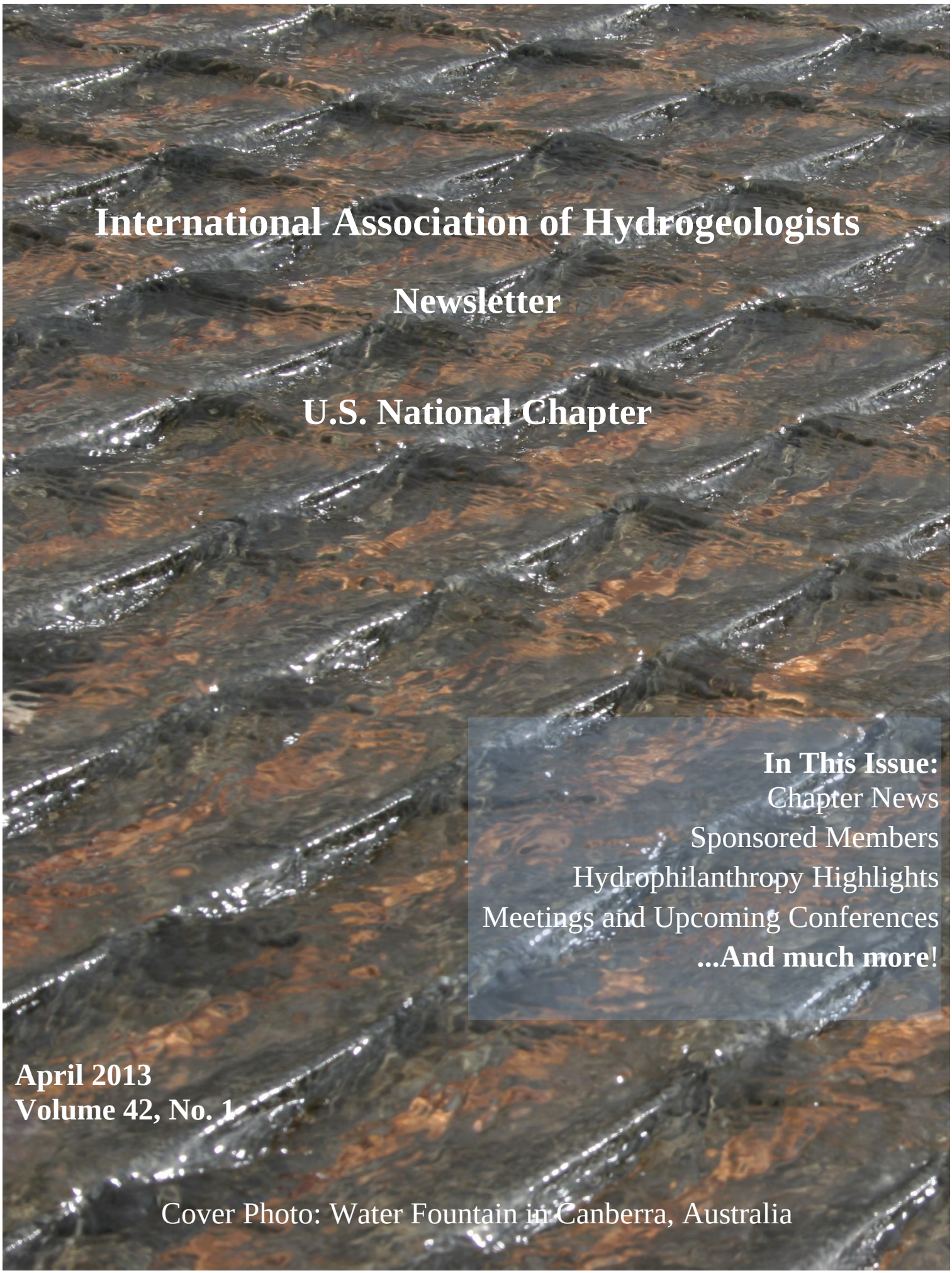

International Association of Hydrogeologists

Newsletter

U.S. National Chapter

In This Issue:
Chapter News
Sponsored Members
Hydrophilanthropy Highlights
Meetings and Upcoming Conferences
...And much more!

April 2013
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Cover Photo: Water Fountain in Canberra, Australia

International Association of Hydrogeologists
U.S. National Chapter
Spring 2013 Newsletter

Editor: Suzanne Pierce

CONTENTS

A Note from the Chair – *Vic Heilweil*
A Note from the North America VP – *Dave Kreamer*
Treasurer's report – *Vicki Kretsinger*
GENESIS - *Mike Wireman*
MODFLOW-USG - *Sorab Panday*
Member News and Highlights
- **IAH-USNC Board Member Appointed Section Editor of Springer Encyclopedia**
- **IAH member Bill Alley publishes a book about the risks and perceptions of Nuclear Waste**

New USNC-Sponsored Members:
- **Bolivian Members - *Suzanne Pierce***
- **US Students - *Devin Galloway***

Descriptions of Selected Hydrophilanthropic Non-Profit Organizations
- **American Ground Water Trust - *Andrew Stone***
- **Hydrogeologists Without Borders/CARA - *Dave Bethune***
- **UniWater - *Laurra Olmsted***
- **Well Aware - *Wendy Robertson***

Recent Meetings, Conferences, and Member News
- **Southern Africa Development Council Workshop- *Todd Jarvis***
- **Regional Consultation on Groundwater Governance – *Todd Jarvis***
- **U.N. Announces 2013 as International Year of Water Cooperation – *Lenny Konikow***
- **U.N. Conference on Water Cooperation – *Lenny Konikow***

