



# Arizona Geological Society Newsletter

FEBRUARY 2012

## February 7, 2012 DINNER MEETING

Steve Peters 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 free with online reservation (\$10 without).  
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 Friday, February 3 or reserve on the AGS website.**

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.

## Afghanistan: Gold Rush in a War Zone

Steve Peters, USGS, Reston, Virginia

Afghanistan contains a number of unexploited gold deposits and gold districts. Many of these deposits and districts have been known since the time of Alexander the Great or Ghenghis Khan. The USGS joined the reconstruction effort in Afghanistan and began to compile data and information about mineral deposits and other natural resources in the country (<http://www.nytimes.com/2010/06/14/world/asia/14minerals.html>). In 2009 the Department of Defense (DoD) Task Force for Business Stability Operations engaged the USGS to help identify and develop favorable mineral sites to stabilize the country, increase its security, and provide new jobs from an emerging mineral industry. Gold deposits show great promise.

The Task Force provided field support for USGS scientists to visit, map and sample known mineralized areas. This support included military transportation, planning and security. The rationale for this work is to provide the country of Afghanistan with enough revenue to fund a standing army so that the NATO troops can be replaced.

Much of the USGS data for prospective deposits and districts have been compiled into tender packages by the Afghan Ministry of Mines. Chinese, Indian, and South African firms have already begun mineral development in several areas in Afghanistan (<http://bigpeace.com/jbradley/2011/12/30/china-claims-afghan-mineral-resources-while-us-counts-down-to-withdrawal/>). The opportunity for investors is that a single company can acquire an entire ore district and develop it without inheriting existing land or environmental issues.

There are a number of different types of gold deposits in Afghanistan. Pluton-related gold deposits in Afghanistan mainly are porphyry-copper related, polymetallic, gold-quartz veins. In addition, orogenic lode gold occurrences associated with metamorphic rocks are present in the north. Extensive gold placer deposits are present in northern Takhar Province.

Pluton-related gold deposits are best represented by the Zarkashan porphyry-skarn deposit. The Zarkashan copper-(gold) deposit contains gold and copper mineralization in skarn and shattered zones (Table 1). Several auriferous zones were delineated by Soviet workers; their width varying from 1 to 15 m and extension reaching 600 m. The zones

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### About the Speaker

**Stephen G. Peters** is a research geologist with the US Geological Survey. His background is in mining, exploration geology and resource assessment. He is the Project Chief for the USGS Afghanistan Minerals Project and has also led projects in SE Asia and Madagascar. He received a PhD in Economic Geology from James Cook University of North Queensland, Australia, an MSc in Engineering Science Management from the University of Alaska, and a BSc in Geology from Northern Arizona University. Steve has conducted field and laboratory research on Carlin-type gold deposits in Nevada and China for the USGS. Prior to joining the USGS he worked in private industry for 20 years in the exploration and production of mineral deposits with various mining companies in Australia, Western U.S., Alaska, and South Africa. Steve is a registered engineer (CEng) with the Institute of Mining and Metallurgy (London), a 32-year member of the Society of Economic Geology, and the American Institute of Mining and Exploration (AIME).

enclose ore bodies of commercial value, which appear as lenses and nests 1.5 to 50 m in length and 0.5 to 3.8 m in thickness. The gold content varies between several tenths of a gram to 10 g per metric ton. The zones were evaluated by tunneling to a depth of 80 m. The probable and possible reserves are 7.7 metric tons of gold. The tenor of gold in the Zarkashan mine area and at Zardak were confirmed in 2010 by the USGS and DoD.

