



Arizona Geological Society Newsletter

NOVEMBER 2017

November 7, 2017 DINNER MEETING

Who: Dr. Eric Sundquist is the 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 **SABINO 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 \$30, Guests \$33, Students Members free with on-line reservation (\$10 without).

RESERVATIONS ARE REQUIRED: Reserve on the AGS website (<http://www.arizonageologicalsoc.org/events>) by **11 a.m. Friday, November 3**. Please indicate Regular (braised short ribs, sauteed vegetable, Boursin potato mash), Vegetarian (Roasted Vegetable Towers) or Salad (Chopped Chicken Machaca Salad) meal preference. Please cancel by **Friday, November 3 at 11 a.m.** if you are unable to attend - no shows and late cancellations will be invoiced. (Please call or text David Briggs at 520-784-3954 if you must cancel after the deadline. We may be able to sell your meal and you won't be billed).

The November
dinner meeting
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ABSTRACT

Geological Perspectives on Carbon Dioxide, the Carbon Cycle, and Carbon Management

Eric T. Sundquist
U.S. Geological Survey

In 1957, the prominent oceanographer Roger Revelle described the increase in atmospheric carbon dioxide concentrations as a “large-scale geophysical experiment.” Over the decades since this insight, investigation of the carbon dioxide “experiment” has expanded to include many areas of the natural and social sciences. Some of the most important emerging perspectives have come from geologic evidence linked to changes in atmospheric carbon dioxide in the pre-human past, and from geologic understanding applied to analysis of potential future human carbon dioxide management. The geologic record provides abundant evidence for changes in the amounts, rates, and forms of carbon buried in sediments throughout Earth’s history. Geoscientists have long sought to understand how these changes in the cycling of carbon might have interacted with changes in climate. The peer-reviewed literature now provides a broadly coherent collection of narratives in which

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atmospheric carbon dioxide is viewed as a central mediator of feedbacks linking changes in global climate and carbon cycling in the geologic past. These geo-scenarios are broadly consistent with the range of effects attributed to increasing atmospheric carbon dioxide concentrations in model simulations of current and projected future climate. However, the scenarios often depend on uncertain inferences about oceanic and atmospheric chemistry. The plausible feedbacks linking carbon and climate are diverse and complex, often involving changes in carbon dioxide as both cause and effect of changes in climate over a broad spectrum of timescales. Perspectives from the geologic record highlight significant uncertainties affecting model projections and targets for potential future carbon management.

ABOUT THE SPEAKER

Eric T. Sundquist has been a Research Geologist with the U.S. Geological Survey (USGS) since 1978. His research seeks to understand the natural and human factors that control and respond to the biogeochemical cycling of carbon. A recipient of the U.S. Department of the Interior (DOI) Superior and Meritorious Service Awards, Dr. Sundquist is a Fellow of the American Association for the Advancement of Science. He has edited two American Geophysical Union (AGU) Monographs, *The Carbon Cycle and Atmospheric CO₂: Natural Variations Archean to Present*, and *Carbon Sequestration and its Role in the Global Carbon Cycle*; and he has served as Editor-in-Chief of the AGU journal, *Global Biogeochemical Cycles*. He has served as chair of several national scientific committees, including the AGU Focus Group on Global Environmental Change, the USGS Interdisciplinary Carbon Committee, and the DOI Biological Carbon Sequestration Workgroup. He has also served as a member of the U.S. Carbon Cycle Scientific Steering Group and the U.S. Carbon Cycle Interagency Working Group. He was a coauthor of the U.S. Carbon Cycle Science Plan and the North American Carbon Program Plan. Dr. Sundquist holds a B.A. degree in Geology from Pomona College, and A.M. and Ph.D. degrees in Geological Sciences from Harvard University.



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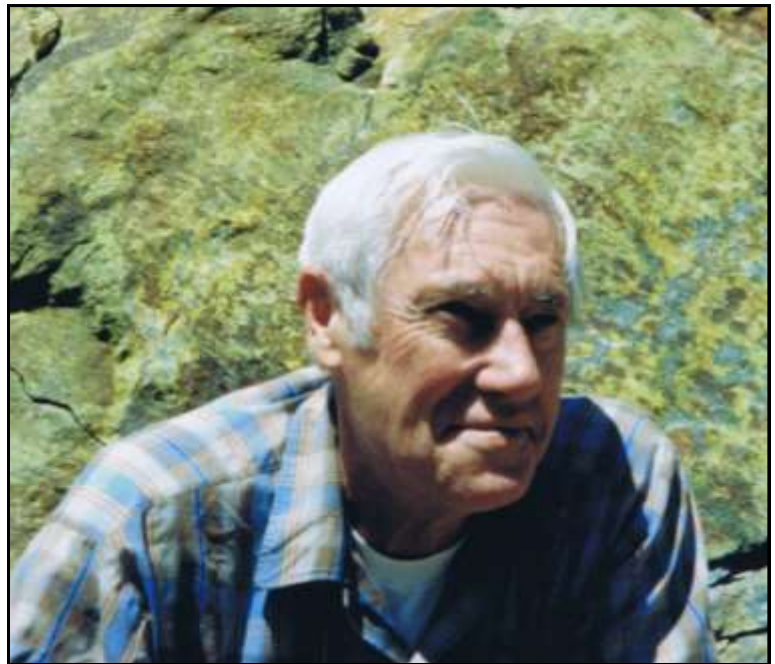
In Memoriam: John Moss Guilbert