Upcoming Meeting Announcements: NGWA, IAH, ISMAR, GSA - *Jim LaMoreaux*

IAH/US NATIONAL CHAPTER: EXECUTIVE COMMITTEE 2012-2015

Chairman:	**Victor Heilweil** **heilweil@usgs.gov**	**U.S. Geological Survey** **(801) 908-5042**
Vice President, North America:	**Dave Kreamer** **dave.kreamer@unlv.edu**	**University of Nevada, Las Vegas** **(702) 895-3553**
Past-Chair:	**Michael Wireman** **wireman.mike@epa.gov**	**U.S. Environmental Protection Agency** **(303) 312-6719**
Secretary:	**Jim LaMoreaux** **jlamoreaux@pela.com**	**PE LaMoreaux & Associates, Inc.** **(205) 752-5543**
Treasurer:	**Vicki Kretsinger Grabert** **vkretsinger@lsce.com**	**Luhdorff & Scalmanini, Consulting Engineers** **(530) 661-0109**
Newsletter Editor:	**Suzanne A. Pierce** **sawpierce@gmail.com**	**University of Texas, Austin** **(505) 918-9300**
Director:	**Devin Galloway** **dlgallow@USGS.gov**	**U.S. Geological Survey** **(916) 278-9549**
Director:	**Andy Manning** **amanning@usgs.gov**	**U.S. Geological Survey** **(303) 236-1812**

A Note From The Chair

As 2014 gets underway, our 2012-2016 IAH-USNC Board Members have been eagerly adapting to their new roles. I'd like to acknowledge Vicki Kretsinger for quickly learning the financial aspects of our organization, Jim LaMoreaux for organizing our presence at the upcoming NGWA Summit; Dave Kreamer for informing us on our organization's international activities; Devin Galloway for reaching out to our recently sponsored student members; Andy Manning for coordinating with the Geological Society of America; and Mike Wireman for his guidance as past Chair. Regarding recent accomplishments, Bill Alley (one of our past Board Members) and his wife Rosemarie recently co-authored a must-read book "Too Hot to Touch" on the nuclear power industry and challenges surrounding nuclear waste disposal.

As our USNC editor, Suzanne Pierce has done a very nice job putting together this Spring 2013 Newsletter. It contains articles submitted by both Board and other USNC members on a variety of topics including new student and developing country members sponsored by the USNC, some interesting groundwater modeling developments, along with past and upcoming international hydrogeology-related workshops and conferences. Also included are short articles describing hydrophilanthropic and educational efforts of several non-profit organizations. Two of these, Hydrogeologists without Borders (HWB) and UniWater Education, are Canadian organizations working primarily in South America and Sub-Saharan Africa. American Ground Water Trust is US based and promotes interest in and awareness of groundwater issues. Well Aware operates in East Africa with a focus on installing and maintaining technically sound and community-run water systems. HWB recently assisted our USNC in identifying developing country candidates in Bolivia for sponsorship by the USNC. We are currently helping the Bolivians form a National Chapter and may consider developing a mutually beneficial long-term "Twinning" relationship with them.

We would like to invite anyone planning on attending the NGWA Groundwater Summit to participate in our US National Chapter Board meeting. This would be a good opportunity to meet some of our Board members and learn about several of the Board's current activities and efforts. Because of the Federal Government sequestration, several of us will not be able to attend the meeting in person, but plan to participate by way of a conference call. The meeting will be on Tuesday April 30th during lunch (12-1:15) in the Guadalupe Room. Box lunches may be provided by the conference, so please notify me (heilweil@usgs.gov) or Jim LaMoreaux (jlamoreaux@pela.com) if you plan to attend.

In this age of increasing digital access to journals, IAH and its National Chapters need to offer its membership compelling benefits beyond *Hydrogeology Journal* subscriptions. The primary mission of the USNC is to help build our hydrogeology community, with special focus on involving students and young professionals. We regularly reach out to our membership through our newsletters, website, emails, and our presence at national and international meetings. But we are always open to new suggestions for improving our outreach and relevance. Please feel free to contact myself or any of our other Board Members with ideas and suggestions.

Vic Heilweil

An update from the Vice President for North America
Dave Kreamer

I'm truly honored to have been elected as the new IAH V.P. for North America, and realize that I have big shoes to fill, following the terrific job that Lenny Konikow has done. I look forward to working with the chapters and IAH individuals to help communicate concerns and ideas to the IAH Council. If anyone has any suggestions or thoughts, please don't hesitate to contact me.

The IAH Executive met 21-23 February 2013 in Evora, Portugal and discussed many topics, including finance and budget; IAH Commissions, Networks and Working groups; program of actions for the "Forward Look" initiative; website redevelopment; the Burdon Fund and charitable activity; international liaison with key external agencies; cooperation with the International Hydrologic Program; the Global Environmental Facility (GEF) Groundwater Governance project; IAH publications; membership strategy; Council election process; and outreach and publicity. In charitable activities, it was concluded that we need to broaden the scope of activities, including supporting some efforts of the African Groundwater Network training activities. International liaison activities which were discussed included work with the alphabet soup of: UNESCO, FAO, UNEP, GWP, UN Water and other UN Agencies, WWF, IHP, IGRAC, HWB, and relationships with sister societies. The IAH Executive is also pursuing establishment of new national chapters, including Malawi, Tanzania, and Zambia.

Feedback is welcomed – please contact me if you would like to discuss any of these matters. I'm grateful for the opportunity to serve IAH. Hope to see you at the NGWA Groundwater Summit in San Antonio, Texas and the IAH Congress in Perth, Australia.

Treasurer's Report – *Vicki Kretsinger Grabert*

2013 U.S. National Chapter (USNC) Memberships

- As of December 31, we had 290 paid USNC members, along with 25 honorary members and 19 sponsored members. This is approximately the same as last year at this time. Since January 2013, membership renewals and new members have resulted in about 235 members. If you have not renewed, you should do so soon! Otherwise, your subscription to the *Hydrogeology Journal* will soon be terminated along with other IAH member benefits.
- In addition, individual members in the USNC are sponsoring 11 developing country memberships and the USNC is sponsoring 5 developing country and 3 student members this year.

