Arizona Geological Society Newsletter

JANUARY 2014

JANUARY 7, 2014 DINNER MEETING

Who: **Steve Castor** 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 by 11 a.m. Thursday, January 2. Reservations can be made on the AGS website (www.arizonageologicalsoc.org). If you do not have internet access, you may call 520-663-5295. Please indicate regular (chicken breast with a sun-dried tomato and thyme cream sauce and herb roasted potatoes), cobb salad, or vegetarian meal preference. Please cancel by Thursday, January 2 at 11 a.m. if you are unable to attend.

ABSTRACT - Nevada Bureau of Mines & Geology: Mountain Pass and other North American Rare Earth Element Deposits

Steve Castor Former Chief Geologist at the Molycorp Mountain Pass, CA

Beginning in the 1960s, most of North America's rare earth element (REE) production came from a carbonatite deposit at Mountain Pass, California, which was also the source of most of the world's REEs between 1965 and 1995. In the 1990s, Chinese mines demonstrated the ability to produce more REEs than could be consumed globally, prices dropped drastically, and Mountain Pass REE production declined. Mountain Pass mining ceased by 2001, although shipments of some REE products continued from stockpile.

In 2005, after dominating global REE raw materials production for a decade, the Chinese government announced it would restrict REE raw material exports, causing alarm among users worldwide and US government agencies. REE prices subsequently rose sharply, and several REE exploration projects were begun in North America. In 2011, Molycorp Minerals LLC began an ambitious expansion and modernization project at Mountain Pass. Production start up in 2013 is anticipated to produce about 20,000 metric tons (mt) of rare earth oxide (REO) per year, with possible future annual production of 40,000 mt. Because of the 2008-2011 global recession, REE prices declined in 2012.

In 1987, the Mountain Pass ore resource was estimated by the author to be 29 million mt (Mt) with 8.9% REO based on a 5% cutoff grade, and the remaining resource is thought to be > 20 Mt. Proven/potential reserves of 18.4 Mt with 8% REO using a 5% cutoff were announced by Molycorp in 2012. The Mountain Pass carbonatite is a moderately dipping, tabular 1.4-Ga intrusive body associated with ultrapotassic alkaline plutons of similar age. The ore mineral is bastnasite (REE fluorocarbonate); other REE minerals are present but minor. The unusual chemistry and alkaline association of the deposit suggest a different source than that of most other carbonatites.

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ABSTRACT—Continued from Page 1

Because of its grade, size, and relatively simple metallurgy, Mountain Pass remains North America's best source of light rare earth elements (LREE). Large but low-grade LREE resources and relatively small moderate-grade carbonatite deposits are in Colorado and Wyoming. Other types of hard-rock REE deposits in North America include small iron-REE deposits in Missouri and New York, and vein deposits in Idaho, Alaska, and Saskatchewan.

Minor REE production came from North American placers between 1885 and 1994. Neogene placer REE resources, both marine and continental, are small or in environmentally sensitive areas, and unlikely to be mined. Paleoplacers also contain minor resources; possible future uranium processing of Precambrian conglomerates at Elliott Lake, Canada, may yield byproduct heavy rare earth elements (HREE).

Several relatively low-grade REE deposits in peralkaline syenitic and granitic rocks occur in North America. These deposits are enriched in HREE and Zr, and some have associated Be, Nb, and Ta. The largest such deposits are at Thor Lake and Strange Lake in Canada, and similar deposits occur elsewhere in Canada. A eudialyte syenite HREE-Zr deposit at Pajarito Mountain, New Mexico, may also be prospective.

The speaker considers development of new REE sources in North America unlikely in the near future. Deposits with the most potential are probably the large HREE deposits in peralkaline igneous rocks. Competition with established Chinese HREE sources and a developing Australian LREE/HREE deposit will be a factor. Because the North American deposits are essentially Zr deposits with HREE credits, future development may depend on the market potential for Zr.

