Arizona Geological Society Newsletter

DECEMBER 2011

December 6, 2011 DINNER MEETING

Dr. Spencer Titley 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 December 2, 2011.

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.

METALS AND THE HISTORY OF SOCIETIES

S. R. Titley, University of Arizona

The evolution and dissolution of human societies is closely linked with the use of metals. The earliest dated associations are in the first "cities" where archeological remains in the Anatolia region of Turkey are comprised of primitive tools made of copper from nearly 10,000 years ago. Copper was overtaken by bronze following the discovery of smelting, possibly in the firing of painted pottery. The age of bronze closed about four thousand years ago in the middle east when the source(s) of tin were no longer accessible. The first iron implements aside from iron meteorites were the implements of nearly 5,000 years ago. After the creation of efficient bellows, which allowed for the attainment of high temperatures, iron became the metal of choice for weapons and tools. Gold, rarely found in burials, is recorded in sites five thousand years old. It has been reasoned that because of its value, only kings could afford its burial; the artistry of its wealth is found in burials of kings and in Egyptian Tombs and much gold is inferred to have been recycled.

From these starts, a continuous evolution of both use and discovery of copper, iron and gold has traced the expanded and increasingly complex societal demands for metal. Nations have formed and disappeared in patterns that reflect the influence of this triad of metals, together with mercury, tin, lead and silver. It is the malleability and conductivity of copper, the strength of iron, and value of gold, however, that represent the most material, most useful, and most consistent reins of societal evolution over ten thousand years. And their utility and use has not diminished.

About the Speaker

Spencer R. Titley is Professor of Geosciences Emeritus at the University of Arizona where he has taught Economic Geology, Geochemistry, and Regional Geology for more than 50 Years. He graduated from the Colorado School of Mines with the Degree of Geological Engineer in 1951 and received his Ph.D. from the University of Arizona in 1958. During studies at Mines, he worked partial summers as a contract miner in Colorado. He has worked full time in industry as a mining and exploration geologist with stints at Gilman, Colorado and Hanover, New Mexico, as well as in exploration geology in the southwest. He has traveled widely and written extensively about ore deposits in regions of the Pacific Rim where he has worked during release time as a teaching consultant with many corporate exploration groups and as an exploration consultant in deposits of island arcs. His professional focus has been on the geology, exploration and engineering parameters of ore deposits in the Pacific Rim with emphasis on porphyry copper deposits. He continues to teach, write and carry out research at the University of Arizona.

Courtright Scholarship Award

The Arizona Geological Society is happy to announce that the 2011 Courtright Scholarship has been awarded to ***James Girardi,*** a Ph.D. student from the University of Arizona working under Mark Barton. James is conducting a field and lab study involving geologic and alteration zone field mapping, geochemistry, geochronology, and petrogenetic and tectonic interpretation of Jurassic arc rocks titled, "Jurassic Volcanism and Magnetite-Apatite Mineralization in the Southern Palen Mountains, Southeastern California."

From the Arizona State Geologist's Blog:

Lee Allison, Arizona State Geologist, Director of the Arizona Geological Survey and AGS member, posts timely (and fascinating!) information on his blog at ***http://arizonageology.blogspot.com/***. Some recent posts include:

November 23, 2011:

The Obama Administration is proposing significant changes to hard rock mining laws, but one called the "Abandoned Mine Lands Hardrock Reclamation Fund" is generating angst in the mining community. Paraphrasing the legislative proposal, all operators of hard rock mining operations shall pay to the Secretary of the Interior, a reclamation fee based on the tons of material displaced by the operation at the rate of 7.8 cents per ton of material displaced for fiscal years 2012 through 2015. Beginning in 2016 and in each subsequent fiscal year, the Secretary may adjust the fee rate. The fees would go into the reclamation fund.