2013 USNC Financial Status

- Regarding our general funds, we currently have about $16,000 in our JPMorgan Chase checking account and about $29,000 in our Vanguard Mutual Fund Account (Total Stock Market Index Fund).
- Separately, we have about $15,000 in our Endowment Fund, split evenly between two Vanguard Funds (STAR and Extended Market Index). Our goal is to add additional contributions and let these funds grow to $20,000 before utilizing earnings for funding our endowment goals.
- The USNC received about $2,500 in membership dues for 2012, or 10% of the approximately $25,000 IAH dues paid by US National Chapter IAH members. We used about $900 of this for sponsored memberships and expenditures, including American Geological Institute membership dues, tax preparation, and tax-exempt incorporation fees. The remainder was invested in our Endowment Fund at the end of 2012.

Groundwater and Dependent Ecosystems: New Scientific and Technological Basis for Assessing Climate Change and Land-use Impacts on Groundwater (GENESIS) - *Mike Wireman*

Groundwater resources are facing increasing quantitative pressure from land-use and consumption pressures. In some areas, groundwater quantity and quality have been reduced, resulting in negative impacts on drinking water and important ecosystems relying on groundwater. There is a strong need to reduce input of pollutants to prevent groundwater pollution. Additional threats from climate change are unknown, highly interwoven and complex. A consortia of 25 partners from 17 countries has initiated the GENESIS project.

The objective of the 60 month long GENESIS project is to integrate pre existing and new scientific knowledge into new methods, concepts and tools for the revision of the Ground Water Directive and better management of groundwater resources.The research will: i) link the present knowledge to an integrated model from sources of pollution to the recipient ecosystem, ii) improve the understanding of pollutant leaching from different land uses both in time and space considering also uncertainty, iii) develop a better understanding of how ecosystems depend on groundwater, iv) understand how changes in land use and climate affect the groundwater and dependent ecosystems, and v) develop better cost-efficient management and monitoring tools and transfer the research results to stakeholders and end-users for better management.

The project is multidisciplinary with a focus in hydrology, water resources, hydrogeology, agronomy, soil science, modeling, economy, sociology and legal aspects. The main scientific research work on groundwater and ecosystems processes comprises studies on water flow paths with tracers, pollutant transport and leaching processes, groundwater ecosystems, modeling, management and engineering. Case study aquifers and ecosystems will be studied in different climatic regions with various land use pressures.

GENESIS will provide tools to assess land-use and climate impacts on groundwater and related ecosystems. The tools will be based on better scientific basis of: i) groundwater flow paths , ii) biogeochemical processes, iii) methods to observe and reduce pollution, iv) ecosystem interactions, and v) integrated management. GENESIS will provide better solutions to identify groundwater pollution changes, develop methods to assess the points for pollution trend reversal, and generate knowledge on how to protect groundwater dependent ecosystems. This sets the basis for future and better groundwater management. To learn more visit the project webpage (thegenesisproject.eu)

Development of MODFLOW-USG: An Un-Structured Grid Version of MODFLOW - *Sorab Panday*

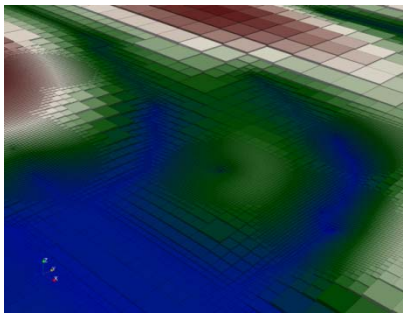


Figure 1: A three-dimensional rendering of the simulated results from a quadtree example problem using MODFLOW-USG. The cell shading and top elevations correspond to the simulated water table elevation.

MODFLOW was revolutionary when it was first unveiled by the USGS in 1988, and since then it has been the most widely used groundwater flow modeling program in the world. MODFLOW's simulation capabilities have evolved substantially since its initial release and it has been an inspiration for more comprehensive analysis simulators including surface-water/groundwater interaction models (e.g., GSFLOW, SWF, MODHMS, ISGW), flow and transport analysis simulators (e.g., MT3D, MODFLOW-SURFACT, MODFLOW-T), and saltwater intrusion models (e.g., SEAWAT). A rectangular structured grid has been at the core of MODFLOW and most of its variants. The system of equations resulting from a structured grid is symmetric, has a known pattern, and can be solved with standard MODFLOW solution schemes. One limitation

with a structured grid requirement is that there is no straightforward way to increase resolution in subareas of the grid or use other types of grids. Another limitation is that the coupling of groundwater flow with other processes, such as flow within a surface-water system or flow within a multi-layer well, requires an iterative coupling approach. Iterative coupling approaches can cause convergence issues for some problems, especially for steady-state simulations and applications with large time-step sizes, and for cases where the interaction flux between processes is large.

With larger model domains, extreme heterogeneities, complex geology including lenses and faults, and more complicated applications involving automated parameter estimation and Monte Carlo uncertainty analysis, an alternative to the structured grid approach became necessary. Recognizing this need for a freely available, MODFLOW-based, open-source groundwater modeling code with flexibility for gridding and process coupling, a collaborative effort was forged between AMEC, the USGS, and Ohio State University (OSU) to develop an Un-Structured Grid version of MODFLOW, called MODFLOW-USG. Working together enabled the team to leverage resources and bring individual expertise to the development effort. A control-volume finite difference methodology, similar to the one implemented in TOUGH2, was implemented in a modular fashion using the MODFLOW-2005 design, formats, and development principles. Robust nonlinear schemes were designed to handle complex flow behavior, and a connected linear network process was designed to simulate flow in conduits (wells, tile drains, and karst features, for example) in a fully implicit manner. A state-of-the-art linear solution scheme for symmetric or asymmetric unstructured sparse matrix equations forms the heart of the code.

