



SPHERES OF INFLUENCE

A QUARTERLY NEWSLETTER FOR DEG – 2014 ISSUE 2

President's Column

Douglas E. Wyatt Jr.



April was a wonderful month for the Division of Environmental Geosciences. The DEG sessions at the Annual Convention in Houston, both oral and poster, had excellent topics and speakers, and were very well attended. Our DEG luncheon was filled and our speaker was outstanding. DEG contributed to the Advisory Council meeting, and our audiovisual report to the House of Delegates received rave reviews! It was fun.

With the growing demand for cleanly produced and utilized oil and gas comes a growing role for the DEG. We have been asked to join with EMD in looking at the utilization and merger of alternative energy sources, particularly solar, coupled with the production cycle of oil and gas. We have talked with the DPA towards working together to help merge our efforts with similar efforts in our sister organizations to which many of us also belong. Our plans for a special topics meeting next year are proceeding well and many within AAPG, both nationally and internationally, are eagerly awaiting our draft whitepaper on hydraulic fracturing. What we do has immediate and visible relevance.

However, we have the opportunity to do much more. In this issue of Spheres please note that Kansas has set up a task force to explore the link between hydraulic fracturing and earthquakes and that some of the latest issues in fracturing are discussed. As a DEG member you can contribute to a better public understanding of these topics. The beauty of water also is discussed and appropriately so. We all understand that water may be our most precious environmental resource. Finally, as geoscientists within DEG, we have so much more to offer. The application of our understanding of the environmental issues of the earth directly relate to forensic geology and the support our science can give to criminal investigation.

I want to thank all of you for your support and tolerance during this past year. It has been a wonderful experience to be your president – and a lot of fun. I look forward to what DEG will do next year!

From the Editor-In-Chief's Desk

Kristin M. Carter

Publication of the June 2014 issue of *Environmental Geosciences* marks the end of my second two-year term as your editor-in-chief. When I accepted this position in 2010, topics surrounding the geologic sequestration of carbon dioxide (CO₂) in deep formations were all the rage. Now in 2014 we still see a concerted, focused effort on the part of the research community to investigate exactly how CO₂ may behave in sequestration reservoirs and their associated caprocks, particularly as the U.S. Department of Energy's Regional Sequestration Partnerships implement full-scale CO₂ injection at sites across the country. Whether measured or modeled, fluid flow in porous media (a topic near and dear to my heart) remains at the forefront of this research. This issue's contributions (from Swift et al. and Mishra, Oruganti and Sminchak) are top-notch examples of this kind of work.



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Hydraulic Fracturing in the News

Kansas task force to explore possible hydraulic fracturing, earthquake link

Recently Sam Brownback, Governor of Kansas, appointed a task force to investigate increased seismic activity in south-central Kansas. The goal is to determine whether or not fracing and/or deep, high-pressure injection of waste water from fracing is causing the increase in modest tremors in the area (magnitude 3.8 – 3.9) or if the activity is the result of natural events. Ed Cross, president of the Kansas Independent Oil and Gas Association supports the endeavor and admits the potential that injection wells might be a contributing factor. He also states the existing fault zones in the areas of interest are prone to natural seismic activity. Members of the task force include Rex Buchanan, interim director of the Kansas Geological Survey; Kim Christiansen, executive director of the Kansas Corporation Commission; and Mike Tate, chief of the water bureau at the Kansas Department of Health and Environment. The focus of the task force is to “consider public safety, environmental issues and the impact on the industry development.” The group first met on April 16 at Wichita State University. [Read more.](#)

The Good, The Bad and The Ugly

The latest in hydraulic fracturing issues

As the use of hydraulic fracturing (fracing) has increased over the past decade, so has the controversy surrounding the practice. The “newest” fracing issue that has come to light in the media and in public forums is the possibility of frac-induced earthquakes – an issue that is highly debated. This issue’s The Good, The Bad and The Ugly takes a look at induced seismicity, the possibility of frac-induced earthquakes and the common lack of clarification between the two processes.

The United States Geological Survey’s “Introduction to [Hydraulic Fracturing.](#)” provides a general overview of water use and quality, energy assessments and natural hazards. While the page notes the injection of deep well fluid injection as a potential trigger for induced seismicity, it does not mention the process of fracking as a trigger. The [USGS](#), discusses more on induced seismicity.

This article published by [The Independent](#), discusses seismic activity in Oklahoma, which has become “the second most seismically active of the contiguous United States, beaten only by California.” Although the title of the article begins with “Fracking and Earthquakes . . .” and repeatedly sites “scientists” that are linking fracking and seismic activity, the article also points to the deep well injection of fracking waste-water as the possible culprit, rather than the practice of fracking itself. The article also sites a quake in California, one that councilman in the area hoped to link to fracking (below).

