International Association of Hydrogeologists
U.S. National Chapter
Fall 2016 Newsletter

Editors: Leonard Konikow, Gary Robbins

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Cover Photos: Drilling and collection of vadose zone sandstone cores in Spanish Valley, near Moab, Utah. The pore waters from the cores (shown in inset) are being processed and analyzed for tritium, stable isotopes, and chloride to better understand aquifer recharge rates and processes (e.g., diffuse versus focused infiltration). Photos courtesy of Vic Heilweil, USGS.

IAH/U.S. NATIONAL CHAPTER: EXECUTIVE COMMITTEE 2012-2016

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A Note from the Outgoing Chair

Greetings! First of all, I am very pleased to announce the election results for the next IAH U.S. Chapter Board of Directors. Based on the results of our online election (held July 8-29th), our next Board (2016-2018) will include:

Officers (all of whom are current Board Members):

- Jim LaMoreaux, Chair
- Suzanne Pierce, Vice Chair
- Vicki Kretsinger Grabert, Secretary
- Andy Manning, Treasurer

Directors:

- Devin Galloway (current Board Member)
- Adam Milewski (New)
- Timothy Parker (New)
- Gary Robbins (New)
- Bridget Scanlon (New)

This should be an excellent Board, bringing together a unique combination of talent and experience. I'm really looking forward to working with them (as Past Chair) over the next couple of years.

Our next IAH Board Meeting will take place at the annual Geological Society of America (GSA) meeting in Denver. We will meet in the Quartz Room of the Hyatt Regency from 5:15 to 6:45 p.m. on Sunday September 25th. Also, our newly formed Early Career Hydrogeology Network (ECHN) U.S. National Chapter (USNC) has organized a gathering at Wynkoop Brewing Company (1634 18th Street) on Tuesday evening from 7:00 to 9:00 p.m. While the focus will be on our younger members, this event is being sponsored by funds from the USNC Endowment fund and all are invited to attend.

The next IAH Congress will take place in Montpellier, France (http://www.60iah2016.org/en/). This is a very special event, as it is celebrating the 60th anniversary of IAH. This is taking place the same week as GSA, so some of our Directors will be in France, representing the USNC.

In closing, I have had a very rewarding experience serving as Chair of the USNC. Our outgoing Board was a very motivated and engaged group of individuals, and it's been a real pleasure working together with them on various projects and initiatives over the past four years. And special thanks to Mike Wireman, who has been very active as Past Chair; his support and insight have greatly helped me and improved the effectiveness of our current Board. Fortunately, all of our current Board (except Mike) will remain as Directors for the next term, along with the four new Directors. I have full confidence that under Jim LaMoreaux's guidance, this new Board will continue to advance the USNC, taking on new initiatives and creating exciting opportunities for our membership.

Vic Heilweil

A Note from the Incoming Chair

First of all I want to thank Vic Heilweil for all the hard work he has expended on behalf of the IAH U.S. National Chapter (USNC) over the last four years. He has continued the fine job Mike Wireman did and improved upon those efforts to bring us where we are today. Many people have been involved in this endeavor, which is usually the case when an organization like ours is successful in serving its members.

There is always more to be done and you have put your trust in me to carry us forward. Thank you for your support and I look forward to working with everyone as we move into a new administration. Fortunately, Vic has agreed to serve in the capacity of Past Chair and we have a new and enlarged Board to lead us as we work to expand our activities and membership. I thought a good way to summarize my thoughts for the coming year was to incorporate the capabilities that our new board members bring to the table to get our year off to a good start.

Suzanne Pierce, who has been our Newsletter Editor, will be the new Vice Chair. On many occasions over the past four years, the IAH international office has complimented the USNC on the newsletter Suzanne has so ably produced. In addition, she will be our Director of Communications to further develop our social media activities including Facebook and Twitter. Lenny Konikow has graciously agreed to take up the newsletter editorship for the next two issues with Gary Robbins' assistance. Gary will also serve as a new board member, with the idea of moving into the editorship after getting his feet wet, which shouldn't be hard for a hydrogeologist.