Code documentation and benchmarking proceeded simultaneously with development. Beta testing within AMEC, the USGS and OSU focused on new mesh designs and tests with complex problems. To generate excitement and support for its initial release, MODFLOW-USG has been presented at workshops, conferences and in publications. Graphical User Interfaces, particle tracking routines and parameter estimation software are being developed by various parties. Plans for future versions are also already in the works and include support for density-dependent simulations, transport of contaminants and heat, and parallel solver functionality. There have been very positive experiences with the grid and process coupling flexibility that have already been tested at various levels of complexity, with many more possibilities yet to explore.

Member News and Highlights

IAH-USNC Board Member Appointed Section Editor of Springer Encyclopedia
Dr. Jim LaMoreaux has been appointed Editor of the 'Environmental Geology' Section for the expansion and continual update of *The Encyclopedia of Sustainability and Technology*. *The Encyclopedia* is published by Springer Science + Business Media, based in Germany. Dr. LaMoreaux served as Section Editor for *The Encyclopedia's* 1st Edition.

The 1st Edition of The Encyclopedia was released in 2012 and contains 18-volumes and 12,000 pages of material. The Encyclopedia can also be found online on a unique live platform at SpringerReference.com. On this platform, The Encyclopedia will be continually expanded and updated to always provide the latest in the science and technology of the sustainability of the earth. The culmination of the online expansion will be the release of *The Encyclopedia's* 2nd Edition, due in 2016.

IAH member Bill Alley publishes a book about the risks and perceptions of Nuclear Waste
Dr. Bill Alley and his wife, Rosemarie, have just published "Too Hot to Touch: The Problem of High-Level Nuclear Waste," through Cambridge University Press. It is written for the general public and scientists alike on the science, politics, media coverage, and public perceptions of nuclear waste. More information is at the website listed below. It's also available on Amazon. Written in story like fashion, it's quite different from other books on the topic.
http://www.cambridge.org/us/knowledge/isbn/item6893140/?site_locale=en_US

Meet the new 2013 IAH-USNC Sponsored Student Members

The IAH U.S. National Chapter sponsors student memberships and international hydrogeology professionals each year through general funds and through generous individual contributions of our members. So far this year we are sponsoring eight new US student members and three international affiliates members from Bolivia.

Bolivian Postgraduate Students and Professionals – *Suzanne Pierce*

This year the IAH US National Chapter reached out to colleagues in Bolivia to identify up and coming hydrogeologists who are actively pursuing groundwater focused careers. We are proud to share a bit about each the 2013/14 sponsored candidates.

Etzar Reynaldo Gómez López

My undergraduate training as a civil engineer specializing in water and wastewater has allowed me to participate in projects to provide drinking water and irrigation water in several places in rural area of Bolivia. I've designed water systems, supervised construction of potable water systems and irrigation systems, managed similar projects in processes of evaluation, contracting, monitoring and closure using methodologies from many international funding institutions.

That experience has allowed me to specialize as a hydrogeologist, earning a master's degree with the Universities of San Francisco Xavier (Bolivia) and Calgary (Canada). Currently I work in the Ministry of Environment and Water, in a project focused on management of Purapurani Aquifer System, which is the most important for the cities of El Alto, Viacha and La Paz.

Through hydrogeology, I have discovered a specialty that opens doors to potential technical tools to address many needs of water quality and quantity. My expectations as a hydrogeologist are to keep learning more of this specialty and put that knowledge into practice in needy areas of Bolivia.

Gabriela Flores

Gabriela graduated from the University of San Francisco Xavier De Chuquisaca, Bolivia as a Civil Engineer in 2010. That same year, Gabriela was awarded a scholarship to pursue her Master's degree in Hydrogeology and Water Resources. Her study was part of an evaluation of "*Water Management in Bolivia*" which was funded by the Canadian International Development Agency (CIDA). Gabriela has worked in Santa Cruz, Bolivia, at the Normandia Landfill site in the zone of "Plan tres Mil" to study the potential groundwater impacts. Small farmers that live in the area complained about the quality of groundwater available for irrigation and domestic use. Thus, the aim of this research is to determine the susceptibility to contamination of the aquifer underlying the landfill.

Gabriela is currently taking two courses in Contaminant Hydrogeology and Groundwater Management in the University of Calgary thanks to the "Students for Development" program, funded by the Canadian International Development Agency. Her goal for the future is to work in her country and train new professionals for developing and strengthening research projects on groundwater that can directly involve and benefit local communities of Bolivia.

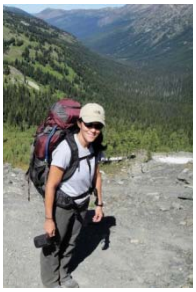
Jhim Terrazas

A Civil Engineer by profession with a Masters degree in Water Resources and Hydrogeology, Jhim Terrazas began his training by applying a hydrological model to complete an undergraduate research project entitled, "*Determination of Precipitation on Recharge Area Vinto – Sipe Sipe.*" Later he extended his knowledge of the field by completing a Masters degree and studying the migration of total chromium and chloride anions in the Rocha River. This study used the anions as indicators to estimate the degradation of soil quality in the agricultural community of Thiu Rancho.

Today, Jhim is interested in extending our understanding of groundwater resources and documenting the solutions that have been adopted to address issues in Bolivia. He is actively learning various numerical and analytical models so that he can use them to support the implementation of solutions for the groundwater resources of Bolivia.

U.S. Sponsored Students – *Devin Galloway*

Each of the sponsored students was nominated by their faculty advisors as part of the annual raffle. The students represent a diverse, ambitious and accomplished group of scientists with strong international interests. If you are interested in sponsoring ($39–52/yr) or nominating a student for sponsorship please contact the IAH-USNC Membership Liaison (Devin Galloway, dlgallow@usgs.gov, 916-801-2040).



