 5 p.m. on October 28, 2011.

Please indicate low-salt, vegetarian, or vegan meal preferences. A coffee/salad/roll/dessert option is also available for \$18.

Please cancel if you are unable to attend. The hotel cannot guarantee that meals will be available without a timely reservation.

ABSTRACT

The country west of Tucson: A geological retrospective

Gordon B. Haxel, U.S. Geological Survey, Flagstaff, AZ

From 1976 through the early 1980s, I was fortunate to be a member of the team of geologists who undertook the first systematic geologic mapping of the Tohono O'odham Indian Nation (TOIN; then Papago Indian Reservation) west of Tucson. The geology of the northern one-third of the TOIN, the area of the Slate and Vekol Mountains, is that of classic southeast Arizona—Pinal Schist, 1.4-Ga granite, Apache Group and associated diabase, Paleozoic strata (Bolsa–Naco), Laramide granite and related porphyry copper deposits. Moving southward into the heart of the TOIN, the geology became progressively less familiar. Geologic mapping of the Comobabi, Quijotoa, and Santa Rosa Mountains and Gu Achi area, completed in 1977, revealed several unexpected and intriguing new rock units, structures, and tectonic patterns. Unfortunately, ages of these features and their relations to larger aspects of southern Arizona geology and tectonics remained uncertain or unknown.

In 1978 the project entered a second phase, marked by initiation of U-Pb geochronologic studies and by geologic mapping of the 80-km-long Baboquivari Mountains. U-Pb ages showed that most of the “new” rock units in the southern TOIN are Middle to Late Jurassic. The Baboquivari Mountains proved a sort of geologic Rosetta Stone—mapping of this range clarified or solved most of the mysteries posed by the ranges mapped earlier. When completed, circa 1982, our mapping and geochronology showed that the southern two-thirds of the TOIN (plus the adjacent area farther south in northernmost Sonora) constitutes a distinctive region, the Papago domain. This domain is strongly dominated by Jurassic rocks, to the virtual exclusion of older or younger units (with the exception of widespread early Tertiary peraluminous leucogranites). These results were corroborated by the concurrent, independent work of Tom Anderson (University of Pittsburgh) and colleagues in Sonora.

Jurassic plutonic and supracrustal rocks in the southern TOIN record two magmatic and tectonic episodes or phases: (1) a Middle Jurassic magmatic arc phase, represented by the 170-Ma volcanic and sedimentary Topawa Group (GSA Special Paper 393, p. 329) and by the 165–159-Ma Kitt Peak Plutonic Suite (AGS Digest 22, p. 497); and (2) a Late Jurassic, post-arc, extensional phase, represented by volcanic, hypabyssal, and epizonal plutonic rocks of the Ko Vaya Suite

Abstract continued on Page 2

(AGS Digest 22, p. 333). The arc-phase units make up most of the Baboquivari Mountains; the Ko Vaya Suite crops out chiefly in the Comobabi and Quijotoa Mountains. The Ko Vaya Suite includes distinctive alkaline rock types that are rare in Arizona: quartz syenite and perthite granite.

I will conclude my presentation by illustrating some little-known alteration features associated with the Ko Vaya Suite, including a giant hematite vein and widespread epidotization of both Middle and Late Jurassic volcanic and sedimentary rocks.

About the Speaker

Gordon Haxel is Scientist Emeritus with the U.S. Geological Survey in Flagstaff. He retired in 2008 after 32 years with the USGS as Research Geologist and Geochemist. His general interests are geologic mapping, regional geology and metallogeny, igneous petrology, and elemental geochemistry. His past and present projects and publications include Laramide orogenesis in south-central Arizona, petrology and tectonic setting of the Jurassic arc segment extending across the Sonora and Mojave Deserts, subducted terranes and adjacent rocks in southeast California and southwest Arizona, the threatened desert tortoise, REE resources, alkaline igneous rocks associated with the Mountain Pass REE deposit, and global production of the chemical elements (the subject of his previous AGS talk). His latest publication concerns the distribution of the Gila monster in southeast California. Gordon received B.S. and M.S. degrees in Electrical Engineering from the University of Illinois, and the Ph.D. in Geology from the University of California, Santa Barbara. He has been a member of the Arizona Geological Society since he began mapping in the state in 1976.

