



# Arizona Geological Society Newsletter

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MAY 2015

## May 5, 2015 DINNER MEETING

**Who:** Gordon B. Haxel will speak about “Alpine Peridotite in the desert - Arizona’s Laramide Subduction Complex”

**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:** Reserve on the AGS website ([www.arizonageologicalsoc.org](http://www.arizonageologicalsoc.org)) by **11 a.m. by Friday, May 1st**. Please indicate regular (Beef Enchiladas), vegetarian, or Cobb salad meal preference. Please cancel by Friday, May 1st at 11 a.m. if you are unable to attend - no shows and late cancellations will be invoiced.

**The May dinner meeting is sponsored by Timberline Drilling, Inc.**



**AGS is grateful for Timberline Drilling’s Sponsorship, which helps us to offset dinner meeting costs**

## **Alpine peridotite in the desert - Arizona’s Laramide subduction complex**

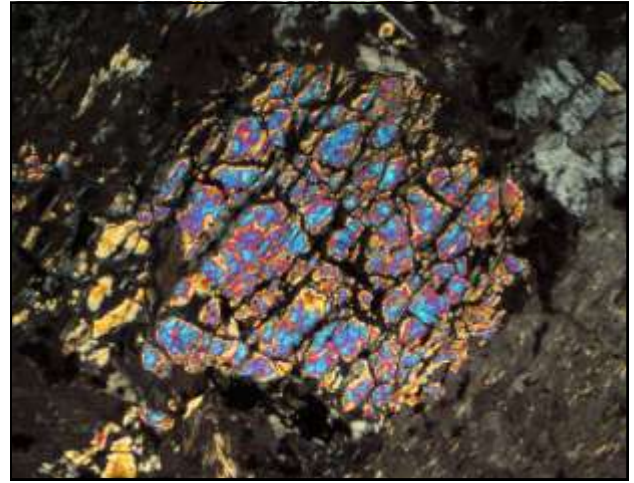
Gordon B. Haxel, Scientist Emeritus, U. S. Geological Survey

In 2012, I discovered fragments of oceanic upper mantle—harzburgite, olivine orthopyroxenite, and serpentinized dunite—in an unexpected place: southwest Arizona. These peridotites and pyroxenites crop out as tectonic blocks or slabs (50–300 m long) within a newly recognized exposure of Orocochia-Pelona Schist, at Cemetery Ridge (130 km west of Phoenix). The Orocochia-Pelona Schist is part of a Late Cretaceous to Paleogene (“Laramide”) subduction complex that, according to current tectonic models, underlies most of southern California and Arizona. Where did these pieces of oceanic mantle, now exposed several hundred kilometers inland from the present and Laramide continental margin, come from?

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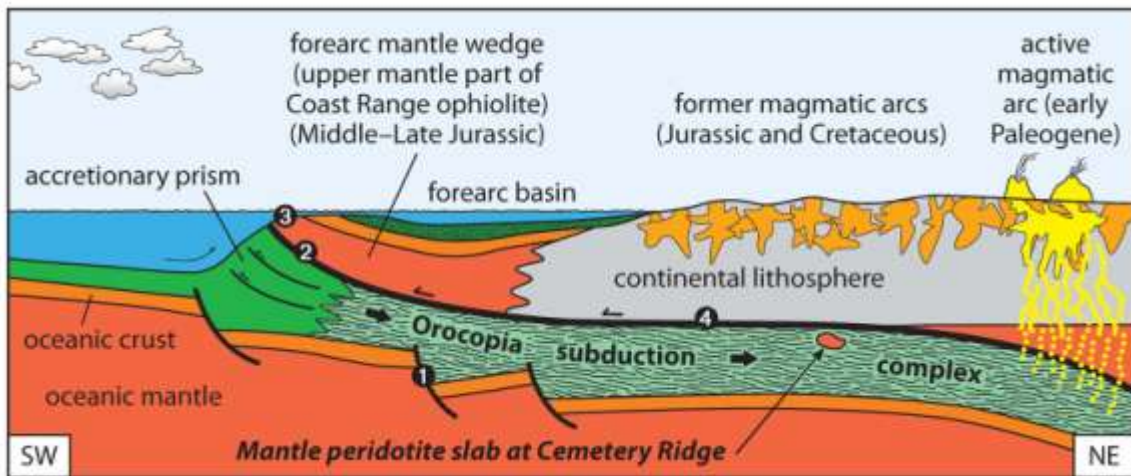
**ABSTRACT - Continued from Page 1**