Maria Gibson, Graduate Research Assistant – Ph.D. candidate, College of Earth, Ocean and Atmospheric Sciences, Oregon State University (Nominating Professor: Dr. Michael E. Campana). gibsonma@geo.oregonstate.edu

Maria is studying hydrogeology and groundwater supply via artificial conveyances. She is currently conducting a large-scale Managed Aquifer Recharge feasibility study and utilizing Retscreen to determine the likelihood of developing renewable energy via injection wells. Additional areas of interests include transboundary aquifer governance and conflict management and resolution.

Md. Mahfuzur R. Khan, Graduate student, Department of Geological Sciences, University of Delaware (Nominating Professor: Dr. Holly Michael). mahfuz@udel.edu

Mahfuzur grew up in Bangladesh and received both his bachelor and master's degree from the University of Dhaka. He is interested in subsurface water storage methods to reduce the river flow seasonality, and its implications for water management and trans-boundary water policy in the Ganges basin. He is also interested in the sustainability of deep groundwater in Bangladesh as an arsenic safe water source.

Nadine Reitman, M.S. candidate, University of Colorado (Nominating Professor: Dr. Shemin Ge). nadinereitman@gmail.com

Nadine is interested in studying hydrogeology to work on problems in human water use and groundwater's role in geologic processes. Her Master's project focused on 3D groundwater flow and solute transport modeling of a desert watershed. She will be continuing physical science work in Denali National Park after defending her Master's and hopes to pursue a career helping implement strategies for efficient and sustainable use of freshwater resources.

Wendy Robertson, Ph.D. candidate, Department of Geological Sciences, Jackson School of Geosciences, The University of Texas at Austin (Nominating Professor: Dr. Jack Sharp). wendyr@utexas.edu

Wendy is studying modern recharge, nitrogen dynamics, and sustainability questions in arid basin aquifers. She also works with the 501(c)(3) non-profit organization, Well Aware, as their lead hydrogeologist and travels regularly to East Africa to construct sustainable water systems.

John Solder, Graduate student, Department of Geology and Geophysics, University of Utah (Nominating Professor: Dr. D. Kip Solomon). john.solder.co@gmail.com

John grew up in the Upper Arkansas Valley of Colorado. Early interest in hydrogeology came from living and traveling throughout the Western US. While attending Stanford University as a student-athlete John continued to enjoy the outdoors and study earth science, often together. After receiving his BS, and living in the Tahoe region for a time, he now calls the Wasatch Mountains home. He enjoys skiing, mountain biking, and whitewater rafting.

Elzie Velasco, M.S. candidate, Department of Geosciences, San Francisco State University (Nominating Professor: Dr. Jason Gurdak). evelasco@mail.sfsu.edu

Elzie was born and raised in Long Beach, California. After visiting Hawaii for the first time in 2008, she developed a huge interest in the natural sciences. This inspired her to move to San Francisco in 2012 to pursue a master's degree in hydrogeology at SFSU. She currently works as a hydrogeologist/environmental engineering intern at Kennedy/Jenks Consultants. She hopes to continue building experience in the environmental consulting industry and then later transition into teaching.

Nathaniel Warner, Ph.D. candidate, Nicholas School of the Environment, Earth and Ocean Sciences Division, Duke University (Nominating Professor: Dr. Avner Vengosh). nathaniel.warner@duke.edu

Nathaniel Warner's current research is a combination of field and laboratory methods evaluating boron, strontium, and radium isotopes as tracers of the environmental impact of shale-gas development on shallow groundwater and surface water. Field areas include the Marcellus, Fayetteville, and Utica Plays. Previous projects include: investigations of drinking water quality in the Kathmandu Valley and Annapurna Conservation Area of Nepal and the relationship between salinity and radioactivity in south-central Morocco.

YaoQuan Zhou, Ph.D. candidate, Department of Geoscience, University of Wisconsin at Madison (Nominating Professor: Dr. Jean Bahr). zhou86@wisc.edu

YaoQuan currently is studying the physical processes and imaging capabilities of Multi-Frequency Oscillatory Hydraulic Tomography. She received a B.S. from Beijing University of Chemical Technology and M.S. from Wright State University. Her M.S. thesis "The Influence of Streambed Heterogeneity on Hyporheic Flow in Gravelly Rivers" is in press at *Groundwater*.

Selected Hydrophilanthropy and Education Non-Profit Organizations

Hydrogeologists are working and volunteering around the globe to assure that people and communities have safe, fresh, and secure water supplies. In the interest of assisting with awareness among the IAH membership in relation to hydrophilanthropy, the IAH US National Chapter has asked some organizations with ongoing programs to describe their efforts, mission, and presence. We hope that this information can help keep our members in tune with on the ground efforts to teach about and provide aide through expertise in groundwater science. We would welcome information from other organizations that may be known to our members – please email Suzanne Pierce (sawpierce@gmail.com) to start the process for including another organization in the next newsletter. More importantly, we hope to help these highlighted organizations connect with our IAH-USNC members!

The American Ground Water Trust (AGWT), Contact: Andrew Stone, astone@agwt.org

AGWT was formed in 1986 as a 501(c)(3) non-profit education organization with the mission of promoting interest and awareness in groundwater issues. The AGWT has a major objective to help achieve science-based water resources policies at local, state and federal level. The organization's track record of over 200 completed education programs has involved identifying and framing groundwater resources issues and combining technical expertise with networking and communication skills to develop focused conference and workshop events.

Specifically, the AGWT's conference and workshop programs and educational materials seek to:

- Communicate the environmental and economic value of groundwater
- Showcase groundwater science and technology solutions
- Increase citizen, community and decision-maker awareness
- Promote water management policies for sustainable groundwater use
- Facilitate stakeholder participation in water resource decisions

In addition to specialist conferences and workshops, the AGWT has convened 77 two-day environmental education programs for teachers and educators. The AGWT's "Ground Water Institute for Teachers" events have been held in 17 states, (including 15 in California, 13 in Texas, 13 in Florida and 10 in New England) with close to 2,000 teachers attending.

