AAPG/DEG grants permission for a single photocopy of an item from the Environmental Geosciences for personal use. Authorization for additional photocopies of items from the Environmental Geosciences in any form (hardcopy, digital/electronic scanning, or other digital transformation into computer-readable and/or transmittable form) for personal or corporate use is granted by AAPG/DEG provided that the appropriate fee is paid directly to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, Massachusetts 01923, http://www.copyright.com. For circumstances occurring outside authorization of Copyright Clearance Center contact permissions@aapg.org.

The Environmental Geosciences (ISSN 1075-9565) is published quarterly by the American Association of Petroleum Geologists Division of Environmental Geosciences. Offices are located at 1444 South Boulder Avenue, Tulsa, Oklahoma 74119-3604. Copyright © 2015 by the American Association of Petroleum Geologists Division of Environmental Geosciences. All rights reserved. Phone (918) 584-2555, fax (918) 560-2694, e-mail: degjournal@aapg.org.

ONLINE SUBSCRIPTIONS

Individual subscriptions are US$45. AAPG/DEG member subscriptions are included in the dues. Back issues, if available, may be ordered from the Association. Price list on request.

The American Association of Petroleum Geologists (AAPG) and its Division of Environmental Geosciences (DEG) does not endorse or recommend any products or services that may be cited, used or discussed in AAPG/DEG publications or in presentations at events associated with AAPG/DEG.

AAPG Division of

ENVIRONMENTAL GEOSCIENCES

EDITOR-IN-CHIEF
Michele L. Cooney
Allegheny College, Pennsylvania Geological Survey Pittsburgh, Pennsylvania, USA

MANAGING EDITOR
Kristin M. Carter
Bureau of Topographic & Geologic Survey Pittsburgh, Pennsylvania, USA

SPECIAL ISSUES EDITOR
Jennifer E. Delaney
Brooklyn, New York, USA

ASSOCIATE EDITORS

USA

Brannon Andersen, *Furman University, Greenville, South Carolina*
Gregory A. Ayres, *Penn E&R, Inc., Warrendale, Pennsylvania*
David M. Bush, *University of West Georgia, Carrollton, Georgia*
Joseph Donovan, *West Virginia University, Morgantown, West Virginia*
Lee C. Gerhard, *Thomasson Partner Associates, Lawrence, Kansas*
Erich D. Guy, *US Army Corp. of Engineers, Huntington, West Virginia*
Paul Hudak, *University of North Texas, Denton, Texas*
Sarah Kruse, *University of South Florida, Tampa, Florida*
Jane S. McColloch, *West Virginia Geological and Economic Survey, Morgantown, West Virginia*
William G. Murray, *URS Corporation, Forth Washington, Pennsylvania*
Cynthia Murray Gulde, *Chevron Energy Technology Co., Houston, Texas*
Rachel O'Brien, *Allegheny College, Meadville, Pennsylvania*
Rima V. Petrossian, *Texas Water Development Board, Austin, Texas*
Viola Rawn-Schatzinger, *NETL-USDOE, Tulsa, Oklahoma*
Janet S. Roemmel, *A&R Resources, LLC, Salt Lake City, Utah*
Joseph Rossabi, *Redox-Tech, Cary, North Carolina*
Laura Sanders, *Northeastern Illinois University, Chicago, Illinois*
Dibyendu Sarkar, *Montclair State University, Montclair, New Jersey*
Henry I. Snider, *Eastern Connecticut State University, Willimantic, Connecticut*
Gary Weissmann, *University of New Mexico, Albuquerque, New Mexico*
Thomas G. Whitfield, *Pennsylvania Geological Survey, Middleton, Pennsylvania*
Robert S. Young, *Western Carolina University, Cullowhee, North Carolina*

AFRICA

Theo C. Davies, *University of Venda for Science and Technology, Limpopo Province, Republic of South Africa*

ASIA/PACIFIC

Xinbin Feng, *Chinese Academy of Science, Guiyang, China*
Sunderrajan Krishnan, *Carewater, Gujarat, India*
N. Subba Rao, *Andra University, Viskhapatham, India*

CANADA

Matthias Grobe, *Alberta Energy and Utilities Board/Alberta Geological Survey, Edmonton, Alberta, Canada*

EUROPE

Peter M. Lloyd, *Consultant, Falicon, Alpes Maritimes, France*

LATIN AMERICA

Aderbal C. Correa, *Texas Tech University, Lubbock, Texas, USA*

MIDDLE EAST

Haluk Akgun, *Middle East Technical University, Ankara, Turkey*

AAPG
Division of Environmental Geosciences

PRESIDENT'S COLUMN

November 5, 2015

Surviving the Rollercoaster

One of the very few benefits of reaching six decades of shuffling around this earth is the ability to have near perfect 20/20 hindsight. I have found that it still does not give me the clarity that I wish for the next 50 years, or even the next 12 months. However, last year about this time I looked back and hoped that we would be going through an oil price shock similar to 2008; instead it has become apparent that we are facing something different and much more akin to the 1980s. There are forces that can keep oil prices low for the foreseeable future: the remarkable innovation improvements in the North American unconventional break-even costs, the political will of several large National State exporters, and weak national economies. On the other hand, it is inevitable that the price will rise again to a very profitable level once the demand/supply curve comes back into balance.

