DIVISION OF ENVIRONMENTAL GEOSCIENCES

SPHERES OF INFLUENCE

A QUARTERLY NEWSLETTER FOR DEG – 2012 ISSUE 1

Issue 3 of the Spheres of Influence

By Douglas C. Peters, DEG President 2011-2012

All of the leadership in DEG hope you are finding our quarterly Spheres of Influence e-newsletter to be of interest and some use in your professional activities! This issue includes another of the Executive Committee's short biographies (for our President-Elect this time, who will be taking charge in July).

A book review is included on a politically and economically charged topic, the movement from fossil-fueled electricity generation to "clean" energy sources. Based on the review, it appears to be another overly optimistic view of how all the old can just go away and be replaced with the new with limited or at least "acceptable" impacts. The pundits seem to think that high energy costs and potentially erratic supply must simply be borne by the masses as a price to pay for a major change in how we do business and for the holy grail of a "pure" environment. Incidentally, there is no such thing except in EPA's and their sycophants imaginations given that absolutely "pure" water (as in nothing but H2O), air (as in nothing but the main gaseous molecules), etc. is not found in nature and only can be generated in a laboratory under sealed conditions or very limited events in nature (such as electrical discharge in lightning creating new water molecules from hydrogen and oxygen, and by the way generating that polluting ozone as well). Go ask the masses what they think of higher prices and questionable reliability of power and see what reaction you get!! So, will we just throw the baby out with the bathwater and just quit all fossil-fueled power without backup, or will there be a serious and progressive, yet balanced, effort to both change how we get our power and improve the overall environment? Or will the powers that be find out the hard way that technology change by fiat or shortsighted regulation leads to unforeseen consequences?? Stay tuned and try to keep the public as fully informed about decisions and consequences as you are able from an energy industry viewpoint.

Please let us know if there are topics or material that you would like to see covered in future issues of Spheres of Influence.

Message from Editor-in-Chief Kristin Carter

We are pleased to announce that the March 2012 issue of Environmental Geosciences will feature three interesting contributions on varied topics, including geologic carbon sequestration, stray gas migration, and water-rock interactions. The Indiana Geological Survey presents its latest reservoir characterization and storage capacity research for the Cambrian Mount Simon Sandstone in the Illinois basin. A timely contribution regarding the processes driving stray gas migration, as well as sampling and forensic methods that can be employed to determine the source(s) of gas in drinking water supplies is a great read, particularly with respect to its inclusion of relevant case study data. This issue concludes with a paper regarding the relationship between surface water and outcropping Cretaceous-age shales in Nebraska. Be on the lookout for this next digital issue in a few weeks!

Division of Environmental Geosciences Mission Statement and Purpose:

EDUCATING the membership of AAPG and the general public about important issues that affect petroleum energy minerals exploration and production.

- **COMMUNICATING** to the general public and government agencies the Association's commitment to protect the environment while developing the world's natural resources in a responsible manner.
- **APPLYING** the expertise developed in the petroleum/energy minerals industries and hydrogeology to resolve environmental problems.
- **PROMOTING** environmental self-regulation within the petroleum/energy minerals industries.
- **PROVIDING** relevant educational opportunities and services for professional development of the AAPG membership through seminars and conferences in environmental geosciences, hydrogeology, and related fields.

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BIOGRAPHIES

Current DEG President-Elect
Dr. Tom Temples

Dr. Temples joined the AAPG in 1978 after employment by Texaco, Inc. When DEG was formed in 1992 he joined and became a charter member of the Hydrogeology Committee.

Dr. Temples has 33 years of experience in strategy development for groundwater monitoring, remediation/restoration, development of health and safety plans, Life Cycle cost determinations as well as managing projects involving geosciences, and oil and gas. He served as Director, Center for Water Research and Policy and an Associate Research Professor at the University of South Carolina and is currently serving as an adjunct at Clemson University.

Dr. Temples has performed work in groundwater monitoring for the Nuclear Regulatory Commission and was Senior Geotechnical Advisor for Environmental Restoration DOE's Savannah River Site. He has considerable experience in environmental compliance and restoration and is a subject matter expert in both groundwater and radioactive waste sites.

Dr. Temples received his Ph. D from the University of South Carolina, his MS from the University of Georgia and his BS from Clemson University.

He is an Advisory Board member for the Bob Campbell Museum of Geology. Dr. Temples is a Registered Professional Geologist in Arkansas, a Registered Environmental Manager and a Certified Petroleum Geologist.

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BOOK REVIEW

The Dirty Energy Dilemma: What's Blocking Clean Power in the United States. Benjamin K. Sovacool. Connecticut: Praeger Publishers, 2008. 294 pp.

The Dirty Energy Dilemma is a critical evaluation of the current state of energy usage and demand in the United States (as of 2008), and ultimately poses the plausibility of clean energy technologies to meet current and projected needs.

