



Arizona Geological Society Newsletter

JANUARY 2015

January 6, 2015 DINNER MEETING

Who: Arend Meijer will present “Sulfide-rich Proterozoic Mafic Rocks and Arizona Porphyry Copper Deposits - A Connection?”

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 on-line reservation (\$10 without).

RESERVATIONS ARE REQUIRED: CALL (520) 663-5295 or reserve on the AGS website (www.arizonageologicalsoc.org) by 11 a.m. Thursday, January 1st. Please indicate Regular (Herb Marinated Chicken Breast with Dill Buerre Blanc), Vegetarian, or Cobb Salad meal preference. Please cancel by 11 a.m. Thursday, January 1st if you are unable to attend - no shows and late cancellations will be invoiced.



The AGS Thanks Our 2014 Sponsors for their Support

Abstract

Sulfide-rich Proterozoic Mafic Rocks and Arizona Porphyry Copper Deposits - A Connection?

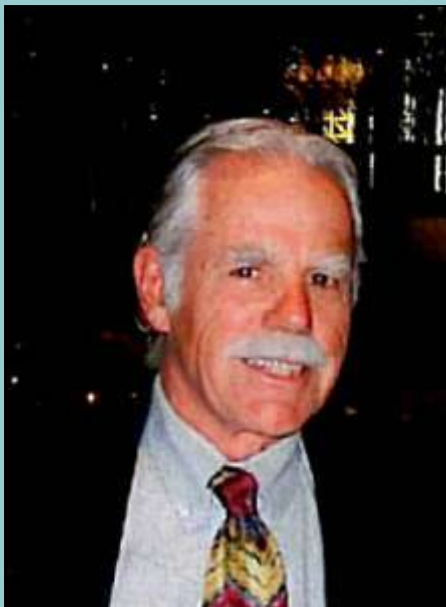
by Arend Meijer

The Paleoproterozoic Pinal terrane comprises the basement (i.e., oldest) rock of southern Arizona. It has the characteristics of a fore-arc/subduction complex and most likely formed a large fraction of the original crust of

Continued on Page 2

ABSTRACT - Continued from Page 1

southern Arizona. In addition to tectonic mélanges and thick sequences of turbidites, it contains Paleoproterozoic mafic rocks that include oceanic crust (based on trace element characteristics) overlain by ferruginous chert. In analogy with modern-day oceanic crust, some fraction of these oceanic rocks likely contain stockworks of sulfide veins and even massive sulfides originally produced at Paleoproterozoic oceanic spreading centers. There are also mafic metavolcanic rocks with arc affinities within the Pinal terrane and these could also have associated sulfide bodies. Most of the known porphyry copper deposits in Arizona are situated within the Pinal terrane. Further, isotopic and trace element data suggest most porphyry copper plutons in southern Arizona contain large fractions of recycled Paleoproterozoic crust with some consisting almost entirely of recycled crust. This suggests the metals in the porphyry copper deposits were likely also derived dominantly from the continental crust. Paleoproterozoic oceanic crust within the Pinal terrane and the sulfides that may be associated with it are here argued to have been sources for a large portion of the metals and the sulfur found in the late Mesozoic-early Tertiary porphyry copper deposits of southern Arizona. Paleoproterozoic arc-related fore-arc metavolcanic rocks and Neoproterozoic mafic rocks may have been additional sources. In analogy with Phanerozoic subduction complexes, the distribution of Paleoproterozoic oceanic crust with depth (up to 35 km) in the Pinal subduction complex is likely irregular. Further, the distribution of sulfide bodies within Paleoproterozoic mafic crust was likely also irregular. Such irregular distributions of source rocks in southern Arizona suggest a model in which magmas with mineralization potential (i.e., “wet” magmas of intermediate composition) would only be extensively mineralized with copper, other metals, and sulfur if their sources included significant proportions of sulfide-rich Proterozoic mafic crust. Thus, a mineralized pluton could have formed in fairly close proximity to a barren pluton of approximately the same age if the former contained a large component of sulfide-rich Proterozoic mafic crust while the latter did not.