Vicki Kretsinger has kept our treasury in good shape and has agreed to take my place as Secretary. We have a substantial endowment that she has administered and which is reaching the level that was agreed upon to be established before starting to distribute the funds. In addition she and Suzanne and our webmaster Kevin Blatt are redesigning our web page to include links with social media to get time critical information out to our membership in between newsletters.

Andy Manning who has served on the USNC's Board of Directors since 2012 will be the new Treasurer. Andy, in coordination with the Canadian National Chapter's Grant Ferguson, organized an excellent Pardee Symposium at the 2014 GSA Meeting. In addition, he was integral to establishing the new USNC International Service Award, the first of which was awarded to Mike Campana at the GSA Hydrogeology Division Luncheon last year. He also coordinated the nominees for this year.

The above officers also serve as Directors of the USNC's Board, which was expanded this year from eight members to ten (the maximum as defined by our Articles of Incorporation). Devin Galloway was re-elected to board membership and has served the USNC well as our Membership Liaison. Devin was instrumental in assembling a list of the hydrogeology departments at universities throughout the U.S and contacting them to obtain student nominations for USNC-funded sponsorships.

Devin's efforts in this regard tie in with the USNC's new initiative to develop an Early Career Hydrogeologists Network (ECHN). To further this enterprise, Adam Milewski has volunteered to spearhead development of the ECHN and will also serve as a Director representing this constituency. ECHN is designed to create networking and social opportunities for USNC members under 35 or within ten years of receiving their degree. If you are or know of an early career hydrogeologist, please contact Adam at milewski@uga.edu or visit the ECHN Facebook or LinkedIn sites at ECHN USA IAH. You can also reach ECHN at echn.usa.iah@gmail.com.

Two other new board members include Tim Parker and Bridget Scanlon, both of whom bring an international perspective to the board. Bridget of course being from Ireland brings that naturally along with being active in speaking at and attending IAH and other international conferences regularly. As a side note, Bridget was a student of my father Dr. Phil LaMoreaux at the University of Alabama a few years back. Dr. LaMoreaux was also the first American President of the international IAH, so you might say we're keeping it in the family. Tim is involved with international conferences and activities, most recently

working with Adriana DePalma Nava of the IAH Mexican National Committee (MNC) on ISMAR9, which was held in Mexico City in June.

Adriana attended the USNC Board Meeting in April at the NGWA Groundwater Summit, where ways were discussed to coordinate with the MNC to increase North American cooperation. This was an outgrowth of there not being a Groundwater Summit scheduled in 2017, the need to replace it as a locale for our semi-annual board meeting, and a desire to have it replaced with an ongoing conference that would involve the American Continent as a whole. IAH Vice President Antonio Chambal and I were at ISMAR9 and took the opportunity to explore this idea with others from North America in attendance.

Not only was I able to attend ISMAR9, but I was also able to attend the Canadian Water Resources Association Conference in May. The IAH Canadian National Chapter (CNC) had its semi-annual board meeting and yearly meeting at the conference. Diana Allen is the Chair of the CNC and she and the board and I discussed ways to work together as well with some promising outcomes. These included co-sponsoring a future IAH Congress—perhaps on the U.S. west coast, with the USNC taking the lead. The time frame would be somewhere between 2018-2020. This would build on the excellent cooperation that occurred at the IAH Congress in Niagara Falls and other joint meetings. The CNC also indicated an interest in coordinating on a yearly North American Conference.

In closing, and to summarize the above, I am looking forward to working with everyone to build on the framework our predecessors have built. Initiatives include expanding activities for the USNC's younger members while continuing to benefit from our older and more experienced members all the while taking our organization to a broader base of activities. Many opportunities abound for your participation with many exciting projects upon which to work. Please feel free to contact any of your Directors to volunteer to be a part of this exciting time in the USNC.