This [Los Angeles Times article](#), cited by the article above, provides context for the public confusion between earthquakes caused by fracking, and those caused by deep well injection. Los Angeles city council members want an investigation into whether hydraulic fracturing and other forms of “well stimulation” could have played a role in a recent Los Angeles earthquake (which took place in the most seismically active state in the contiguous United States). One line of the motion set in place to investigate fracking states “all high-pressure fracking and injection crates “seismic events.” However, the CEO of the California Independent Petroleum Association responded, “I think people are trying to take advantage of a naturally occurring incident in order to attack our industry.”

The [AAPG EXPLORER](#) takes a look at induced seismicity, the many causes and debunks some of the assumptions that the public and media have made about its occurrence. The article offers a series of facts and a small case study to show, most notably, that “to date, hydraulic fracturing by the oil and gas industry hasn’t resulted in reported surface earthquake events”.

Beauty in Geology

Water (H_2O) is something oftentimes we take for granted. It is vital for all life as we know it and exists throughout the solar system and universe. Water can exist in all three phases of matter (solid, liquid, gas) and can take on a variety of different forms on Earth (clouds, rain, snow, lakes, rivers, glaciers, etc.). It continually moves through cycles of evaporation, transpiration, condensation, precipitation and runoff cleansing the landscape and atmosphere. Water can be as delicate as a single raindrop or a fluffy snowflake. It also can be a powerful force as it shapes the landscape through weathering, erosion and floods. No matter its shape, form or where it is found, water is the universal solvent and the uses of this natural resource are innumerable. As a guide, we should all take part in our obligation to respect, project and enjoy the beauty water has to offer.



Image: This individual snowflake was captured as it settled upon a dead flower seedpod. Within minutes its delicate hexagonal structure merged with its surroundings.

Photo submitted by Mark Brown, geologic scientist, Pennsylvania Department of Conservation and Natural Resources

Book Review

Evidence from the Earth: Forensic Geology and Criminal Investigation

Murray, Raymond C. *Evidence from the Earth: Forensic Geology and Criminal Investigation*. Missoula, MT: Mountain Pub., 2004. Print.

Evidence from the Earth serves as a respectable overview of forensic geology for readers completely new to the concept or those interested in expanding their current knowledge of forensics. For the geologist, it provides a general overview of scientific methods of geologic evidence collection and analyses in this field.

Evidence from the Earth begins with key stories in the headlines – examples of crime investigations where forensic geology (usually in the form of soil analyses and comparisons) resulted in key breakthroughs and convictions in criminal investigations. After convincing the reader of the science's effectiveness, he provides some history to forensic geology, from Sherlock Holmes' fictitious (but still inspiring) mastery of mineral and soil identification, to the establishment of the Federal Bureau of Investigation Laboratory as one of the first forensic labs in the United States to use soil and mineral analyses in criminal investigations. Though he is clear in pointing out that the use of soils, minerals, glass and concrete (all materials associated with forensic geology) are still more subjective in nature when compared to DNA, fingerprints or hair, there are clear analytical procedures that can reduce the subjectivity and enhance the applicability of these types of evidence in the courtroom. Murray builds the basis of these procedures by providing a good synopsis of the origin of key geologic materials, including the origin and distribution of rocks and minerals, how soils form, and why they are so diverse (currently about 20,000 varieties recognized by the U.S. Department of Agriculture). The forensic geologist is also called upon to analyze artificial and commercial materials, including glass, insulation and building materials. The author points that out the most important step in analyzing these materials is the proper collection. Murray provides a thorough description of the proper way to collect crime scene evidence, including the critical nature of recording temperature and humidity at the collection site – and working to preserve those parameters. From here the reader learns of the various examination methods, including specimen color and particle size, thin section and microscopy work (including petrography, SEM and XRD), and chemical methods of analysis. On a larger scale, geophysical and aerial means are incorporated, such as ground penetrating radar, seismographs, metal detectors and remote sensing.

Murray concludes with the importance of education in this field to ensure an understanding of the contribution that earth materials can make in criminal investigations, as well as the importance of sound, objective, and scientific methods of examination. High standards are nothing new to the field of criminal science, and they are equally necessary in the field of forensic geology.

-Danielle Deemer

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

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3rd Quarter submissions deadline is Aug. 1, 2014

Submit to krcarter@pa.gov



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