Opponents of the fee are calling it a "dirt tax" because it applies primarily to the dirt and rocks overlying an ore deposit, sometimes called overburden. In some cases, the amount of overburden can be a larger volume than the underlying ore-bearing rocks. Also, the overburden must be removed first to reach the ore, meaning additional upfront costs before any revenue is generated. The National Mining Association says the Administration's own estimate is that this will cost the mining industry an additional $1.8 billion.

This is separate from proposals to charge reclamation fees or royalties on the ore itself. Arizona produces a little over 10% of the non-fuel minerals of the nation, so I would imagine a comparable amount of the fees would come from Arizona mining companies.

November 27, 2011

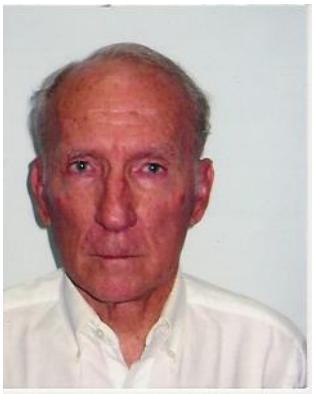
The cover story in the November issue of AGI's *EARTH* magazine offers a grim prediction of the "Return of the Dust Bowl in the American West" that includes Arizona. The article says researchers from a variety of disciplines concur that "Over the next two or three decades, the American West. . .will transition to a climate that may make the 1930s Dust Bowl seem mild and brief." This summer's multiple haboobs in southern Arizona are given as examples of what the future may increasingly hold for us.

The cause is a combination of natural and human causes. "Persistent drought, increasingly violent and variable weather, urban and suburban development, off-road recreational vehicles, and even the installation of large-scale solar energy arrays threaten to shroud the West in dust." One of the biggest factors, and biggest unknowns, is the Pacific Decadal Oscillation (PDO) that moves on a cycle of 20-50 years. A favorable PDO is described as the source of the anomalously wet 20th century, on which we based a lot of our water planning.

In addition to drought-related effects, longer dry seasons lead to more wildfires. And the increase in dust brings more respiratory ails such as Valley Fever.

It's possible there will be a change in trajectory of one or more of the causal factors, but the article cautions that none of that seems to be happening.

December Member Spotlight—Richard D. Jones



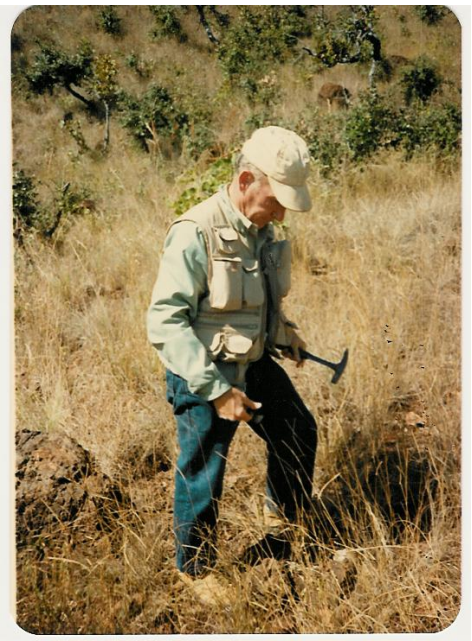
Richard (Dick) Jones was born in Yuma, Arizona in 1932 and he grew up there. He attended the University of Arizona, where he earned a B.S. in Geology in 1956 and an M.S. in Geology in 1957. Shortly thereafter, Dick embarked on a career that would take him all over the world. . . more on that later.

Dick met Iraides Morais Gontijo in Brazil during his travels. They married in 1966 and raised two children—Carolyn and David. Iraides passed away in 1996. Dick is an active AGS member, attending as many field trips and monthly AGS meetings as possible. You can catch Dick having a beer and swapping stories during the social hour prior to the monthly dinner meetings.

