



Arizona Geological Society Newsletter

APRIL 2013

April 2, 2013 DINNER MEETING

Who: Robert Hildebrand will be our featured speaker. See abstract below.

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 Room*. The Pima room is located on the second floor in the northwest corner of the hotel.

When: Cash Bar at 6 p.m.—Dinner at 7 p.m.—Talk at 8 p.m.

Cost: Members \$27, Guests \$30, Students are free with an online dinner reservation (\$10 without).

RESERVATIONS are REQUIRED: CALL 520-663-5295 by 11 a.m. Thursday, March 28 or reserve on the AGS website (www.arizonageologicalsoc.org). Please indicate regular (Grilled Fish Tacos), vegetarian, or cobb salad meal preference. Please cancel by Thursday March 28 at 11 a.m. if you are unable to attend—no shows and late cancellations will be invoiced.

The April dinner meeting is sponsored by:

Clear Creek Associates

AGS is grateful for Clear Creek's sponsorship,
which helps to offset dinner meeting costs.

Go to www.clearcreekassociates.com to learn more about how Clear Creek helps their clients with practical solutions in groundwater science.



ABSTRACT - West-dipping Subduction and the Mesozoic Assembly of the North American Cordillera

Robert S. Hildebrand, Department of Geology, University of California at Davis

The broadly accepted hypothesis for the development of the segmented Cordilleran orogen above a long-lived eastwardly dipping subduction zone is at odds with many critical observations. Therefore, I explore an alternative collisional model in which the western edge of North America was partially subducted to the west beneath the Rubian ribbon continent. The collision of the two initially led to the localized Sevier fold-thrust belt and later to the more extensive Laramide deformational event.

The Rubian ribbon continent was assembled piece by piece, but at 160 Ma, two previously assembled blocks, Sierrita and Proto-Rubia, collided. Proto-Rubia formed during the Mississippian by collision of the Roberts Mountain allochthon with the Antler margin, a Neoproterozoic–Paleozoic passive margin of unknown provenance. Additions at 260–250 Ma included Yukon-Tanana-Slide Mountain terranes and the Golconda allochthon. Sierrita formed during the Middle Jurassic between ~170 and 160 Ma when several east-facing arcs, including the Smartville, Slate Creek-Lake Combie, and Hayfork, were amalgamated west

Continued on Page 2

Arizona Geological Society Douglas Shakel Student Poster Session

The AGS will host a special meeting on **Thursday April 18, 2013** in **Tempe** at the **Embassy Suites Hotel** (at the intersection of South Rural Rd. and the Superstition Freeway, located one mile south of the ASU campus). AGS is inviting students from Northern Arizona University, Arizona State University, and University of Arizona to present posters in all fields of the Earth Sciences.

6 - 7 p.m. Viewing of posters during social hour

7 - 8 p.m. Dinner (Members \$27, Guests \$30, Students are free with reservation, \$10 without)

7 - 9 p.m. Students give a brief (3 minute) oral presentation, summarizing their poster

9 p.m. Presentation of prizes

Please contact Bob Kamilli if you have any questions (520-670-5576, bkamilli@usgs.gov).

RESERVATIONS are REQUIRED: CALL 520-663-5295 by 5 p.m. Friday, April 12 or reserve on the AGS website (www.arizonageologicalsoc.org). Please indicate regular (Sautéed Chicken Picatta), vegetarian, or cobb salad meal preference.

*****Professor Steve Reynolds of ASU will lead a field trip to South Mountain on the morning of Friday April 19th*****

ABSTRACT—Continued from Page 1

of the Sierran-Black Rock arc just prior to and at about the same time as it collided with the western margin of Proto-Rubia to the east. Consequent slab failure generated an arc-parallel suite of post-collisional intrusions, including the Independence dike swarm and the bimodal, alkaline Ko Vaya suite. New eastward subduction beneath the Sierra Nevada may have started sometime between 159 Ma and ~130 Ma.

The Sevier phase of the Cordilleran orogeny began at ~125 Ma when a promontory located in the Great Basin segment of the North American craton was pulled into the westward-dipping subduction zone that existed on the Panthalassic side of the Rubian superterrane. The entry of the margin into the trench formed the Sevier fold-thrust belt and led to accretion of exotic megathrust sheets to western North America. During(?) and after the collision, most of the Rubian superterrane migrated southward relative to North America. To the west at ~100 Ma, a dextral transpressional collision led to the closure of the Gravina-Nutzotin-Dezadeash-Gambier basin(s) in Canada and Alaska, the accretion of the Alisitos arc in Baja California, and the closure of a now cryptic basin within the Sierra Nevada. Post-collisional plutonic suites, such as the La Posta and the Sierran Crest, may have been caused by slab failure.