If your company is interested in sponsoring an AGS dinner meeting, contact Ann Pattison, AGS VP of Marketing.

FIELD TRIP—November 10-13, 2011 — Origin of the Salton Sea

VP of Field Trips, Doug Shakel, has been very busy organizing a trip to the Salton Sea and environs. Please check the AGS website for more details and to sign up. You don't want to miss this one!

NOW AVAILABLE THROUGH AGS!!!

Thanks to the University of Arizona Press, we are able to make the following volumes available to AGS members at a substantial discount *while supplies last*:

"Geology and Mineral Resources of the Santa Catalina Mountains, Southeastern Arizona: A Cross-Sectional Approach" by Eric R. Force with sections by Daniel M. Unruh and Robert J. Kamilli (1997)

Original price: \$49.50 AGS price: \$25.00

"Geology of Pluton-related Gold Mineralization at Battle Mountain, Nevada" by Ted G. Theodore (2000)

Original price: \$71.00 AGS price: \$35

These books will be available for purchase at the monthly AGS dinner meetings, beginning on Tuesday, November 1, 2011.

Field Trip Report: Earth Fissures in Cochise County By Doug Shakel

If an on-time departure is a good omen, the AGS field trip to examine earth fissures in Cochise County on the first of October was a great manifestation of all-around fine field-tripping on a great fall day. The first location covered in the field guide was the site of the 1972 Exxon test well southwest of the I-10 overpass at Wilmot Rd., but no stop was made. Three people joined us at Houghton Rd., including trip guide Joe Cook of the Arizona Geological Survey. The guidebook kept participants apprised of the geomorphology and road cuts for the next 38 miles until we left the freeway at Exit 318 – Dagoon Road.



Eleven miles east on Dagoon Road, where it intersects N. Cochise Stronghold Road, at the northwest corner of a mature pecan grove, we had our first encounter with a Cochise County earth fissure. No actual crack is currently visible at that site, but pavement disruptions and a slight elevation change are evident there, and the County highway department

has decided to mark the site with appropriate warning signs. This site caused considerable consternation when the fissure opened up several years ago. It extends several miles to the north beneath a coal-ash impoundment pond built and managed in conjunction with the Apache Power Plant of the Arizona Electric Power Cooperative (AEPCO).

A mile or so north of the pecan grove site, Joe Cook took us to an abandoned water well site that shows spectacular evidence of some 2½ feet of ground subsidence since the well was constructed, most likely in the 1940's to 1950's. A pebble dropped into the well was heard to splash water after 8 seconds of downward travel!

The trip then backtracked to the pecan grove, and then went east until Dagoon Rd. met US 191, where we turned south for a number of miles. We passed the site at Van Ness Road where mysterious cracks appeared in the road over the summer of this year. But the cracks are now filled and there was nothing to see other than a dirt road and a street sign.

(Continued on page 4)

Earth Fissures Field Trip—continued from Page 3



It took 8 seconds for a dropped pebble to make water splash in this well!

Farther south at Birch Road, we headed east to the Sulphur Hills area and after a few more turns at section line corners we came to our primary stop on E. Parker Ranch Road. There, most of the trip participants joined trip leader Joe Cook on a mile or so traverse through the desert scrub of an abandoned field along a fine and spectacular earth fissure that has been featured in Arizona Geological Survey publications of the past year or so.

Some ate early, some deferred until most of the hike was over, but everyone seemed to enjoy the outing and were impressed by the fissure they followed.



After the fissure traverse, Joe took us to another abandoned well site showing evidence of substantial ground subsidence.

Trip participants inspecting the main fissure south of E. Parker Ranch Rd. This fissure first opened in 2010.

After leaving the second well site, we made an unplanned stop at a very well done and fairly new historical marker along Birch Road telling of how

the Sulphur Springs Valley got its name.