**Table 1. Prospects in the Zarkashan area with gold grades and dimensions from Abdullah**

Target Area	Prospect	Size	Gold grades (g/t)	Comments
Dynamite	Khinjaktu	200 m	1.8	Skarn
Dynamite	Gulakhel	1.5 x 50 x 70 m	4.4	Skarn
Dynamite	Sufi Kademi	Skarn beds with conglomerate	7	Ancient workings
Dynamite	Dynamite	0.6 – 1.2 m	4 - 70	Drill holes
Dynamite	Chah -i Surkh	0.2 – 2.5 x 100 m	0.6 - 3.2	Shattered limonite zone
Bolo gold	Belaw	2 – 25 x 250 m	0.1 - 0.8	Skarn, limonite, 1- 4 g/t Au
Bolo gold	Alaghzar	70 - 100 m x 500 m	0.01 - 1.6	Up to 35 g/t Au in serpentinite
Bolo gold	Bala	0.5 – 12 x 140 m	0.8 -34	Fault zone with limonite
Bolo gold	Anguray	1 – 10 x 189 m	0.3 - 142	Skarn zone with Cu and Zn
Bolo gold	Utqul	0.5 x 300 m	11 (maximum)	Fault zone with limonite
Bolo gold	Bashargar	1 x 50 – 80 m	2.9 – 12.	43 g/t Au in limonite

The best example of an orogenic or metamorphic gold deposit is in Badakhshan Province at the Vekadur deposit, which is one of the larger gold occurrences in Afghanistan. Calculated resources are 958.3 kg Au averaging 4.1 g/t Au. Brecciated rocks grade 46.7 g/t silver and contain arsenopyrite, galena, chalcopyrite, and scheelite. The geometry of the deposit is amenable to open pit mining. The area also contains outcrops of Cenozoic conglomerate that may have potential for gold placer deposits. For more information, see:

<http://afghanistan.cr.usgs.gov/minerals> and <http://mapdss2.er.usgs.gov/openview/welcome.html>

**Said Mirzad, former director of the Afghan Geological Survey, and Stephen Peters (USGS) on the rim of the Khanneshin carbonatite volcano surrounded by Marine security guards, Helmand Province.**



## Member Spotlight—Stanley B. Keith

**Stan Keith** was born in Pasadena, California, where he grew up. He received a B.A. in Philosophy from the University of Arizona in 1972 and an M.S. in Geology in 1978 from UA. While working for Kennecott and the Arizona Geological Survey in the mid-1970s he recognized an empirical relationship between mineral deposits and magma series. Later, Exxon Research funded a research project to pursue this concept in the southwestern United States. In 1983 he founded MagmaChem Exploration (Ideas-Exploration-Discovery) with his friend and colleague, Monte Swan, as they continued to refine the Magma-Metal Series concept. Beginning in 2000, Stan and his colleagues began to apply the MagmaChem model to oil and gas, which led to the concept of the serpentosphere and the hydrothermal origin of kerogen.



Stan has served as AGS President (1984), Past President (1985), and VP of Field Trips (1983). He lives in Sonoita with a series of iguanas, including his current and favorite, Joe, a 13-pound central American iguana that is at least 14 years old.

**How did you first become interested in geology?** I started picking up rocks at the age of 6, as a result of a “communist plot” between my mom and our neighbor. The plot was to stop my friend and I from tearing up their trails. Their rock dump was seeded with some ‘pretties’ and monitored. I was caught ‘stealing’ a few days later. Instead of being jailed however, I was invited in for a lemonade and a tour of Lorna Wise’s mineral collection and the rest, as they say, is history. I also received some extremely important mentoring (in hindsight) from the Wises and later Royal and Cynthia Marshall, all of whom were major members of the Mineralogical Society of Southern California. They took me on numerous field trips from the age of about 10 to 16. I managed to win the national award for Junior Minerals at the American Federation of Mineral Societies show in Las Vegas in May 1966. Later in life, I was the surprise beneficiary of the Marshalls’ mineral collection, which was willed to me in 2001 upon the death of Royal Marshall. I am still cataloging material from what was a collection of over 40,000 specimens of all types (featuring rare minerals and meteorites).