How did you first become interested in geology? I started out at the U of A in Metallurgical Engineering, and had my first geology courses as a junior—Geology for Engineers, from John Lance, plus Crystallography and Determinative Mineralogy from Fritz Galbraith and John Anthony. I was hooked. I entered grad school the year Bill Lacy arrived at Arizona from Cerro de Pasco, and took his Advanced Ore Deposits class, the first class he taught at Arizona. Spence Titley was in the same class. Later I was John Anthony's lab assistant in two mineralogy labs and Evans Mayo's lab assistant in an undergraduate structural geology lab. There was very little for me to do in the structure lab, so Dr. Mayo devised problems to keep me busy, mainly making cross sections from his original field sheets from his classic work on the Mt. Whitney and Mt. Lyell quads in the Sierra Nevada. It was great preparation for thesis work.

What was your first job? I watered and mowed lawns (push mower, not motorized) in Yuma in the summers when people went on vacation. Everyone had lawns in those days, and in the heat of summer, the grass needed watering every other day. It was all Bermuda grass, and I could sneeze for half an hour after mowing because I was (and still am) allergic to the pollen.

What was your first job as a geologist? The first job remotely connected to geology was after geology field camp in the summer of 1955. I was hired by Kenyon Richard of ASARCO as a sampler on a diamond drill. ASARCO had just started drilling the present day Mission mine. I measured the stick-up and footage drilled because ASARCO didn't trust the drillers to do it right. I put the core in boxes, marked the blocks for each run, sampled the sludge in five gallon milk cans, then trucked the samples to the lab at the Silver Bell mine. The core logging was done by Keith Papke and Byron Hardie.



What is your most memorable field experience? Probably in Liberia, West Africa, in 1958 when Liberia Mining Company was starting exploration of the Mano River iron ore project. I had a line cutting crew of about 18 men and we were following an elephant trail atop a ridge capped with ferruginous laterite. I was third in line with a couple of bush cutters from the Gola tribe in front to watch out for snakes and cut vines and stuff when I spotted a green mamba lying in a depression in the rock. My bush cutters stepped right over it without noticing it. While trying to tell them to watch out, I stumbled and fell almost on top of it. I remember thinking with great clarity on the way down that I would land on my right hand and roll to my right away from the snake so if he got me it would be my hand that got bit. I did exactly that, and then a long black arm with a machete reached over me to whack the snake. The Liberian behind me had seen it too. Talk about nervous in the service, that was me. When I got back to Yuma later that year, I jumped at the sight of a green plastic garden hose in my parents' back yard. Having spent a good many years in the tropics, I have lots of snake stories, but that was probably the closest call.

(Continued on page 4)

December Member Spotlight—Richard Jones—continued

What do you consider your greatest professional achievement? Running Republic Steel Corporation's exploration program in Minas Gerais, Brazil, in 1960-62 and 1965-69. We started the Gongo Soco iron ore project with reconnaissance mapping at 1:10,000, followed up with detailed mapping of two square kilometers at 1:1,000 scale with plane table and alidade, doing the topography and geology at the same time, two geologists and one instrument man. We then explored the deposit with several kilometers of hand-dug trenches, channel sampled those, drove some 1,600 meters of cross-cut adits, channel sampled those continuously from hanging wall to footwall. I did the ore reserve estimates (no computers in those days, but I did have an Olivetti electric calculator) and saw the project through into a mining concession. The deposit is in production now, and is currently operated by Companhia Vale do Rio Doce (VALE).

Your greatest achievement EVER? The fact that I managed to stay employed fairly continuously throughout my career, probably due more to luck than virtue. I worked for seven different companies but was only unemployed for about seven months between 1957 and 1996 when I finally retired. I had a lot to do with two discoveries, the Gongo Soco iron deposit and the Jurutí bauxite deposit, both in Brazil. I was involved in the economic evaluation of the Mt. Gibson and Boddington laterite-hosted gold deposits in Western Australia, and kept my employers from spending a lot of money on the many worthless prospects I rejected.