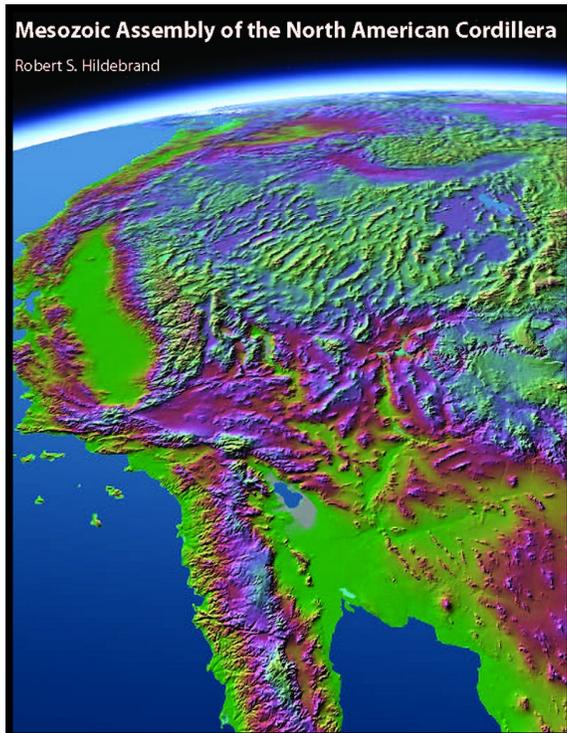
At around 80 Ma, North America started to migrate southward, and this led to the collision of the entire Rubian ribbon continent, which extended from the Alaskan sector at least to northern South America, with the outboard margin of North America during the Laramide phase of the Cordilleran orogeny. The resultant shutdown of subduction along both margins led to (1) termination of Cordilleran-type magmatism, (2) exhumation of Franciscan blueschists within accretionary complexes along the western side of Rubia, (3) emplacement of a linear belt of slab-failure magmatism within the Sonora-Mojave region and the then adjacent Coast plutonic belt, and (4) oblique northward migration of Rubia. The oblique convergence between Rubia and North America created a region of thick-skinned deformation within the Great Basin segment south of the Orofino fault and thin-skinned folding and thrusting in the Alaskan, Canadian, and Sonoran sectors. Prior to their northward migration, the previously amalgamated terranes presently located within the Canadian Cordillera were located several thousand kilometers farther south and joined at their south end with the northern end of the Sonoran sector.

About The April Dinner Meeting Speaker

Robert S. Hildebrand is a Research Associate at UC Davis but lives in Tucson. He grew up in Marblehead, Massachusetts, received a B.A. in Geology from the University of California at Santa Barbara in 1977 and a Ph.D. from Memorial University of Newfoundland in 1982. He then served as a Research Scientist with the Geological Survey of Canada, where for fifteen years he lead field campaigns in the Canadian arctic. Over the past 15 years he has worked as a Senior Exploration Geologist, Chief Geologist, and Project Manager for various mining companies, mostly in Latin America. He also combines geology with large-format landscape photography and his photographs commonly appear in textbooks, calendars, and books on our National Parks.

His main research has focused on ash-flow calderas and subvolcanic plutons, the interplay between arc magmatism and stress regimes, and the overall structure and development of orogenic belts. Hildebrand has led or been part of mapping some seventy-five 1:50,000 sheets in several contractional fold-thrust belts, continental arc terranes, the extensional Basin & Range province, and metamorphic internal zones of orogenic belts. On the economic front he has worked on porphyry copper-gold, vein and shear-hosted gold and silver, IOCG, and VMS deposits.

Hildebrand was an Associate Editor of *Geology* and *The Bulletin of the Geological Society of America*. He was awarded a Presidential Undergraduate Fellowship at the University of California, a Graduate Fellowship at Memorial University, was the 2010 Gallagher Fellow at the University of Calgary. He is a Fellow of the Geological Society of America.



The cover of the GSA Special Paper 495 shows a 3-D shaded relief map of the southwestern US and northwestern Mexico. The image is courtesy Ray Sterner at the Johns Hopkins University Applied Physics Laboratory.

GSA publishes Hildebrand's "Mesozoic Assembly of the North American Cordillera"

Geological Society of America's Special Paper 495, "Mesozoic Assembly of the North American Cordillera," by Robert Hildebrand is now available at the GSA bookstore.

According to the GSA, "In this well-illustrated book, Hildebrand builds upon his model for the Mesozoic collision of the exotic Rubian ribbon continent with the western margin of North America presented in GSA Special Paper 457. Starting with an overview of Cordilleran exotic and suspect terranes, he goes on to integrate the disparate fragments into a dynamic model involving arc magmatism, arc-continent collision, slab failure magmatism, and meridional migration. While the main focus is on the offshore assembly of the Rubian ribbon continent, Hildebrand explores its interactions with North America during the Sevier and Laramide events and concludes that North America was the lower plate in both. The volume will be of great interest to the general geological community, including advanced students, as it presents new ideas on the Mesozoic assembly of California and provides the first overview of the North American Cordillera since GSA's Decade of North American Geology volumes 20+ years ago."

The new paper is 169 pages with 65 color figures including a big fold-out map of North American Cordilleran terranes.