Sovacool begins with a review of the present electric power system, focusing on fossil fuels and nuclear—their supply, efficiency, and costs (both economic and environmental). He addresses the four major challenges of the U.S. electric utility sector: meeting demand projections, finding clean and abundant sources of energy supply, maintaining the infrastructure needed to distribute electricity and minimizing the destruction of the environment. After a thought-provoking, though very critical review of conventional sources (and somewhat outdated portrayal of supply, cost, and demand), Sovacool's main arguments against conventional sources are that they are capitally intensive, they force compliance to traditional means of electricity generation, and they are environmentally destructive. He summarizes these aspects as four major energy challenges: demand, infrastructure, fuel supply, and environment. He then builds his argument that clean power systems can meet these four challenges more successfully. Sovacool focuses on the clean power systems of energy efficiency and demand-side management (DSM), renewables, distributed generation (DG), and combined heat and power (CHP). Sovacool provides solid theoretical arguments to these systems with respect to method, cost and energy savings, and reduced environmental impact, however, he does not provide a clear quantitative analysis of these systems with respect to realistic supply and applicability to the diverse energy markets across the United States. His arguments could very well be overly optimistic, with a lead-in statement that "clean power technologies can do everything fossil-fueled and nuclear plants currently cannot." Sovacool then transitions into the wide range of barriers to clean energy technology implementation, which include economic, political, regulatory, cultural, behavioral, aesthetic, and environmental obstacles.

Sovacool concludes with four proposed mechanisms to facilitate adoption of clean power: make clean power mandatory, eliminate energy subsidies for conventional electricity technologies, price electricity accurately, and establish a national systems benefits charge to inform the public, provide low-income assistance, and fund energy efficiency. Here, Sovacool's arguments could again be overly optimistic in assumptions of limited economic impact with the proposal of obligatory feed-in tariffs (FITs) to require the energy industry to utilize clean power while being exposed to a lack of price regulation and subsidies, including tax treatment, trade restrictions, public funding and direct regulation, and abolishing price caps. These proposed mandates could result in more erratic price fluctuation and perceived energy crises in the United States (i.e., California in the early 2000s to pose an extreme example).

Though overly optimistic with clean power and pessimistic with conventional fossil-fuels and nuclear, his arguments and review of all aspects of barriers to clean power are thought-provoking and compelling. There certainly needs to be more emphasis on a national scale- at the public, industry, political, and regulatory level placed on the viability of cleaner options sooner rather than later given the current dependency on largely non-renewable sources. Sovacool's review is definitely a stern prod in that direction.

Danielle Deemer
February 2012

THE RANT: ASTRONAUT OR ASTRONOMER?
How does your learning approach/learning needs affect the kind of geologist you become?

The Astronomer: Kris Carter

Those of you film buffs out there no doubt recognize this question from Jurassic Park III, when Dr. Alan Grant talks with Eric Kirby, the teen stranded on Isla Sorna after a parasailing trip gone wrong. Eric's parents and a small contingent of people, including Dr. Grant, came to this"other island with dinosaurs on it" to rescue him, only to be marooned themselves. At the presumed demise of Alan's graduate student, Billy, he and Eric struck up a conversation about which is better – being an astronaut, who can go into space and set foot on the moon, studying the universe first-hand and in person, or being an astronomer, who studies these heavenly bodies that are millions and millions of miles away with feet firmly on the ground. Dr. Grant opines that his geologic discipline – paleontology – is like being an astronomer; he is able to study and learn about extinct animals using evidence contained in the rock record, in other words, from a "place of complete safety."

This begs the larger question: do our learning preferences guide us to one particular discipline or another as we enter the field of geology? Based on my experience, the answer is a resounding yes. Let me explain.

It is commonly accepted that geologists can visualize that which we cannot see (at least to some degree), because let's face it, a lot of what we study cannot be seen in the here and now by the naked eye. Even so, that may not be our dominant approach to learning. Even though a majority (that is, about 75 percent) of people are visual learners, some people are principally auditory learners – they learn best by hearing something, and others may be tactile learners – they learn by touching, smelling, and tasting.

When I first started taking geology courses in college, I didn't know I was destined to be an "astronomer", but that is clear to me now based on the fact that I immediately gravitated to classes that involved fluid flow through porous rocks. I loved my geochemistry, hydrogeology, and mineral-water interaction courses, and completed undergraduate and graduate-level theses in aqueous geochemistry and the influence of rock properties on fluid flow. Whether that fluid is groundwater, oil, gas, or brine, it still moves through pore spaces in permeable rocks based on physico-chemical interactions that are occurring at the molecular level. Did I need to dig a hole or core through rock to satisfy myself that groundwater exists or that fluids move through pore spaces and forever change the surfaces with which they come in contact? No. Even though I cannot see or touch a single molecule of water or methane, I am comfortable researching these phenomena by using high-tech microscopic and laboratory analytical techniques to visualize, quantify, and otherwise describe pore fluid behavior. I suspect that this may also be the case with many of you in the disciplines of hydrogeology and geophysics.

What say you, Danielle?