New Addition of Arizona Geology Magazine and Maps

http://azgeology.azgs.az.gov/

Feature Articles:

The Geological Exploration of Arizona: The Role of State and Federal Surveys and the Geologic Map of Arizona by Steve Reynolds et al. (http://azgeology.azgs.az.gov/article/feature-article/2013/12/geological-exploration-arizona-role-state-and-federal-surveys-and)

Arizona Geology and New Concepts in Geosciences by Jon Spencer and Steve Reynolds (http://azgeology.azgs.az.gov/article/geology/2013/12/arizona-geology-and-new-concepts-geosciences)

New AZGS map products. All are available online at the AZGS Document Repository (repository.azgs.az.gov)

- Geologic map of the Artillery and Rawhide Wash 7 ½' minute Quadrangles, Mohave and La Paz Counties, AZ
- Geologic Map of the Sullivan Buttes 7 ½' Quadrangle, Yavapai County, AZ
- Geologic Map of the Prescott Valley South 7 ½' Quadrangle, Yavapai County, Arizona.
- Exploration and Production History of the Uranium-Vanadium Mines on Cove Mesa, Apache County, Arizona.

About the January Dinner Meeting Speaker

Steve Castor received his BA in geology in 1965 from University California at Riverside. From 1965 through 1967, Steve was a Peace Corps Volunteer geologist in Ghana where he worked mostly on dimension stone deposit evaluation and geologic mapping. He received a MA in geology in 1971 from the University of Nevada, Reno. While working on his Masters Degree he also did petrographic work for Phelps-Dodge, Calumet & Hecla, and NASA.

He joined Bear Creek Mining in 1971 for whom he was an exploration geologist for copper and molybdenum in Nevada. In 1972 he received his Ph.D. in geology from University of Nevada. From 1972 through 1976, Steve was a project geologist for Ethyl Corporation, working out of Baton Rouge exploring for aluminum silicates, titanium sands and similar deposits. He worked primarily a single drill project in Idaho and also worked a little on a coal acquisition.

From 1976 through 1981, he worked for Bendix Field Engineering on the NURE project out of the Spokane Washington office. He worked in Montana, Idaho, Washington, Oregon, and Nevada. He joined Molycorp in 1981 in their Spokane office searching for molybdenum, rare-earth elements, and tantalum mostly in Montana, Idaho, and Washington State. In 1984, he became the chief geologist at the Molycorp Mountain Pass rare earth mine, CA.

In 1988 Steve joined the Nevada Bureau of Mines & Geology, where he mostly worked on various industrial minerals, gold-silver deposits, government-resource studies, and geologic mapping. Steve has many publications to his credit, including some on rare earths, and he published a book titled "Minerals of Nevada," which was modeled on "Minerals of Arizona."

From 2009 to the present, Steve characterizes himself as "pretty much a retired snowbird". But he still keeps his hand in with some petrographic consulting on zinc, lithium, uranium, and zeolite deposits.

2013 Scholarship Winners

The 2013 Scholarship awards were presented by Bob Powell, the Scholarship Committee Chairman, at the December AGS dinner meeting.

Lily Jackson – AGS Scholarship Co-Recipient

J.D. Mizer – AGS Scholarship Co-Recipient

Simone Runyon - Courtright Scholarship Recipient

AGS Scholarship and Executive Committees would like thank all the students that 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 AGS's scholarship program and how to make a tax-deductible contribution, please visit the AGS website (www.arizonageologicalsoc.org/Default.aspx?pageId=1580766).

2013—AGS's Year in Review

By Alison Jones—2013 AGS President

It was an honor to serve as AGS President in 2013, and I am grateful to the Executive Committee that made it a successful year. Early in the year, we set two major goals for 2013: setting up a new website with increased functionality, and making electronic documents available online. Although they seem like modest goals, the devil was in the details, as the saying goes.

AGS field trip guidebooks and out-of-print digests are now available FREE online to members (www.arizonageologicalsoc.org/PublicationsArchive). Non-members must pay (or join AGS) to get documents published in 2000 or later. Availability of these high-quality electronic documents will raise the profile of AGS throughout the world, which is smaller, thanks to the internet. The Arizona Geological Survey also helped to make the goal a reality by hosting our documents on their server.

AGS's new website allows one to make reservations for our dinner meetings and field trips, pay online, purchase publications, donate to our scholarship funds, and sponsor a dinner meeting. Many of the advantages of the new website are visible only to those who use the website in an administrative capacity. It helps us keep track of our membership rolls and simplifies membership renewal.

In 2013, AGS continued to reach out to students, the future of our Society, through scholarships, dinner meetings, and the student poster night. The first AGS Scholarship was awarded in 2013. Several well-qualified students applied, and the Scholarship Committee decided to split the award between an undergraduate and a graduate student. We also awarded the Courtright Scholarship to a deserving graduate student. BHP Billiton generously paid for students' meals at the 2013 dinner meetings which most certainly increased attendance. The annual Doug Shakel Student Poster Night in Tempe drew students from NAU, ASU, and UA. Seeing all of that youthful energy in one room gave me reason to feel optimistic about the future of our science!