Tell me more about your career path. . . It sounds like you have been all over! I mentioned my summer job with ASARCO. The following summer, I worked for Bear Creek under Ray Robinson when they were starting the Safford Project. After receiving my MS in 1957, I explored a rutile deposit in Oaxaca, Mexico for Cia. Minera El Tisur, a Republic Steel subsidiary. We shut the project down after three months, and I was sent to one of Republic's iron mines in the Adirondacks of New York through the end of 1957. From there, I went straight to Liberia to start exploration on the Mano River iron ore project, directed by Joe Patrick, Liberia Mining Company's chief geologist. After six months, we pulled out of the bush for the rainy season, and when I returned in the fall, the project had changed management. I stayed with it until June of 1959, and then left the company. Republic Steel's Chief Geologist Ed Fitzhugh hired me with the intention of sending me to Brazil, but as they weren't quite ready, I was sent to Crystal Falls, Michigan for the winter where we drilled a blind iron ore deposit beneath an abandoned airfield. Nothing between us and the North Pole but a barbed wire fence, and below zero most of the time.

If that wasn't enough, when spring was almost there, I was sent to western Ontario where we drilled another iron ore prospect beneath a frozen lake. We had to hurry to finish the job and get the drills off the ice before breakup. Finally, in June of 1960, I did get to Brazil, and we began mapping and sampling the Gongo Soco deposit. That lasted two years, and then because we were unable to get the necessary government permits to continue, we put the project in mothballs. In 1962 I went to Liberia Mining Company's Bomi Hills mine for two years, spent mainly drilling to expand ore reserves and providing technical assistance to the struggling Mano River project, in which LMC retained a small interest.

I returned to Brazil in 1965 and stayed until the end of 1969, seeing the Gongo Soco project through into a mining concession. With that completed, the only job Republic had for me was back in Liberia. By then I had a wife and a baby, with another on the way, so I decided to leave the company.

In 1970, I was hired by Bear Creek Mining Company to work out of the Southwest District office in Tucson, doing mainly aeromag follow-up for a year, and then I looked after the drilling at Courtland-Gleeson. Then came the big layoff at the end of 1971—Bear Creek laid off 66 out of the 100 geologists on their payroll.

After three months of job hunting, in April, 1972, I was hired by Reynolds Metals Company's Chief Geologist John Moses to explore for bauxite in the Amazon region of Brazil. My only acquaintance with bauxite at the time was with specimens in a mineral collection, but I spoke fluent Portuguese, and that's what they wanted. I was in the Amazon for three years, during which time we discovered the Juruti bauxite deposit which is now in production. In 1975, my daughter was approaching school age, and I arranged a transfer back to the U.S. I was sent to western Kentucky, to

Do you know someone who would be an interesting subject for a "Member Spotlight" column? Email his/her name and contact information to ajones@clearcreekassociates.com.