The AGWT's 2013 conference and workshop program focus includes:

- The impacts on water resources from shale gas & oil development
- Geothermal heating and cooling innovations
- Water well & pump design and operation to maximize efficiency
- Groundwater management and Aquifer Storage Recovery technology & policy

Details of all programs are listed at www.agwt.org once the event details have been established.

In addition to 25 specific conference & workshop events already scheduled for 2013, teacher training programs are currently in the planning stages for the summer and fall in Texas, California, New Hampshire and Florida.

The AGWT routinely responds to groundwater questions received via e-mail and 1-800 phone calls. The AGWT also maintains a "groundwater information" section on its web-site as an independent non-commercial information source for people with questions about wells and groundwater.

Hydrogeologists Without Borders (HWB), contact: Dave Bethune, info@hydrogeologistswithoutborders.org.

HWB is a new Canadian charity that focuses on linking the field of hydrogeology to international aid and development, in particular the water supply and sanitation sector (WASH or WATSAN). The Board of Directors is comprised of Michael Campana, John Cherry, Bernadette Conant, Peter Thompson, Greg Shyba, Cathy Main and David Bethune. HWB's International Scientific Committee includes Stephen Foster, Dave Kreamer, Antonio Chambel, Ricardo Hirata and Ramon Aravena.

HWB's vision is a world where groundwater is developed and sustainably managed for community water supplies worldwide. HWB's mission is to build capacity in emerging regions to provide safe, sustainable water supplies.HWB has four goals:

- Establish HWB as the "go-to portal" for practitioners on best practices for groundwater development and sustainability
- Facilitate the creation of a growing pool of professional and technical hydrogeologists in regions of critical need
- Facilitate increased application of sound hydrogeological principles and practices in aid and development programs
- Establish HWB as a valued partner and leader in international networks of organizations engaged in developing safe sustainable community water supplies

HWB current activities include a fellowship fund that is supporting five hydrogeology masters students in Honduras and El Salvador; the development of an on-line teaching module on hydrogeology applied to rural water and sanitation projects, awareness-building and networking activities at various water events and raising sufficient funds to hire a full-time Executive Director. HWB is now beginning a collaboration with IAH-USNC following a preliminary meeting held at IAH Niagara and a subsequent conference call. The first collaboration involved the IAH-USNC sponsorship of three new IAH members from Bolivia. Hydrogeologists interested in getting involved with HWB or making a financial donation are encouraged to visit www.hwbwater.org or email info@hydrogeologistswithoutborders.org.

UniWater Education: A Different Approach to Education, Contact: Laurra Olmsted, UniWatered@gmail.com

According to the African Development Bank, for every million people in sub-Saharan Africa, there are 35 technical specialists and engineers – this compares to 4,000/million people in North America (AfDB website, 2009). For Africans to become educated in the field of water resources, they often need to leave their country or even the continent, to attend a school in a western country due to the lack of programs available at their local universities. Typically there are jobs available in this western country, where the new graduate can earn a living, sufficiently high enough to support their entire family back home. So they stay, working in the western country.
UniWater Education was established in 2011 in Canada as a non-profit organization focused on increasing the number of trained technical specialists in sub-Saharan Africa by improving access to water resource programs in African universities. In order to address this, Uniwater is compiling a university program that will be offered to various established universities in sub-Sahara Africa using donated curricula and existing training programs that have already been developed by others.

The program is planned to be a one-year MSc-level program in Water Resources. It encompasses aspects of hydrogeology, engineering and the social aspects of water supply. Each host university is required to have a basic science and math department, with a preference for a geology department. It is necessary that the program be headed by someone with a PhD in Hydrogeology or a closely related specialty. Each program will be partnered with a mentoring university where a program of this sort is currently being taught to address any issues related to faculty shortcomings and to enhance future exchanges for students and professors.

Providing this curriculum is only the first step in a long struggle for Africans to solve their own water problems. It is up to them to own this education, train their people, and reduce their reliance on foreign aid and expertise. For further information on the program, please visit www.UniWaterEd.org

Well Aware, Contact: Sarah Evans, sarah@wellawareworld.org
Well Aware is a 501(c)(3) non-profit dedicated to providing life-saving water to those who have none. We install sustainable clean water systems for the people of East Africa, provide community education, and continued involvement to ensure long-term and scalable impact. We are a team of professionals and volunteers who are dedicated to realistic, community-specific and sustainable water solutions that fit community needs. We achieve this with detailed hydrogeological and engineering support, thorough community involvement and planning, and with nonprofit partnerships. Because more than 60 percent of water wells in East Africa currently do not work, we are committed to operating differently than other water nonprofits by installing and maintaining technically sound and community-run water systems. Our objective is to provide guidance and initial support to communities while promoting community ownership in their water systems and their futures. Their responsible oversight and use of their water provides opportunities for them to receive education, implement new agriculture, create new commerce, decrease or eradicate disease, take advantage of microfinance and build medical clinics. None of these are possible without water.

Well Aware completed a highlight project with the Watoto Wa Baraka orphanage in Mithini, Kenya. The orphanage once consisted of only a small tin structure sheltering 9 homeless children who had to collect water from a contaminated ditch at the bottom of an escarpment; almost all of the children were sick with water borne illnesses. In August of 2011, we provided a water well for the orphanage and the surrounding community. They now have dorm facilities for 40 children, flush toilets with a proper septic system, several plots of irrigated crops, a preschool, and are in the process of constructing a primary school at the facility. The children are healthy and the community at-large is experiencing decreases in illness as well. Learn more about current projects and ongoing work at the Well Aware website: http://www.wellawareworld.org/

Southern Africa Development Council Workshop
- Todd Jarvis

The Southern Africa Development Community (SADC) Secretariat, in concert with the UNESCO Office in Nairobi, convened a Workshop on *Promoting Cooperation and Conflict Prevention in Transboundary Water Resources.* The event was hosted at the Phakalane Golf Estate Hotel Resort from 25-27 February 2013 in Gaborone, Botswana. IAH Member, Todd Jarvis from the Institute for Water and Watersheds at Oregon State University, provided training to twenty-four water professionals from Botswana, DRC, Malawi, Mauritius, Namibia, Swaziland, South Africa, Zambia, and Zimbabwe.