(Continued on page 5)

Earth Fissures Field Trip—continued from Page 4



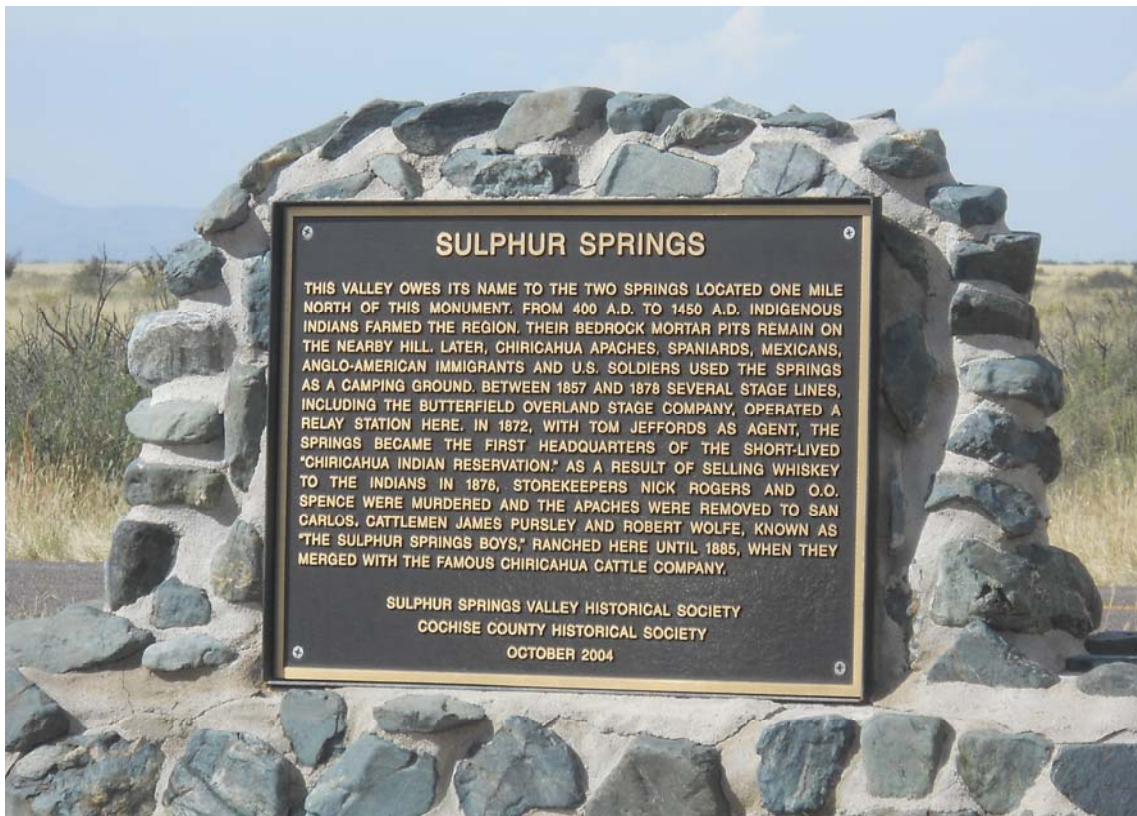
Some people are more adventurous than others in their technique for crossing an electrified fence!

We saw most of what we'd come to see by 3 p.m., and our vans headed back to Tucson into a fine, unseasonal non-monsoon rain situation of some consequence, but no great inconvenience.

Your Field Trips VP wishes to thank Joe Cook for leading a very fine field excursion, and expresses sincere gratitude to Jan Rasmussen for driving the second vehicle on this trip.

The only down-side for the trip were the several "no-shows" who made reservations but lacked the courtesy of giving sufficient notice to spare us the unnecessary expense and waste of ordering too much food for lunch. The AGS Executive Committee will have to consider instituting some kind of cost penalty for future incidents of this kind.

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Darn... I should have included this stop in the guidebook !

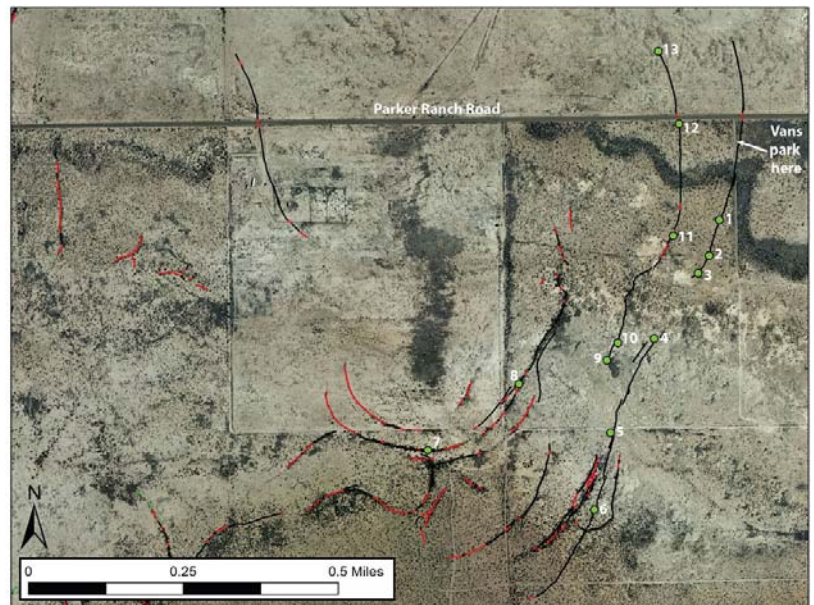
(Continued on page 6)