About the January Dinner Speaker

Dr. Meijer received a doctorate in geology in 1974 from the University of California at Santa Barbara. The title of his doctoral dissertation was “A Study of the Geochemistry of the Mariana Island Arc System and its Bearing on the Genesis and Evolution of Volcanic Arc Magmas”. His dissertation advisors included Drs. George R. Tilton, Daniel E. Karig, and Clifford A. Hopson. Following the completion of his dissertation work, Dr. Meijer conducted post-doctoral studies with Dr. Krishna A. Sinha at Virginia Polytechnic Institute and Dr. Lee T. Silver at California Institute of Technology before joining the Geosciences faculty at the University of Arizona in 1976. In addition to teaching undergraduate and graduate courses, he conducted field and laboratory studies focused on volcanic rocks in the Mariana island arc system. In 1984, he accepted a position at Los Alamos National Laboratory in New Mexico. In addition to work on classified projects, he carried out studies of the U-Th-Pb isotope systematics of ultramafic nodules from the mantle. In 1994, Dr. Meijer started his own consulting company to provide geochemical expertise to chemical companies, mining companies, and oil companies. He retired from the company in 2008. Dr. Meijer has published over 50 papers in peer-reviewed journals in addition to several books. Although originally from southern California, he prefers the geological variety and freedom of movement available in southern Arizona.

Arizona Geological Society Recognizes Three of Its Members for their Service to the Society

AGS has been the beneficiary of generous donations by the members. By far, the most valuable donation we can receive from our members is their TIME. The time required to operate the society, manage its financial affairs, select scholarship recipients, prepare newsletters, and organize meetings field trips and symposia is immense. In short, the Society would cease to exist without these generous donations of time by the members.

The Executive Committee recently selected three members who have made extraordinary contributions to the Society, who we are pleased to award Honorary Life Membership. Each of the honorees has donated the equivalent of at least a couple of years of full-time work to the Society.



The first Honorary Life Membership was awarded to one of the unsung heroes of AGS, **Kevin Horstman** – a 25-year member and behind-the-scenes volunteer who has selflessly assisted in numerous capacities – most of which weren't glamorous, but which helped AGS events to function efficiently. He served on dozens of field trips as a driver (and ad hoc tour guide with deep knowledge of Arizona's history and geology), has prepared AGS directory covers, field trip maps and guidebook components, been a late-night compiler for several guidebooks, and is someone who has helped ensure the comfort of others by providing logistical support to numerous field trip

leaders. He made countless trips to the AGS storage room to collect books to sell at the dinner meetings and to help perform the necessary, but admittedly tedious annual inventories. He served as AGS President in 2009 and Past-President in 2010 and has been on the Publications Committee since this time.

Archiving of AGS publications in the past few years is probably the single most important factor in raising AGS's profile in the world. This honoree has spent countless hours digitizing to a better-than-original condition more than 100 AGS publications including 22 Digests and 80 Guidebooks. He prepared the digital publications in a high-resolution, high-quality OCR format for download from the AGS website. This has revived formerly out-of-print works and made our excellent publications available to a wider audience. His exceptional service is fulfilling AGS's mission to promote interest in the geology of Arizona. Many of our publications were not easily acquired previously and, frequently provide insights about locales that are no longer accessible or are not easily accessible to the geologic community.

The second Honorary Life Membership was awarded to Ann Pattison, who has been tireless in her participation, holding almost every office and committee assignment in the Society over the past 23 years! She served as VP of Programs in 1992 and 1993, Vice Treasurer in 1994 and 1995, Vice Secretary in 1996, Councilor in 2000, 2002-2006, and 2010, President in 2007, Past president in 2008, and VP of Marketing in 2011-2014. Her efforts in rounding up dinner meeting sponsors has done much to improve our bottom line.

BUT THERE'S MORE. Ann has also been a member of the finance committee for the past 13 years and on the scholarship selection committee for 11 years (2002 through 2004 and 2006-2014). She was part of the team that made the Ores and Orogenesis symposium a success by organizing short courses. And she continues to be active - next year she will continue to serve as VP of Marketing and on the Scholarship and Finance Committees.