**What was your first job?** I worked as a paper boy for the Pasadena Star News from about 15 to 17 years old.

**What was your first job as a geologist?** It was a summer job for Texas Gulf Sulfur in 1970 arranged by my undergraduate advisor, John Guilbert. I was an assistant to Jan Krason who had just immigrated to the U.S. from Poland via Libya. The job assignment was to find porphyry coppers according to a hot new theory. Someone in Texas Gulf cooked up the idea that the porphyries were remobilized massive sulfide—especially the San Manuel deposit, for some reason. The culmination of this lunacy (in my opinion) was an urgent phone call from “White Shoes” in upper management who was well known for wearing top-of-the-line white Gucci-style shoes to the field. White Shoes had some hot advice. A well-known Mexican consultant who was advising Texas Gulf had spotted a major color anomaly from 30,000 feet while on a flight from Mexico City to Denver that needed a top priority field follow-up. We needed a little more location information and were told that the anomaly was somewhere near the town of Warren. Jan and I dutifully took a tour of the Lavender Pit overlook and informed White Shoes that we were a little late to this one. Perhaps Phelps Dodge would consider a joint venture. After this fiasco, Jan decided to check out the Southeastern Arizona Paleozoic black shale scene for Kupferschiefer Type Copper Deposits and I learned a lot of interesting details about the Kupferschiefer Copper model in which Jan Krason was an acknowledged world expert.

I subsequently made quite a nuisance of myself by writing White Shoes’ boss about my frustrations with what I considered a lunatic exploration program. When I returned to UA for my senior year, John Guilbert urgently ushered me into his office and said something to the effect of “What the hell did you do?” Texas Gulf had sent him a letter prohibiting me from saying anything about what I had done on my summer vacation. So much for the initial advisal of going around immediate management if you thought you had some irreconcilable difference. I did find out a few

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**Member Spotlight—Continued from Page 3**

months later that White Shoes was terminated. So began my career of “telling it like I think it is” and “marching to my own drummer.”

**What is your most memorable field experience?**

Most of my memorable field experiences have to do with snakes, including a recent encounter with a large nontoxic member of the boa family during a trip in Brazil. During a ‘whirlwind tour’ of a regional gold play, the lead vehicle screeched to a stop on a jungle road in Amazonia, just in time to avoid running over an 8 foot boa constrictor. A group of us quickly assembled to marvel at the reptile. Like many Latin cultures, most Brazilians are deathly afraid of snakes and so kept a polite distance from the beast, which by that point I was pretty sure was a girl and had just had lunch, giving her a docile demeanor and the telltale bulge. To this point on the trip the Brazilians



had been putting up with my no-nonsense, somewhat low pH geologic commentary and we had not really established a personal rapport, so I decided to accelerate the personal side of things. After touching the snake discreetly and receiving no reaction (the boa was quietly slithering up the road embankment attempting to make a diplomatic escape), I thought to myself, “This should impress ‘em,” and proceeded to pick up the snake. Needless to say the entourage was surprised and impressed, and I suddenly became a lot more interesting to them. I made several new friends after the encounter and I look forward to renewing my relationship with my Brazilian friends later this year. I hope to see some more snakes but I would much rather pick up a big South American Green iguana along with a few good rocks.

**What do you consider your greatest professional achievement(s)?**

I am most proud of three geologic concepts that I developed over the past 30 years:

1. The Magma-Metal Series classification and geologic approach which has been used to advise target designs for numerous discoveries of gold and copper deposits.
2. The layered earth geologic model which includes a new layer called the “serpentosphere.” (GOOGLE it!).
3. A serpentinite powered origin of oil model. Everything from mantle hydrocarbons to magmatic hydrocarbons to hydrothermal oil (oil beats any water solvent as a transporting agent for metal; especially gold, PGE elements, and mercury). The origin of oil is not about dead dinosaurs.

If these concepts are validated (and they will be), they will change the way humans look at rocks.

**Your greatest achievement EVER?** Keeping the Magma-Metal Series concept going for over 37 years through thick and thin. If I had to do it all over again, I wouldn’t change a thing (well, maybe a few things).

**Do you have any hobbies?** Collecting minerals.

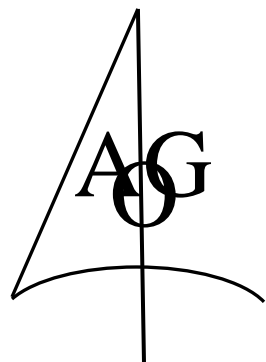
**Water, Whiskey or Wine?** None of the above. . . right now I am sipping a Milagro tequila.