Commonwealth Field Trip Report

by Rachel Feuerbach, AGS Councilor

Hall Stewart and Lora Chiehowsky of Commonwealth Silver & Gold hosted a great AGS tour of the Commonwealth project near Pearce, Arizona for 28 attendees on Saturday, February 23. We had a beautiful though slightly chilly day. Hall explained the geology of the area and the project development status while we visited the core shed and the viewed examples of the rock types and mineralization in the drill core. Next on the agenda was a short trip to the home built by the original mine owner, where we watched a video that showed the drill locations and 3-D rendering of the ore body. We then drove up the hill to see Shafts A and C and the ruins of the old mill. From the top of the hill, we could see the Blue Jeep



Walking Hudley Hill to examine the colloform, banded North vein and collect late-stage amethyst specimens. Photo by W. Peachey



David Boyer and Jeff Cornoyer listening to Hall Stewart discuss the Commonwealth mineralization.

Photo by W. Peachey

and San Ignacio locations, as well as a great view of the snowy Chiricahua Mountains. After collecting amethyst from pits on the east side of the hill, we drove over to the Blue Jeep prospect. We discussed the structural setting and fluorite veins. Several people collected beautiful fluorite samples. The last stop was the San Ignacio hill, that contained small boulders of drusy quartz, platy calcite, and breccias. Attendees had an interesting discussion about the clay minerals that had developed on several rocks. Copies of the color guidebook are available for sale at the dinner meetings for \$23 or by mail order with postage added.

Contact VP of Field Trips Cori Hoag at choag@srk.com if you'd like to order a copy or if you have an idea for a future field trip.



Hall Stewart describes mineralization on Pearce Hill. Covered C Shaft is in the background. Photo by W. Peachey

Remember to Renew Your AGS Membership

Thank you if you have already paid your 2013 AGS dues. To renew your membership you can go online at <http://www.arizonageologicalsoc.org/208/membership> or fill out and mail the form on page 6.



Join host Lee Allison, Arizona State Geologist, for Episode 3

Arizona Mining Review video magazine—Live!

Day: Wednesday, 27 March

Time: 10:00 – 10:30 a.m. (MST)

Where: Streaming online at the Arizona Mining Review Live Stream Channel (<http://new.livestream.com/accounts/2496466/azminingreview>)

Arizona Mining Review is a live, online video magazine from the Arizona Geological Survey exploring and reviewing mining in Arizona -- its challenges and successes. From potash to copper to gold, from mineral exploration to policy development, tune in to see experts from industry, academia, research, and politics discuss the current state and future of mining in Arizona.

March 27 Topics

- **Mining News & Update.** Lee Allison and Nyal Niemuth explore the newest developments and trends in Arizona mining.
- **Fraser Institute's Survey of Mining Companies Report.** Dr. Kenneth P. Green, Senior Director, Energy and Natural Resources at the Fraser Institute, discusses the recent "Survey of Mining Companies" report and what it means for Arizona mining.
- **Curis Resources Florence Copper project.** VP Dan Johnson talks with Lee Allison about Curis's plans for in situ copper recovery on 160 acres of Arizona State Trust lands.

Subscribe to the Arizona Mining Review listserv (<http://azgeology.azgs.az.gov/newsletters/amr>) for regular reminders of upcoming episodes.

The Arizona Mining Review, a product of the Arizona Geological Survey, is broadcast live and recorded for later viewing at the AZGS YouTube Channel (<http://www.youtube.com/user/azgsweb>).

Attention Student Members: AGS is pleased to provide free meals for student members with a dinner reservation. Please keep in mind that these meals are paid for with a generous gift from BHP Billiton. If you make a reservation and do not attend, AGS must still pay for the meal. If you are unable to attend, please cancel your reservation by 11 a.m. on the Thursday before the meeting. If the cost of no-shows continue to be a problem, the AGS Executive Committee may consider charging for unclaimed student meals, as we do for regular members.

Welcome New AGS Members

James Girardi, University of Arizona, Tucson, AZ

Sharvari Nafziger-Kolb, Tempe, AZ

Vincent Salvato, Envirotech, Winnemucca, NV

Courtney King, Asarco LLC, Tucson, AZ

Intan Yokelson, University of Arizona, Tucson, AZ

Victoria Hermosilla, Clear Creek Associates, Tucson, AZ

Mariah Sanchez, University of Arizona, Tucson, AZ

Todd Keay, Montgomery & Associates, Tucson, AZ



The future is amazing.
The future is yours.

**AGS is grateful to
BHP Billiton for
their generous
support of our
student members!**

Sustainability

In BHP Billiton, we achieve Sustainability when everyone builds and maintains meaningful, long term relationships with internal and external stakeholders.

That is why we are proud to sponsor the student dinners of the Arizona Geological Society.

Careers.bhpbilliton.com



2013 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.

Enclosed is a _____ tax-deductible contribution to the AGS' Greatest Needs Fund.