Renowned geologist and AGS Lifetime Member John Moss Guilbert passed away on October 17, 2017 at his home in Oro Valley. As a Professor at the University of Arizona, he influenced many young geologists who went on to successful careers of their own. He was a star in the Economic Geology world, and received numerous awards including the R.A.F. Penrose Medal (1998) from the Society of Economic Geology and the D.C. Jackling Award (2001) from the American Institute of Mining, Metallurgical and Petroleum Engineers (AIME). He is known for numerous articles on ore deposit geology, metallogeny, and ore geochemistry. He co-authored *The Geology of Ore Deposits* with Charles F. Park (1986 reissued in 2007).

Dr. Guilbert will be missed by his family, students, and professional colleagues. The following interview, which appeared in this newsletter in 2010, reflects his infectious enthusiasm and the joy with which he faced life.

John M. Guilbert was born in 1931 in Dedham, Massachusetts. He received a B.S. in Geology in 1953 from the University of North Carolina-Chapel Hill. From there he went to the University of Wisconsin-Madison, where he received an M.S. in Geology in 1957 and Ph.D. in Economic Geology with a minor in Physical Chemistry in 1962.

From 1957 to 1965 John was a member of the team at Anaconda's Geological Research Laboratory in Butte, Montana that determined that the depth of ore-bearing veins was limited due to geochemical factors. After his stint at Anaconda, John spent the remainder of his distinguished career at the University of Arizona. While there, he co-authored the classic (and still very current) economic geology text, *The Geology of Ore Deposits*, with



Charles Park, making his name familiar to geologists throughout the world. He retired from U of A in 1993, but he remains busy with a variety of activities, including consulting.

John and his late wife, Mary, raised three children, Anne, Linda, and Paul. He lives in Tucson with his partner Jan Harelson. (NOTE: John married Jan after this interview was originally printed). John shared his story, along with his infectious love of life, from his summer home in New Hampshire.

How did you first become interested in geology? An asthmatic 12-year-old, I was sent in 1943-44 to the Little Outfit School near Patagonia, where the asthma vanished. On horseback pack trips into the Santa Ritas, Huachucas, and Patagonias, I became fascinated by all the rock types and colors, prospect adits, small mine dumps, etc. That was probably the first time I asked, "Why would anyone dig here?"

What was your first job? After lawn-mowing and paper routes, working as a 17-year-old go-fer during the summer of 1948 at a family camp in Maine. Nice granites, nice clams, nice first girl, but not for me.

What was your first job as a geologist? First came a summer of doodle-bugging ("Seismometer Placement Engineering", or "Jug-Hustling") in the Kansas-Oklahoma oil patch for

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Tulsa-based Republic Exploration in the summer of 1952. Then in summer 1954, I worked for Vernon Pick and Leo Miller (Pick Uranium Co.) exploring exposed paleostream beds on mesa cliffs for reduced-zone wall-rock alteration and associated Colorado Plateau uranium deposits around Grand Junction, Colorado. My die was cast.

What is your most memorable field experience? Waking up in a tent in northwestern Argentina on a United Nations Development program mission during my first sabbatical in 1976, stepping outside to a total déjà vu that I was at Silver Bell, and going a few steps to be astounded by the same cactus (cardon), same colors, same alteration! I was an early visitor to a prospect called Bajo de la Alumbrera, with Lowell-Guilbert zoning as if made in Hollywood and (ultimately) 900+ million tons of Cu-Au ore. I was happy to help get it financed and developed in the mid-1990s into an open pit mine that is still in production.

What do you consider your greatest professional achievement? Without a doubt, my greatest professional achievement is that I was fortunate to be able to touch and constructively inform so many undergraduate and graduate students, both in the classroom at the amazing University of Arizona and throughout the world, with *The Geology of Ore Deposits*, with our 17 global U of A Economic Geology field trips, and with worldwide academic and corporate cooperation. What a life!