**Harzburgite, Cemetery Ridge, southwest Arizona—orthopyroxene (reddish brown) and serpentinized olivine (black).**



**Relict olivine in harzburgite, Cemetery Ridge, southwest Arizona. Width of view 2 mm; crossed polarizers.**

Petrographic and geochemical characteristics of the peridotite at Cemetery Ridge are in some ways similar to mantle-wedge (suprasubduction) peridotites and serpentinites, but in other ways more like abyssal peridotites and serpentinites. Initial interpretation of ambiguous field and petrologic data suggests the peridotite may have been detached from the leading corner or edge of a mantle wedge, presumably in (pre-San Andreas fault) southwest California. However, derivation from the subducting plate is not precluded.



**Cartoon showing four tectonic settings where mantle peridotite in the Laramide subduction complex exposed at Cemetery Ridge could have originated. Number 4 is unlikely.**

### Reference

Haxel, G.B., Jacobson, C.E., and Wittke, J.H., 2014, Mantle peridotite in newly discovered far-inland subduction complex, southwest Arizona: initial report: *International Geology Review*, v. 56, doi:10.1080/00206814.2014.928916.

## About the May Dinner Speaker



Gordon Haxel is Scientist Emeritus with the U.S. Geological Survey in Flagstaff. He retired in 2008 after 32 years as Research Geologist and Geochemist. His general interests are geologic mapping, regional geology and metallogeny, igneous petrology, and elemental geochemistry. Past 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\*, the threatened desert tortoise, REE resources\*, alkaline igneous rocks associated with the Mountain Pass REE deposit\*, and global production of the chemical elements\* (\*topics of previous AGS presentations). Since 2012 his research has focused on oceanic peridotite in southwest Arizona, the subject of this talk.

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.

### SRK CONSULTING ANNOUNCES 2015/2016 SCHOLARSHIP PROGRAM

This program is intended to help students complete master's and doctoral degrees in mining-related fields, including: mining engineering, exploration and mining geology, hydrogeology and water engineering, tailings and mine waste management and environmental science and engineering. For more information please visit SRK's [web page describing this program](#).

## A Special Note of Thanks!

Trevor Cole served as AGS Ex. Com. Vice Secretary for 2014 before resigning in April 2015. Trevor, on behalf of the AGS membership and AGS Ex. Com, thank you for your service.

## Arizona Geological Society Membership Stats

Total Membership	Professional Members	Student Members	Organizational Members
547	386	154	7

### New Concepts and Discoveries:

#### 2015 Geological Society of Nevada Symposium

May 14-23, 2015

Co-hosted by the Society of Economic Geologists, Nevada Bureau of Mines and Geology and the U. S. Geological Survey.





## AGS Spring Field Trip | Oak Creek – Mormon Lake Graben

**Date/Time:** Saturday, 2 May / 7:30 a.m. – 5:00 p.m.

**Starting Location:** Parking lot at the High Country Conference Center, 201 West Butler Ave., Flagstaff, AZ 86001 (about 1/2 block east of intersection of Milton Rd and Butler Ave.)

**Trip Leader:** Paul Lindberg, Geologist

**Level of Difficulty:** Most stops along the field trip route will be short and close to the vehicles. However, there will be one short rock scramble along Oak Creek. Comfortable, supportive footwear is recommended.

Check weather forecast in advance and dress accordingly; it is spring and we will be at a relatively high elevation (3,800 to 7,000 feet).

**Guidebook and Lunch Costs:** \$50 (members and guests) , Student members are free.

Field trip guidebooks will be provided to trip participants. Additional guidebooks will be produced by the AGS following the trip, which can be purchased at our dinner meetings.

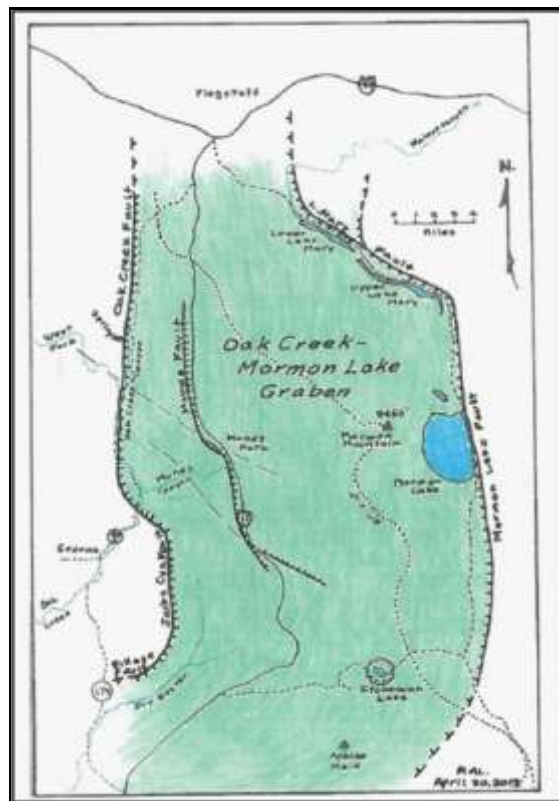
A sack lunch and bottled water will be provided. Participants should bring snacks and other beverages to suit their needs.