December Member Spotlight—Richard Jones—continued

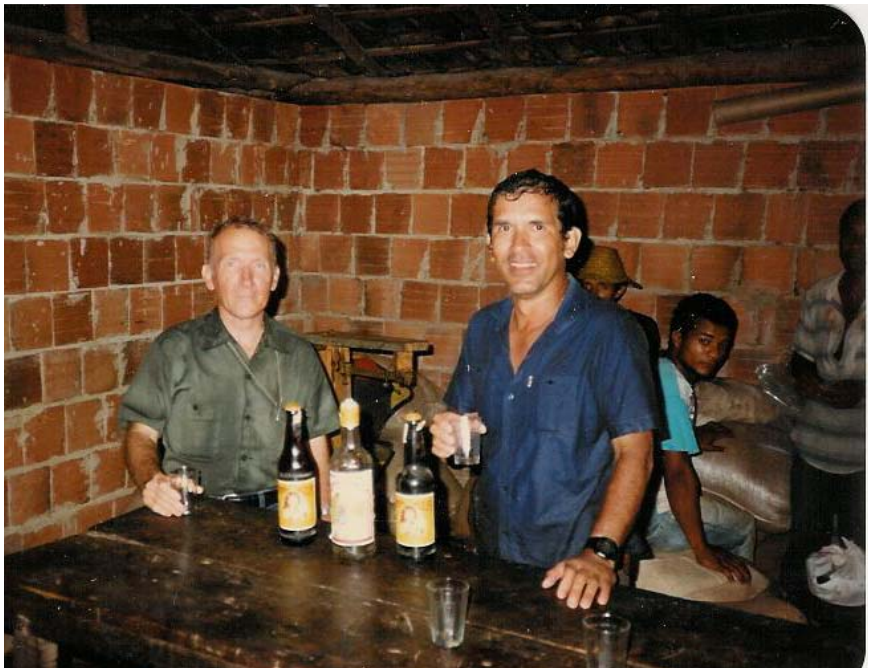
continue their fluorspar exploration program. During the five years I was based in Kentucky, I spent a couple of months in Western Australia bulk sampling the Saddleback bauxite deposit, and also in Georgia, where the company had large reserves of kaolin clay, an alternate alumina resource.

In 1980, I was transferred to Reynolds' corporate headquarters in Richmond, Virginia. During that time, I was involved in exploration for bauxite and gold in Western Australia, gold and PGM in Brazil, and gold in Virginia, North and South Carolina, Georgia, Alabama, and Arkansas, and in northern Nevada. I was based in Richmond until I retired in 1996.

What are your hobbies? I like researching historical subjects, military, western, mining, ancient technology. I still collect minerals, and build military models related to the history I'm studying. I'm particularly interested in the history of the Gongo Soco mine mentioned previously. It was originally a gold mine, discovered in 1808, and was purchased by an English company in 1825, the first foreign mining company authorized to operate in Brazil after Independence. A lot of interesting people had connections with that mine. How many deposits can boast analyses performed by Michael Faraday?

Water, Whiskey or Wine? Whatever the natives are drinking. Here in Arizona, usually beer, preferably dark.

Thanks so much, Dick!



Dick imbibes shots of cachaça with Jorge, a Bolivian geologist, somewhere near Niquelandia, Goias, Brazil.

AGS dues are based on a calendar year. That means your dues for 2012 are payable by January 1, 2012. You should have received an email from AGS to let you know if you owe dues for 2012. Many of our members are paid up for a few years in advance. If that's you, THANKS!

Welcome New AGS Members!

The Newsletter Editor has been remiss on keeping up with the listings of new members. Some of these may have already appeared in this newsletter—others may never have been posted. We will attempt to do a better job in the future. If you are a new member and I failed to include you, please send me an email at ajones@clearcreekassociates.com.

Patrick Garretson, Barrick Gold, Oro Valley, AZ
Robert Allender, Jr., Scottsdale, AZ
Javeed Mohsin, Abbotabad, Pakistan
Felicia Novotny, Student, Tucson, AZ
Michael Miller, Bureau of Reclamation, Glendale, AZ
Praveen Kumar, ITT Bombay, Samastipur, Bihar, India
Cin-Ty Lee, Rice University, Houston, TX
Christopher Slocum, Arizona Oil and Gas, Inc., Bisbee, AZ
Dan Hausel, W.Dan Hausel Geological Consulting, Gilbert, AZ
Ryan Mitchell, Clear Creek Associates, Phoenix, AZ
Simon Heath, Arizona State University, Tempe, AZ
Verl Garrett, Bureau of Land Management, Glendale, AZ
Warren Allen, Tucson, AZ
Samuel Grainger, Cwmbran, Wales, U.K.
Brin Lindley, University of Arizona, Tucson, AZ
Kerry Paul, University of Oklahoma Student, Tucson, AZ
Michael Ehrhardt
Bradley Hay, Schlumberger Water Services, Tucson, AZ

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 will be in effect for the January 6, 2012 meeting.

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.