The Astronaut: Danielle Deemer

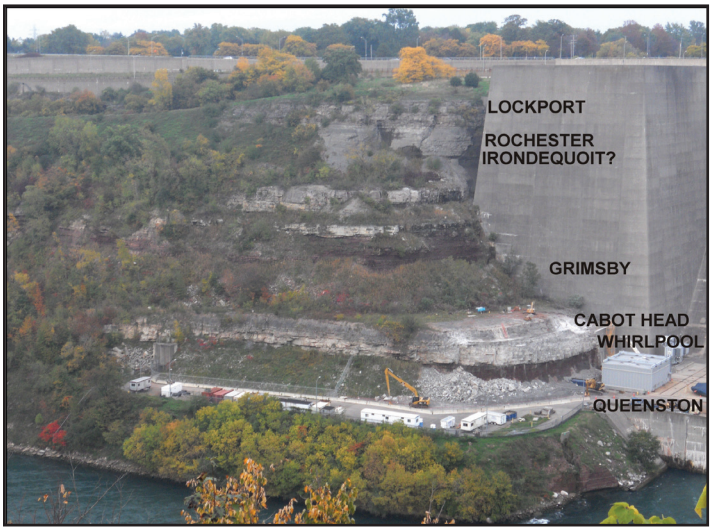
In contemplating this topic, I recall so many instances where I have been amazed to learn about an abstract (or abstract to me) concept in the classroom, only to confirm its existence in the field. One of the most striking recollections of this is my first mountain experience (ok, not abstract- but it made a big impact). I ventured out to California and was amazed at the majestic (and still growing!) Sierra Nevada Mountains. My first thought- "to see them is to confirm their existence."

My learning experiences were very theory based for the majority of my education- little hands on experience. My first degree is in biology, and I think the draw for me was based in the lab experience- the labs helped to verify some very abstract theoretical concepts. When I discovered geology, I was more than sold. I found a discipline with clear and applicable building blocks (even more so for me than biology)- where theory could be observed in nature, and nature made so much more sense with the theory.

It's amazing to study the concepts- learn the theory, and then have the ability to apply in the field and at multiple scales. I am reminded of a project that a colleague of mine was working on- a project to understand the link and predictive means between shapes in nature. It is so interesting to make connections that begin with observations in nature, lead to the establishment of analogues, which are then used as predictive means to better understand systems, processes, even emerging plays. Though as my colleague recalled his time on that project, he stated those were two years of his life he will never get back… In any case, I recognize the beauty and power (and for me, often the necessity) of direct observation- that which is seen, touched, hammered upon, agonized over (sometimes for years). It starts with going to the puzzle, looking at the pieces, walking on them, staring at them, measuring them- an iterative process with field and office. As a geologist, going to the rocks makes it real and keeps us honest. One subsurface project that I worked on clearly demonstrated this concept to me. The area was a complex overthrust environment- we had extensive 3D seismic and hundreds of logs. The 3D seismic interpretation gave one interpretation that was quite independent of the ground-truthed log data. Only in combining the log data with the 3D seismic did we keep ourselves honest and unravel the 3D puzzle. Perhaps that's part of the excitement (and frustration) with the processes that take an oil and gas geologist from exploration to development to production- as development of a field progresses, the theories change, become refined, and evolve into what is actually occurring as revealed through data and direct observations.

So for me, so many times, seeing (and hammering upon) is believing. Going to the rocks puts it all together for me- clay mineralogy makes more sense, Reynolds number has an even bigger purpose, and climate and tectonics become more intermingled than either-or. Perhaps my direct observation needs are why I migrated more closely to structural geology and left the finer details of fluid flow to my Kris Carter-like colleagues…

BEAUTY IN GEOLOGY



Niagara Gorge
Submitted by John A. Harper, P.G., Chief, Geologic Resources Division
PA Department of Conservation and Natural ResourcesBureau of Topographic & Geologic Survey

View of Robert Moses Niagara Hydroelectric Power Station in New York from parking area near Sir Adam Beck Hydroelectric Generating Station between Niagara Falls and Niagara on the Lake. Note entire Lower Silurian/uppermost Ordovician sequence viewable at north end of dam.

Triassic Latemar Platform, Dolomite Mountains
Lago di Carezza, Italy
Submitted by Chris Willan, Director of Geology, EQT Production Company

View of the Dolomite Mountains in Lago di Carezza, Italy. Specifically featured is the Triassic Latemar Platform, an isolated carbonate platform. Dramatic uplift occurred during Alpine tectonic shortening initially during the Eocene and later during Neogene compression and strike-slip deformation.

Links of Interest

http://www.aapg.org/
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http://energytomorrow.org/energy/hydraulic-fracturing/
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Invitation to Contribute and Attend SAGEEP 2012 Special Workshop

Hydrofracturing 101: What Is It, What Are The Issues, and How Can Geophysics Help?
Thursday, March 29, 2012, Tucson, Arizona

We welcome your articles, comments and feedback for this quarterly Newsletter publication.

Kristin Carter, DEG Editor-In-Chief
Danielle Deemer, Managing Editor

Submissions deadline for 2nd Quarter Issue: April 1, 2012
Submit to ddeemer@talismanusa.com

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1992-2012

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