**Car pooling Arrangements:** Carpooling is strongly encouraged to reduce travel costs and number of cars at each stop for safety and logistical reasons. Participants names/contact information will be circulated to registered attendees for participants to make arrangements, as needed.

**Additional Transportation Costs:** Rental vans may be required depending on the group size and need to reduce the number of caravan vehicles at field trip stops. An additional fee to cover these costs will be evaluated once trip registration begins.

**Motel Accommodations:** Participants will be responsible for their own motel accommodations. [See Field Trip Flyer.](#)

**Tour Description:** Paul Lindberg has graciously agreed to lead an AGS field trip to the Oak Creek – Mormon Lake area south of Flagstaff. Participants from outside the Flagstaff area, will probably need to arrive in Flagstaff on the evening of 1 May.



**Oak Creek—Mormon Lake Graben Field Trip, Continued from page 4**

The May 2, 2015 field trip will examine the Oak Creek-Mormon Lake Graben by circumnavigating key locations around its perimeter. The age of the new graben cutting into the Colorado Plateau is estimated to be only 2-3 million years old and its subsidence may be contemporaneous with the start of the eruption cycle of the San Francisco Peaks. Flagstaff lies within the northern end of the graben and the I-17 freeway corridor extends south toward Camp Verde, where the rift valley merges into the older Verde Graben that is estimated to be ~10 million years old. As such, Interstate 17 traverses from Flagstaff to Camp Verde entirely on the surface of Miocene basalt lava flows with no Paleozoic Mogollon Rim sedimentary rocks exposed along its length. Mogollon Rim exposures lie to the west and east of the young graben.

For a detailed description of the geology of Oak Creek and the nearby Mormon Lake Graben see Paul Lindberg's 31-page paper in the Oak Creek Watershed book now available at the AZGS's Arizona Experience Store.

There may be an opportunity for an informal tour of the San Francisco volcanic field on Sunday, 3 May. We'll circulate information as it becomes available.

### **Arizona's Ad Hoc Earth Science Outreach Consortium convened in Phoenix on 27 March**

Representatives from groups and institutions with an interest in Earth science outreach education met at the Clarion Hotel on Friday, 27 March, to discuss their outreach philosophies, objectives, challenges and successes. The meeting was sponsored by the Flagg Mineral Foundation.

The following groups, which included the Arizona Geological Society, participated: Arizona Geological Society, Arizona Geological Survey, Arizona Sci-Tech Festival, Arizona State University School of Earth and Space Exploration, Arizona State University Strategic Education & Public Outreach Initiatives, Arizona State University Mars Education, City of Chandler Environmental Education, Earth Science Museum, EarthScope, Flagg Mineral Foundation, Mesa Community College Geosciences, Science Foundation of Arizona (AZ STEM Network), Tucson Gem and Mineral Society, University of Arizona Geosciences, University of Arizona Lowell Mineral Institute – Mining Foundation of the Southwest.



It was a successful program and we all learned a lot about how groups are faring and finding ways to be successful. A common challenge: financial resources. While funds are short, the energy and group synergy was overflowing. Our next objective is to improve communications between groups and look for way to promote and showcase each other's work.

## Third Annual AGS Doug Shakel Memorial Student Poster Event

The Arizona Geological Society thanks the students, judges, organizers and sponsors, who participated at our annual student poster event on Saturday, April 18, 2015.