Much of SADC is reliant on groundwater for supplies. For example, Botswana is 70-80% dependent on groundwater for drinking water, agriculture, and supplying water to three diamond mines. Depth to water is apparently deep, and aquifers are typically fine-grained, which complicates efficient well design.

The main objectives of the workshop were to increase capacity of high-level water decision makers on water conflict management and cooperation; share and exchange on SADC sub-region experiences on water cooperation; establish a sub-regional platform on water conflict management and cooperation; and learn more about designing and conducting a negotiation process.

Some of the take-home messages the participants walked away with included: (1) negotiations over water require much time to prepare for, initiate, and complete; (2) negotiations over groundwater are often not just over water but also identity, thus increasing the likelihood of a protracted dispute; and (3) some disputes and conflicts over groundwater and aquifer storage can be prevented or resolved by taking a business approach to development with regular re-determination of the recoverable quantities and uses of both resources.

Participants in the Workshop Promoting Cooperation and Conflict Prevention in Transboundary Water Resources, Gaborne, Bostwana, February 2013.

Regional Consultation on Groundwater Governance
- Todd Jarvis

UNESCO, together with FAO, World Bank, IAH and UNECE, organized a Regional Consultation on Groundwater Governance celebrating World Water Day 2013 and the framework of the UN International Year of Water Cooperation at The Hague (NL) from 19–21 March 2013. The agenda and professional roundtable can be viewed at this link: http://www.hydrology.nl/ihpevents/385-benchmark-meeting-on-groundwater-governance-marks-road-to-world-water-day-and-un-international-year-of-water-cooperation.html

Ken Howard and Shammy Puri convened an IAH meeting at the regional consultation with 25 members attending as shown in the photo. A summary of the total membership revealed a continued rise in members to over 4,000 worldwide. Mentoring the next generation of groundwater professionals was discussed at length. Increased efforts to embed the IAH "brand" on related mentoring opportunities, as well as hydrophilanthropic activities such as Hydrogeologists Without Borders, were emphasized.

The only member not wearing an IAH lapel pin at the consultation was IAH-NA member Todd Jarvis, who was promptly "pinned" by Past president Willi Struckmeier (shown right).

2013: The United Nations Announces International Year of Water Cooperation
- Lenny Konikow

In December 2010, the United Nations General Assembly declared 2013 as the United Nations International Year of Water Cooperation, and the 2013 World Water Day also will be dedicated to water cooperation. The objective of this International Year is to raise awareness, both on the potential for increased cooperation, and on the challenges facing water management in light of the increase in demand for water access, allocation, and services. The Year will highlight the history of successful water cooperation initiatives, as well as identify important issues on water education, water diplomacy, transboundary water management, financing cooperation, national/international legal frameworks, and the linkages with the Millennium Development Goals. It also will provide an opportunity to capitalize on the momentum created at the United Nations Conference on Sustainable Development (Rio+20), and to support the formulation of new objectives that will contribute towards developing water resources that are truly sustainable. More information is available at: http://www.unwater.org/watercooperation2013.html

United Nations Conference on Water Cooperation
- Lenny Konikow

As part of the International Year of Water Cooperation, the United Nations Water Conference on water cooperation was held January 8-10, 2013 in Zaragoza, Spain. It focused on how to make water cooperation happen. The participants emphasized mutual trust and understanding the real needs of communities as key factors for successful water cooperation. Cases from Kenya and Bolivia demonstrated that the existence of a legal framework to support the creation of collective water management is important but it is implementation that is determinant. To actually realize cooperative water management, the implementation of a system of incentives and penalties is also required. While political will enables the development of laws and regulations, implementation should come from local organizations and institutions. Identifying appropriate solutions can be hampered by differences in perceptions, as demonstrated by specific cases in Peru and Kenya, where projects failed because irrigation technologies were imposed without taking into consideration traditional practices and perspectives. Overexploitation of aquifers was one of the other main themes in which the collective management by organizations such as water user associations has been recognized as essential. In cases such as the aquifer of the Bajo Llobregat in Spain, the fact that all stakeholders felt the urgent need for cooperation was the key success factor for sustainable basin management. Presenters of this and other cases emphasized the importance of building relationships between water user communities and authorities based on mutual respect and avoiding paternalistic attitudes. Overall, political will, legal frameworks, accountability, and institutional structures provide a solid foundation for water cooperation. More information is available at: http://www.un.org/waterforlifedecade/unwdpac.shtml

Upcoming 2013 Meetings and Conference Notes
- Jim LaMoreaux

The 2013 NGWA Summit, The National and International Conference on Groundwater, will be held April 28th to May 2nd in San Antonio, Texas. The organizers promise "everything groundwater". The keynote speaker for this year's meeting will be Charles Fishman, *New York Times* bestselling author of *The Big Thirst*. The IAH-USNC will hold its next board meeting at the Summit on Tuesday April 30th during lunchtime (12:00 – 1:15) in the Guadalupe Room. The deadline for abstract submission has passed. To register and for more information, go to: http://groundwatersummit.org.