**Thanks, Stan!**

## ANNOUNCEMENTS

The February meeting will be sponsored by:

### ARIZONA OIL AND GAS, INC.



Thank you for your generous sponsorship, which helps to offset meeting costs!

Carmon Decker Bonanno, President  
PH: 816-223-3712  
FX: 520-432-6624

### FIELD TRIPS

AGS announces **Arizona Centennial Fieldtrips** to be scheduled throughout the year. If you have an idea for a trip you'd like to lead or coordinate (with or without guidebook), please contact Cori Hoag at choag@srk.com or Doug Shakel at dshakel@dakotacom.net.

**GeoGRAFX GIS Services** cordially invites you to an Open House to celebrate their move to larger office space on Friday, February 17, 2012 from 5:00 p.m. until 7:00 p.m. Meet the GeoGRAFX staff, see some of the exciting projects they are doing for the mining industry and get a sneak peek at early work on a cloud-based investment portal.

1840 E. River Rd., Suite 300, Tucson, AZ 85718  
Please reply by February 12 if planning to attend  
520-744-4457 or bcarroll@geografxworld.com

### Welcome New AGS Members!

Peter Dunn, Tucson, AZ (a former AGS member)  
Richard K. Jones, retired, Tucson, AZ  
Fredrick Rixton, retired, Tucson, AZ  
Angela Roach, Freeport McMoRan, Tucson, AZ

*Thanks* to the following AGS members for their recent generous donations to the J. Harold Courtright Scholarship Fund:

*Frederick Graybeal*  
*Tom Prisciantelli*

*Greta Orris*  
*Eric Seedorf*

The **Tucson Gem, Mineral and Fossil Showcase** runs from January 28 through February 12, 2012. Thousands of participants and attendees from all over the world will be buying and selling at more than 40 locations throughout Tucson. If you are in the market for beads, a piece of petrified wood, a dinosaur skeleton, or a meteorite, this is the show for you! Just look for the big white tents. The main event, the "Tucson Gem and Mineral Show" is at the Tucson Convention Center during the final weekend. For more information: <http://www.visittucson.org/visitor/events/gemshow/>

### From the Arizona State Geologist's Blog:

On January 7, 2012, Lee Allison, Arizona State Geologist, Director of the Arizona Geological Survey, and AGS member, reported on his blog at <http://arizonageology.blogspot.com/>:



Senior executives in seven major industry segments worldwide "expect their companies to be affected by minerals and metals supply scarcity in the next five years," according to a report from PricewaterhouseCooper titled "Minerals and metals scarcity in manufacturing: the ticking timebomb".

The key conclusions of the report are:

- Major manufacturing companies consider minerals and metals scarcity an important issue for their business, but do not see sufficient awareness of this topic among all their stakeholders.
- The risk of scarcity is expected to rise significantly, leading to supply instability and potential disruptions in the next five years, but this also creates opportunities for competitive advantage.
- Because of the crucial nature of these minerals and metals, companies expect that the impact will be felt throughout the entire supply chain.
- Economic and political drivers of scarcity are generally seen as much more important than physical drivers.
- The renewable energy, automotive and high-tech industries have a high level of co-operation with their first-tier suppliers and customers.
- For a large majority of the companies interviewed, efficiency and collaboration throughout the supply chain are seen as essential to responding to the risk.

**REMINDER: AGS dues are payable by January 1, 2012. Thanks to all members who paid on time, and to those of you who pay for more than one year in advance!**

### New AGS Policy in 2012

AGS loses money on dinner meetings, largely because of no-shows. Therefore, the AGS Executive Committee has decided to invoice those members who reserve a meal and do not show up for the meeting. ***This new policy went into effect on January 3, 2012***. Reservations can be cancelled *without penalty* by calling the AGS reservation line (520-663-5295) before 8 a.m. on the Monday before the dinner meeting. We are unable to respond to every message left on the answering machine, but if you cancel a reservation in time, you will not be charged. Even if you are unable to cancel before Monday at 8 a.m., please let us know you are unable to attend. We may be able to give the reservation to someone else who forgot to reserve a meal.

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.

**AGS 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.

## 2012 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.