Earth Fissures Field Trip—continued from Page 5

At right: All were very interested in the ‘bridge’ of soil between one side of the fissure and the other. Cori Hoag dared to test it, even though there were tiny cracks on each side.



One of the participants had a smart phone that showed the Google Earth image as we traversed the mile-long and 3 to 6-foot deep crack that had opened up since the 2010 survey. The parallel, curved paths clearly outline the bedrock shoulders of the mountain blocks, in contrast to the subsided valley. The circles of irrigated farmland were more abundant where the subsidence was the most severe. The differential subsidence between the mountain blocks and the valley blocks is the obvious cause of the fissures. Luckily, the population of Cochise County is very sparse, in contrast to Maricopa County, so little structural damage occurs in the rural areas.



Thanks to AGS member Jan Rasmussen for additional text and photos for this article.

Additional copies of the field trip guidebook are available from the Society for \$30 per copy. The entire field trip guidebook is available on-line as a “.pdf” file at:

<http://rheologic.net/AGS/FissuresTripGuidebook-Complete.pdf>

Announcements

Conference: Opportunities for Alternative Energy Development in Arizona and the Southwest—Geologic/Hydrologic Considerations

Tempe, Arizona, October 27-28, 2011

Sponsored by AEG and the Arizona Land Subsidence Group

More information about the presenters/topics, sponsorship, exhibits, and registration can be found at this link:

<http://www.aegweb.org/i4a/pages/index.cfm?pageID=5464>

From the State Geologist's Blog:

The statutory authorization for the Arizona Geological Survey ends on June 30, 2012. The Arizona Legislature conducted a Sunset Review of AZGS to determine if the agency should be continued, revised, consolidated, or terminated at that time. This is standard procedure for all state agencies, commissions, and boards.



On October 17, the Arizona Legislature's Committee of Reference voted unanimously to endorse continuation of the Arizona Geological Survey for 10 years, the maximum allowed by law. The recommendation will be drafted into legislation that will be presented to the full Legislature in January 2012.

Our stakeholder community showed up in force to testify in support of continuing the Survey. They described the value of the data and reports we provide to industry, government, and academia, and the responsiveness of the Survey in meeting stakeholder needs.

Senator Jack Jackson commented that the large outpouring of support for the Survey made it easier for the Committee to come to their decision. He noted that no other agencies going through their own Sunset Reviews had this kind of public support from their constituencies.

So thanks to all of you who spoke up on behalf. And thanks to the staff of the Arizona Geological Survey for the tremendous work they do to meet the needs of Arizona and its people. We will continue to work hard to earn your respect, protect our communities from natural hazards, and pursue wise development of our resources for economic growth.

In order to encourage interaction between students and working professionals, **BHP Billiton** is proud to sponsor student dinners at monthly Arizona Geological Society dinner meetings. **BHP Billiton** is a global mining, oil and gas company headquartered in Melbourne, Australia. The company mines copper, iron, gold, and coal, and has proven oil reserves. It is the world's largest mining company measured by revenue and, as of February 2011, the world's third-largest company measured by market capitalization. **AZGS is grateful to BHP Billiton for their generous support of our student members.** In order for students to receive dinner at our monthly meeting compliments of BHP, students must make an online dinner reservation.



An earth fissure in Cochise County, as photographed by AGS member and VP of Field Trips, Doug Shakel. Read the whole story, starting on Page 3 of this newsletter.

2011 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

Starting in 2011, 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.