Through it all, the regular business of AGS continued: field trips, monthly dinner meetings, newsletters, accounting, investments, publications, marketing, elections, and website maintenance. Remarkably, virtually all of this business is conducted by volunteers. Our Society could not exist without them. Other societies often pay a director to manage these tasks, and AGS may need to consider hiring a director in the future. Volunteer fatigue is a reality. However, as 2013 comes to a close, I am more optimistic than ever about the future of AGS as we further our mission of fostering interest in the geosciences. Our membership includes a good mix of seasoned veterans, active professionals, and students, which helps to make AGS stronger. I look forward to serving on the Executive Committee as our new President, Kim Wilson, guides our Society through the coming year.

More AGS Publications Available for Download

There are two more new archive guidebook publications on the AGS archive website
www.arizonageologicalsoc.org/PublicationsArchive

New Dummett, Hugo, and Colburn, Nora, leaders, 1988, Visit to the Tombstone, Bisbee, and Commonwealth Districts, Arizona: Arizona Geological Society Fall Field Trip, October 22-23, 1988, Guidebook, 170 p.

New Reynolds, S.J., ed., 1990, Field guide to the New Waddell Dam site, Vulture-Hieroglyphic Mountains area, and Mystic, Clemontine, Newsboy, and Yarnell gold deposits, central Arizona: Arizona Geological Society Field Trip, December 8-9, 1990, Guidebook, Leader - Stephen J. Reynolds, 123 p.

Thank You 2013 Dinner Meeting Sponsors

AGS would like to thank the 2013 dinner meeting sponsors. Sponsorship helps to offset costs and is a great way to get the word out about your company or organization. If you or your company are interested in becoming a dinner meeting sponsor please contact AGS VP of Marketing, Ann Pattison (msgeo81az@yahoo.com).

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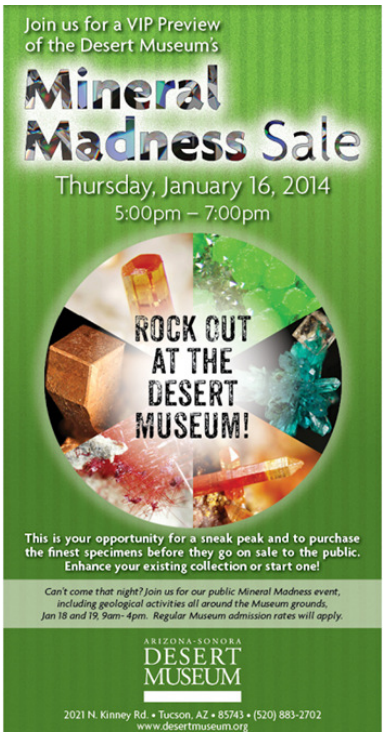

Where do the beautiful mineral specimens come from that are given to our monthly speakers?

For at least twenty years, the Arizona Sonora Desert Museum geology department has donated beautiful Arizona mineral specimens for each of our monthly speakers. AGS would like to thank the Museum for their generosity.

If you have time you should check out their **Mineral Madness Sale**, which brings in greatly needed funds for the Museum.

The Museum's annual Mineral Madness event is on January 16, 18, and 19.

- Thursday January 16th (5 p.m. to 7 p.m.): VIP Preview of Mineral Sale
- Saturday and Sunday January 18th and 19th (9 a.m. to 4 p.m.): Mineral Sale:
- Saturday and Sunday January 18th and 19th (10 a.m. to 4 p.m.): Family Mineral Activity Stations.

For more information visit (www.desertmuseum.org/visit/mineralmad.php?ref=hp).

Our thanks to

Greta Orris	**Jeff Cornoyer**	**Mike Conway**	**Cori Hoag**	**Mike Busby**
Bob Kamilli	**Alison Jones**	**David Briggs**	**Kevin Horstman**	**Ann Pattison**

for their recent generous donation to the AGS Scholarship Fund.

Welcome New AGS Members

Connor Nolan	Mariah Armenta	Mike Thille
Andrew Cunningham	Logan Hill	Ashlyn Hooten
Kaitlynn Walker	James Barker	Michael McIntire
Edward Cross	John Petersen	

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 at the 2014 AGS monthly meetings.

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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: _____

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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 you are a registered geologist/engineer, indicate your 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 Scholarship Fund.

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