Re-inventing the Nation's Urban Water Infrastructure & Association of California Water Agencies. The Groundwater Resources Association invites you to attend a 1.5-day technical and policy symposium focusing on managed aquifer recharge in the urban environment. The event will be held in Burlingame, CA on May 22 and 23, 2013. The Symposium will emphasize the growing range of approaches to the capture and recharge of urban stormwater, recharge of aquifers with reclaimed water, reduction of the footprint and energy needs for recharge, and water quality issues associated with managed aquifer recharge. Additionally, the Symposium will examine technical and policy challenges related to current and planned small- and large-scale projects, as well as strategies for increasing managed aquifer recharge to help address goals for conjunctive use and groundwater banking. More information, including the program agenda and registration information can be found at http://www.grac.org/aquiferrecharge.asp.

International Interdisciplinary Conference on Land Use and Water Quality: Reducing Effects of Agriculture. Planned for June 10-13, 2013 the event will be held in The Hague, The Netherlands. LuWQ2013 is an international and interdisciplinary conference on the cutting edge of science, management and policy to minimise effects of agriculture and land use changes on the quality of groundwater and surface waters. The date for abstract submission has passed, but more information regarding registration and attendance can be found at http://www.luwq2013.nl/.

Sustaining Water Resources and Ecological Functions in Changing Environments 2013 Joint Annual Meeting of the Universities Council on Water Resources (UCOWR) and the National Institutes for Water Resources (NIWR), June 11-12, 2013 in Lake Tahoe, California. As water demand increases and regional climates change, an important scientific challenge will be to understand and predict how ecological functions will respond and change to climatic and anthropogenic stresses. An understanding of changing ecological functions will be needed to manage water resources in a sustainable manner that will provide for future water needs and maintain healthy ecosystems. The Earth's growing population will continue to increase water demand for domestic, agricultural and industrial uses. When combined with a changing climate, this will increase the pressure on ecosystem functions needed to maintain healthy environments and sustainable water resources. UCOWR and NIWR invite you and your colleagues to join leading water managers, educators, researchers, and other professionals from across the country to beautiful Lake Tahoe, straddling the Nevada-California state lines. For more information visit the conference website (http://ucowr.org/conferences/item/36-2013-conference). Or contact 2013 Conference Committee Members: Jim Thomas, jim.thomas@dri.edu, Christopher Lant, clant@siu.edu, or Alan Heyvaert, alan.heyvaert@dri.edu

The 2013 IAH International Congress will be held September 15-20 in Perth, Western Australia. The organizers have chosen the theme "Solving the Groundwater Challenges of the 21st Century", recognizing that groundwater resource use, management and protection will become ever more important during the course of this century. In addition to a widely ranging technical program, there will be pre- and post-meeting workshops, courses, and field trips. Come take in the unique Australian springtime! The deadline for abstract submission has passed **but late submissions are being considered**. For more information, go to: http://iahcongress2013.org.

The 8th International Symposium on Managed Aquifer Recharge, ISMAR8, will be held October 15-19 in Beijing, China. This is the premier international conference on this subject and is held only once each three years. In addition to papers on the many advances in technical and scientific areas, the IAH Commission on Managing Aquifer Recharge (MAR) is interested in attracting papers on the economics of MAR, policies that encourage groundwater replenishment, MAR in cities, MAR as a buffer against climate change, and MAR in karst aquifers. The last two will be sessions jointly chaired with IAH Commissions on Groundwater and Climate Change and Karst Hydrogeology. The Abstract submission deadline has passed. Early bird registration closes July 1. To register or for more information, go to: http://ismar8.org.

The 2013 Geological Society of America Annual Meeting and Exposition will be held October 27-30 in Denver, Colorado. The theme will be "Celebrating 125 years of Advances in Geoscience". The abstracts submission period is now open. **The deadline for abstracts submittal is Tuesday, August 6, 2013.** In addition to the eight sessions shown below, the IAHUS National Chapter is co-sponsoring a field trip titled "Rocky Mountain Unsaturated Zones--Exploring Fire-Earth-Sky Connections" (Session ID: 32374) on behalf of the Unsaturated Zone Interest Group (UZIG). The IAH-USNC will hold its Fall board meeting at this conference (time/place to be announced later). For more information, go to: http://www.geosociety.org /meetings/2013/

The IAH-USNC is co-sponsoring the following 2013 GSA technical sessions:

1) Groundwater Extremes: Groundwater's role in drought, floods, depletion, subsidence, landslides, and sea level rise, Session Chairs - Cunningham, W.L., Sheets, R.A. and Burbey, T.J. (Sheets, Rodney rasheets@usgs.gov)
2) Mountain Groundwater: Recent Advancements in the New Era of Climate Change and Resource Development, Session Chairs - Andrew Manning, Jonathan Caine, Lyndsay Ball (Manning, Andrew amanning@usgs.gov)
3) Environmental and Social Implications of Hydraulic-Fracturing Driven Oil and Gas Development: Toward a More Holistic Assessment, Session Chairs - Chris Potter, Avner Vengosh, Zack Bowen, Vic Heilweil, and Peter McMahon (McMahon, Peter pmcmahon@usgs.gov)
4) Vadose Zone Flow and Transport in Natural or Engineered Systems Under Extreme Conditions, Fred Zhang, H. Liu, J Zhu (Fred Fred.Zhang@pnnl.gov)
5) A Comprehensive Look at Hydraulic Fracturing, Neil Coleman, Gerry Winter (NCOLEMAN@pitt.edu)
6) Anomalies, Surprises, Irregularities, and Contradictions in Variably-Saturated Subsurface Flow, Ben Mirus, Brian Ebel, and John Nimmo (Ben Mirus bbmirus@usgs.gov)
7) Unsaturated Zone Geophysics, John W. Lane, Kamini Singha, (John W Lane jwlane@usgs.gov)
8) Recent Advancements in the Theory, Characterization, and Modeling of Unsaturated Zone Processes, C. Amanda Garcia , Michael H. Young, David Stonestrom, John Nimmo, (cgarcia@usgs.gov)