**Jordan Abell Receives 1st Place Award from AGS President Mike Conway (Photo Taken by Nyal Niemuth)**



**Group Photo of Students, Judges and Organizers (Photo taken by Nyal Niemuth)**

### First Prize (\$500)

Jordan Abell, Undergraduate Student, U of A: Geochronology Study of the Loess Plateau for Comparative Statistical Analyses and its Effect on Asian Paleoclimate

### Second Prize (\$250)

Nathaniel Borneman, Graduate Student, ASU: Age of the Shyok Suture in Ladakh, Northernmost India and Implications for Offset Along the Karakoram Fault

### Third Prize (\$150)

Gayatri Indah Marliyana, Graduate Student, ASU: Tectonic Geomorphology of the Hanging Wall Blocks of the Cimandiri Fault Zone, West Java, Indonesia

### Honorable Mention (\$50)

Michelle Dafov, Undergraduate Student, U of A: Lu-HF Isotopic Trends during Shallow Subduction and Foundering of the Farallon Slab and the Resultant Magmatic Sweep Across the Southwestern U. S.

Marie Glenyss De los Santos, Graduate Student, U of A: Paleoenvironments and Age Analysis of the Lobo Formation: A Laramide Syntectonic Deposit in southern New Mexico

Kristen Whitney, Graduate Student, ASU: Role of Biological Soil Crusts in Hydrologic Modeling of Western High-desert Ecosystems

### Other Participants

Enrique Chon, Undergraduate Student, U of A: Evaluating Fault Slip Rates Beneath the Northern Apennines, Italy Using Present-day Site Velocities Measured by GPS

**Continued on Page 7**

**Student Poster Event - Continued from Page 6**

Michelle Dafov, Undergraduate Student, U of A: British Columbia Coast Mountains Metasedimentary Rocks: Age Constraints and Provenance

Michelle Dafov, Undergraduate Student, U of A: Zircon Ages from Jack Hills Quartzite, Australia

Ravidnra Dwivedi, Graduate Student, U of A: Similarities and Differences between Transport of a Solute and Water Age Mass: Why is the Picture so Blurry?

Angel A. Garcia, Jr., Graduate Student, ASU: Using Traditional Ecological Knowledge to Teach Geosciences: An Ethnogeology Study in the Caribbean

Jesse McCraw, Undergraduate Student, U of A: Detrital Zircon Analysis of Rock Slabs from Brazil for Provenance, Absolute Age and Regional Geohistory Study

Jesse McCraw, Undergraduate Student, U of A: Detrital Zircon Age Analysis of the Jacks Hills Quartzite Conglomerate

Brian St. Clair, Graduate Student, ASU: Detailed Geochemical Analysis of Arizona Acid Mine Drainage Reveals Energy Availability to Microbial Metabolism

Katherine Sheppard, Undergraduate Student, ASU: Modeling Basalt Genesis in the Lassen Volcanic Center

Stephen Sobansky, Undergraduate Student, U of A: Attempt to Constrain Initiation of the southern Tibetan Detachment System using U-Pb Geochronology and Temporal Evolution of Associated Intrusions

Joseph Michael Valachovic, Undergraduate, U of A: Preliminary Results from HSPDP Drill Site Utilizing LOI to Understand Paleoclimate-Environmental Context for Human Evolution in the North Awash Osi Isi

Guang Zhai, Graduate Student, ASU: Time-Dependent Deformation Source Model of Kilauea Volcano Inferred from InSAR Time Series and Inverse Modeling

## Arizona Geological Survey News Brief

[Arizona Mining Review](#) (AMR) e-Video Magazine – 4/29/2015

The 29 April episode of the [Arizona Mining Review](#) (AMR) includes the following topics and guests:

- Nyal Niemuth on SB 1200 and the state of mining in Arizona
- Mineral fingerprints in surficial sediments near porphyry copper – gold deposits: An exploration tool. Jon Spencer interviewing Stu Averill (Overburden Drilling Management Limited)
- “Wild Places: The adventures of an exploration geologist”, Harold Linder talking with Nyal Niemuth.

Arizona County Geologic Map Series goes digital. In 1959 and 1960, the then Arizona Bureau of Mines at the University of Arizona released the Arizona county geologic map series. The map scale is 1:375,000 and the contour interval 500 feet. Each map is accompanied by an Explanation with rock formation names. All Arizona County Geologic maps are now available at the AZGS Online Document Repository (<http://repository.azgs.az.gov/>).



# ANNOUNCEMENTS

## Welcome New AGS Members

Jordan Abell	Marie De los Santos	Jessie McCraw	Stephen Sobansky
Nathaniel Borneman	Andrzej Dubiniewicz	Mark Nelson	Cody Unger
Sally Branscomb	Jessie Dwivedi	Brandon Ostler	Kristen Whitney
Enrique Chon	William Fisher	Katherine Sheppard	

**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.