The final honoree was Jon Spencer, Senior Geologist with the Arizona Geological Survey. Since 1992, Jon has served on the AGS Executive Committee as President in 2001, Past President in 2002, Secretary from 1995 to 2000 and Councilor from 1992 to 1994 and 2003 to 2008. He was member of Technical Program Committee for the 2007 Ores and Orogenesis symposium and a co-editor of Digest 22, which resulted from this successful event. Over the years, Jon has participated as leader or co-leader of many AGS Field Trips and was one of the authors of the Arizona Geologic Highway map. He also served on the Arizona Geological Society's Scholarship Committee from 1998 through 2005.

In addition to his participation with the Arizona Geological Society, Jon has worked throughout much of his professional career with the Arizona Geological Survey, where he has authored and/or co-authored more than 150 scientific publications that have greatly advanced our knowledge of the geology of Arizona.

Jon was unable to attend December's meeting due to work commitments that kept him in the field. The Arizona Geological Society will formally make a presentation to him at our January 2015 meeting.



Notice

Due to high costs, the Arizona Geological Society's phone message service will be discontinued on January 31, 2015. After that time, those making dinner reservations or wishing to contact us must do so on-line.

2014 Scholarship Winners

The AGS Scholarship Committee presented the 2014 Scholarship awards at its December AGS dinner meeting.

AGS Scholarship and Executive committees would like to thank all the students, who applied for the scholarships. We would also like to thank everyone, who donated to the scholarship funds; your donations help make the scholarships possible. To learn more about the Arizona Geological Society's scholarship program and how to make a tax-deductible contribution, please visit the [AGS website's student outreach page](#).



J. D. Mizer – 2014 Courtright Scholarship Recipient

After serving eight years in the U.S. Navy, J.D. received both his B.S. in Geology and a PSM in Economic Geology from the Geosciences Department at the University of Arizona. For his Masters, J.D. studied igneous geochronology in the Central Mining District, New Mexico and he is now working toward a Ph.D. in Economic Geology at the U of A. In research for his dissertation, “Geology of the Cerro Colorado and Las Guijas Districts, Pima County, Arizona”, J.D. is trying to better understand the emplacement of silver-bearing veins in the Cerro Colorado District and of tungsten-bearing veins in the Las Guijas District, and whether these veins systems are related to the emplacement of porphyry copper (-moly) intrusions at depth. He has served as president of the Society of Economic

Geologist's Student Chapter at the University of Arizona. J.D. was born in Arizona and is a claim-holder and conservator at the Glove mine in the Santa Rita Mountains and the Flux mine near Patagonia. He hopes to have a Tucson-based career in mining-related geology.

Kathleen Compton – 2014 Arizona Geological Society Recipient

Kathleen graduated *Magna cum Laude* from Whitman College in 2008, receiving her B.A. in Geology with Honors. She is pursuing her Ph.D. in Geophysics in the Department of Geosciences, University of Arizona. Her research focuses on the ways in which weather and climate can change the physical shape of the Earth, in particular using GPS data from Iceland to measure uplift patterns of glacial rebound as the ice cap there melts. The first chapter, entitled “Vertical acceleration of Icelandic crust measured by continuous GPS geodesy” is in review with *Geophysical Research Letters*. In the first half of this year, Kathleen served as a Public Affairs Intern in the Science Policy Office at the American Geophysical Union. Currently, she is on the AGU Whitten Medal Committee and is Co-Chair of the GeoDaze Symposium of the U of A Department of Geosciences. Kathleen's career goal is to combine her research background and her communication and media-relations skills to facilitate interaction among the scientific community, policy makers, and the public.



Fifty-Year Members Honored

According to our bylaws, members in good standing who have maintained continuous membership for a minimum of 50 years shall have the privileges of a full member of the society and are excused from further payment of dues. At the December 2014 meeting, the Arizona Geological Society recognized two 50-year members: **BOB METZ** and **CHARLIE MILLER**.