What about your greatest achievement EVER? My greatest achievement(s) EVER have to include my self-determination to be my family's first member to get a PhD, to have been integral to really understanding the Butte system, to have won a faculty position at UA, to have collaborated with Dave Lowell in our 1970 and subsequent papers, to have worked hard and well at family and career, and to have established a significant professional profile. Also, I am thrilled to have won a second love in Jan Harelson, following Mary's death in 2004. Again I say, what a life!

What are your hobbies? Being a Study Group Leader (and Study Group participant) at Tucson's Osher Lifelong Learning Institute, still involving Geology but also Archaeology, Anthropology, American History, and general science. Also reading, the Red Sox, and woodworking.

Water, Whiskey or Wine? After answering these questions? Whiskey! Normally, water with wine at meals.

Thanks, John!

SCHOLARSHIPS!!

Attention Students: The deadline for applications for the Courtright and M. Lee Allison Scholarships is Friday, October 27, 2017. Please go to the AGS website to download application forms and instructions. The scholarships will be awarded at the December dinner meeting.

Interested in an 8-day Grand Canyon Geology raft trip in 2018?

Contact Alison Jones for more information.

ajones@clearcreekassociates.com

Please contact the AGS Secretary if your firm is interested in advertising in this monthly newsletter.

In Memoriam: Robert Leslie Clayton

Longtime AGS Member Bob Clayton passed away peacefully on October 10, 2017. He is survived by three children and several grandchildren. He was an active member in AGS and will be remembered fondly. Bob's obituary can be read at the following link:

[Obituary](#)

Our condolences go out to the Clayton family.



Above: Bob Clayton (left) on an AGS field trip to the Mission Mine in 2004. Also shown are Coleen Brown (red hard hat), Bob Cummings (center), and Jon Spencer (far right).

Photo courtesy of Cori Hoag.

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New Dinner Payment Policy

The AGS Executive Committee voted in November to institute a pre-pay policy for dinner meetings, beginning in January 2018. This action was necessary due to the numbers of no-shows who never pay for the meal they reserved, even after frequent reminders. This has resulted in financial losses that are not acceptable for the Society.

For those members who need assistance with navigating the online payment, please contact an officer and we will be happy to walk you through the process.

HARDROCK MINING AND RECLAMATION ACT of 2017

Following the House Natural Resources Subcommittee on Energy and Mineral Resources hearing on hardrock mines, the Senate is now wading into mining policy reform. Senator Tom Udall (D-NM), along with four co-sponsors, introduced the Hardrock Mining and Reclamation Act of 2017 (S.1833). Senator Udall's bill would affect mining legislation laid out in the 1872 General Mining Act (30 U.S.C. 24), a law that has remained largely unchanged since its passage. The new bill includes provisions for collecting royalties and establishing a reclamation fund.

The Hardrock Mining and Reclamation Act of 2017 would impose a royalty of two to five percent for new mining operations based on gross income. Although some states charge their own royalties, there is no federal royalty for mineral commodities mined on public lands, unlike oil and gas or coal operations. Opponents of a hardrock mining gross royalty cite the differences in producing commodities from hardrock mines compared to oil and gas or coal; commodities from hardrock mines are not usable until after being processed, and different metals have different markets. The proposed legislation would allow the Secretary of the Interior to grant royalty relief to companies depending on the market and other economic factors.

The bill would also create a Hardrock Minerals Reclamation Fund, similar to the Abandoned Mine Lands (AML) fund for coal extraction sites, to pay for cleaning abandoned hardrock mine lands. AML funding comes from a fee charged to coal companies based on the amount of material they mine. S.1833 would establish a similar fee for hardrock mines that would be determined based on the value of the mining production instead of the material removed.

Sources: American Geological Institute, E&E news, Library of Congress, U.S. House of Representatives

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~ ~ Welcome New Members ~ ~

Fred Croxen, III Jeanmarie Haney
 Sian Proctor Nicholas Van Buer
 Brad Johnson

Arizona Geological Society is grateful to Freeport-McMoRan, Inc. for their generous support of our student members! Freeport-McMoRan sponsored student dinners for the 2017 AGS monthly meetings.



AGS MEMBERSHIP APPLICATION OR RENEWAL FORM

YOU CAN RENEW OR SIGN UP as a new member and pay online. Please go to our website, arizonageologicalsociety.org. Or use the form below if you are more comfortable with the old school approach.

Please mail check with membership form to: Arizona Geological Society, PO Box 40952, Tucson, AZ 85717

Dues (check box) 1 year: \$35; full-time student (membership is free)

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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 the M. Lee Allison Scholarship Funds.