During the 1980s crisis, the oil industry lost a generation of workers, and we were just now struggling with how to fill this huge gap, "The Great Crew Change." Now with the huge global layoffs we, as an industry, are compounding the problem. In fact there may no longer be a "Crew Change" but a "Reckoning Day" for some companies. I have already heard of companies offering 100% voluntary severance, putting all assets on the sale block and giving up. I was once part of a corporate strategy of placing all corporate debt on the upstream company and spinning the downstream company off debt-free, expecting the upstream company to sink. We stayed alive for many years by innovation until we were purchased, mainly for our personnel. Many of those employees are still there at what has become the eventual parent. While we can understand the need to survive on a corporate level, these large redundancies will set the industry up for an unhealthy battle for talent when prices recover. To survive this will not be easy—both now and later. Those of my generation are being moved out now; we are the higher-cost employees. Our expertise is and will be needed, but more and more as mentors and as temporary consultants. For the younger generation I advise taking or keeping any work you can. Many of my colleagues did have to leave in the 1980s but successfully came back; the industry has a way of forgiving and forgetting when they need talent. The trouble and temptation will be once the next boom comes back. Those that have been able to stay with single successful companies generally do better than those that jump and jump. There will be a tremendous people and skills gap in the coming years. We will manage it as we always do, in part by innovation, in part by technology, and in part by either raiding the best people or by mergers and acquisitions. After the '80s crisis came the recovery of the '90s, during which it was common to find managers in their 30s and 40s. We drilled a lot of dry holes and as an industry we lost much of our mapmaking skills but we broke new ground; we moved from silo organizations to asset teams, we embraced workstations and computer modeling, we enabled (or created or discovered—choose your term) deep-water exploration/development and unconventionals. It will, at times, be painful but exciting to see how the industry rises to the challenge over the next decade with the next generation at the helm.

During the layoffs of the 1980s many, but not all, of those who left the petroleum side transitioned to environmental work, and it was at that time that the AAPG formed the DEG. The AAPG recognized that the work of the environmental geoscientist is much the same of the petroleum geologist—though at the time at a shallower depth. Today's environmental geologist is likely to be involved in CO_2 sequestration, induced seismicity, monitoring of stimulation, and other deep underground geological investigations. Today, as in the past, we will see many of our petroleum colleagues transition to environmental careers; today, as in the past, we will see that the environmental companies do not pay the salaries of the petroleum companies, as the environmental program is seen as a cost to be borne, not as potential product to be delivered. Today, as in the past, those that make the transition will find the work just as challenging and just as intellectually rewarding, but you better bone up on your chemistry and partial pressures. To those who transition, or set themselves up as consultants with an environmental tag, the DEG has been and continues to be here as a professional division of AAPG to assist you with excellent technical content, training, and connections.

On a final note and speaking of transitions: last month, after decades of incredible service, Mrs. Norma Briggs retired as AAPG's staff Division Manager. Norma has kept the DEG, and the EMD and DPA, on track with meetings, budgets, reminders, gentle nudges, countless phone calls, and billions of emails. Her duties are being reassigned but she can't be replaced; Norma, you will be missed. I know I speak for all of the divisions in wishing you the best in your transition to the next phase of your life.

Jeffrey B. Aldrich,
President

Case Studies for Water Concerns During Energy Production: Introduction

Since Range Resources-Appalachia's Renz No. 1 well discovered the modern Marcellus Shale play in 2004, the shale gas boom has brought an immense wave of production to the Appalachian Basin, as well as an increased awareness of environmental issues. Arguably, the most widely recognized areas of concern are the quality of surface water and groundwater near production wells as well as disposal sites and the manner in which produced water is being used, transported, and disposed of. In my area of the country, where many residents rely on private wells and springs for their water sources, these concerns have only grown as production has moved forward over the past decade.

This special issue of *Environmental Geosciences* looks at the issues to be addressed during production and disposal activities related to shale gas in any part of the globe, using shale gas production in the Appalachian Basin and oil sands production in Alberta, Canada, as case studies. The goal of this issue is to showcase the research that is actively taking place regarding water use, monitoring, and disposal related to energy being conducted all over the world—it highlights some of the major concerns to be addressed and further research opportunities to be pursued.

Michele L. Cooney
Editor