Bob Metz graduated from the Colorado School of Mines in 1955 and began his career working at Kennecott's Chino mine near Silver City, New Mexico. He later moved to Kennecott's Ray mine before joining the Duval Corporation in 1968, where he briefly worked at the Sierrita mine before joining their exploration department. Following his retirement from Duval's successor, Battle Mountain Gold in 1991, Bob has worked as a consultant for major mining corporations in the United States, Latin America and Australia. He has also served as councilor, Vice Treasurer and Treasurer for the AGS during the late 1960s and early 1970s.

Charlie Miller completed a Ph.D. degree at Stanford University in 1957 and began his professional career with Phelps Dodge in Douglas, Arizona. By the mid-1960s, he was working for American Metal Climax, Inc. Following his retirement from American Metal Climax's successor, Amax in 1985, Charlie formed Miller Resources, Inc. Over the years he has remained active in the mining community and a strong advocate of the mining industry. Charlie's service to the Arizona Geological Society included Vice President, Field Trips in 1975, President in 1976 and Past President in 1977, as well as serving as a councilor from 1988 to 1990 and during 2009. He was also a member of various committees for AGS symposia that spanned several decades and most recently served as a member on the AGS Finance committee from 2008 to 2013.



Arizona Geological Society Membership Stats

Total Membership	Professional Members	Student Members	Organizational Members
539	369	163	7

Arizona Geological Survey News Brief



[Arizona Mining Review](#) e-Video Magazine – SPECIAL SME Episode (12/30/2014)

AMR's special, hour-long December episode was filmed at SME's Arizona Conference 2014 and will be broadcast at 10:00 am MST on 30 December on LiveStream (<http://new.livestream.com/accounts/2496466/azminingreview>) and will be available immediately at [AZGS YouTube Channel](#) .

Guest & Topics

Nyal Niemuth (AZGS) on the latest in Arizona mining.
 John Marsden (President, SME) Mining & the American Public: connecting the dots
 Ian Edgar (Rio Tinto) Resolution Copper - Looking up from 7,000 feet down.
 Dawn Garcia (JDS Mining & Energy) Tucson – Gateway to mining in northern Mexico
 J. David Lowell – A conversation with the world's greatest mine finder
 Mindy Vogel (US Forest Service) Environmental Regulation of mining in Arizona
 J.D. Mizer (University of Arizona) Gold & silver mineralization in Cerro Colorado District, AZ

American Geophysical Union Annual Fall Meeting

We had a strong presence at this fall's AGU Annual meeting. AZGS staff engaged in one panel discussion (Lee Allison, AGU-EGU Great Debate: Open Data Policies Questions); authored or co-authored seven oral or poster presentations; hosted an EarthCube Townhall on 'Community Governed Cyberinfrastructure for the Geosciences'; and staffed EarthCube and USGIN exhibit booths. It was a busy five days.

New Publications

Philip A. Pearthree and P. Kyle House, December 2014, [Paleogeomorphology and evolution of the early Colorado River inferred from relationships in Mohave and Cottonwood valleys, Arizona, California, and Nevada](#). Geosphere.

Now available online at the [AZGS Document Repository](#), publications of the Arizona Dept. of Mines and Mineral Resources. Examples of recently uploaded ADMMR titles, include

Arizona Zeolites
 Directory of Active Mines in Arizona 2007
 Arizona Industrial Minerals 2nd edition
 Arizona Mining Update Annual Series 1997-2007
 Primary Copper Industry of Arizona – Annual Reports from 1974 – 1992

NEW at the The Arizona Experience Store, 416 W. Congress, Tucson, autographed copies of J. David Lowell's, 'Intrepid Explorer: The Autobiography of the World's Best Mine Finder'.

ANNOUNCEMENTS

Welcome New AGS Members

Andrew Enns	Youra Jun	Reg Olson	Sheila Robinson
Harry Hanneman	Rebecca Miller	Carl Peterson	Hanna Schilcher
Darryl Johnson	Michelle Montague	Alex Potter	Carlyn Stewart

Photos from Our December 2014 Meeting



Group Photo of our Student Members



AGS Members Enjoy the Meal

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 AGS Scholarship Funds.