Jim LaMoreaux

A Note from the IAH Vice President for North America

Happy summer everyone! Things are cooking internationally with elections to the IAH Council and final details solidifying for our annual Congress in Montpellier in southern France this September. Every four years a new IAH Council is elected, and this year Joanne Thompson, who was editor of the Canada IAH Newsletter for many years, is a candidate for IAH Vice President for North America. I am stepping down from this position, but hope to continue to serve by moving into a new position as IAH Vice President for Programme and Science Coordination. Voting commenced on July 1, 2016 and, as the tongue in cheek phrase goes, "vote early and often." New Council members will begin their terms at the Montpellier Congress. That Congress, which is IAH's 43rd and the focus our 60th year anniversary celebration, will be held September 25-29, 2016. (Note: this unfortunately conflicts with the Geological Society of America conference in Denver). IAH Congresses are typically held in September and are always terrific, from the wonderful venues to the great sessions and field trips. The previous Congresses have been held in great locales, with the last four in Niagara Falls, Canada; Perth, Australia; Marrakesh, Morocco; and Rome, Italy. For more information on the Montpellier Congress see http://www.60iah2016.org/en/

Dave Kreamer

Treasurer's Report – *Vicki Kretsinger Grabert*

2016 U.S. National Chapter (USNC) Memberships

As of August 2016, USNC had 276 USNC members, including 31 honorary members and 26 sponsored members. In addition, individual USNC members sponsored 11 developing country memberships, and the USNC sponsored 7 developing country and 5 student members.

2016 USNC Financial Status

Regarding our general funds, we currently have about $13,400 in our checking account and about $42,400 in our Stock Market Index Fund. Separately, the USNC has about $24,700 in its Endowment Fund, split evenly between two mutual funds. Last year, we reached our goal of establishing an Endowment Fund total of at least $20,000. We continue to add additional contributions to grow these funds. The USNC Endowment Fund is intended for purposes such as sponsoring students and developing country memberships, supporting national chapters in developing countries, and promoting international activities that further the advancement and application of hydrogeology, including research, education, outreach, and training. The USNC's Finance Committee, in coordination with the Executive Committee, will be identifying specific ways to use these funds for their intended purposes.

Membership Renewals Coming Soon…

Please consider sending sponsor funds to the USNC. Your funds help support the IAH/USNC Endowment Fund to support students and developing country members.

Final Note

I have very much appreciated the opportunity to serve as the IAH/USNC Treasurer during the past four years. I wish to extend a hearty welcome to Andy Manning (amanning@usgs.gov), the USNC's incoming Treasurer!

Updates on IAH/USNC Activities and Projects of Interest

Dr. Alan Fryar to Receive the 2016 IAH/USNC International Service Award

Andy Manning

Dr. Alan Fryar, Department of Earth and Environmental Sciences, University of Kentucky, has been selected to receive the 2016 International Service Award. The Award recognizes the efforts of hydrogeologists based in the United States who have shown an outstanding commitment to assisting the international community with groundwater-related needs. Selection is based on exceptional work in assisting those outside of the U.S. (particularly in developing countries) with developing, managing, or protecting groundwater resources for public and/or ecosystem benefit.

Alan began working internationally in 2001 in a study of groundwater arsenic in West Bengal, India. He has since worked in Morocco, Turkey, Indonesia, China, Bangladesh, Thailand, India, Saudi Arabia, and Pakistan. Alan has received substantial grants from the Department of State, NSF, and Moroccan Education Commission for multiple international projects, hosted four Fulbright scholars from Morocco and Pakistan, was a Fulbright Scholar in Morocco in 2014, as well as a Fulbright Senior

Specialist in Pakistan in 2009, and co-developed the ARCHES (Advancing Research & Capacity in Hydrogeologic Education and Science) program, which has trained over 40 graduate students from the Middle East and Southeast Asia (http://arches.wrrs.uga.edu).

The Award will be presented to Alan during the Hydrogeology Division Luncheon and Awards Ceremony at the Annual Meeting of the Geological Society of America in Denver on Tuesday, September 27th. We hope you can join us there for the presentation. Congratulations Alan!

USNC Early Career Hydrogeologists' Network

Adam Milewski

We are excited to formally announce the establishment of a new ECHN for the U.S. National Chapter of IAH. What is "early career"? If you are within ten years of receiving your degree or under the age of 35, then you would be considered an Early Career Hydrogeologist. In 2011, the ECHN was formally acknowledged as a Network of the International Association of Hydrogeologists. The main aim of the Network—both abroad and in the new USNC network—is to assist hydrogeologists at the start of their professional or academic careers by providing support in information sharing, networking, and strengthening the status of early career hydrogeologists within the IAH.

The steering committee for the new ECHN will be: Chair - Adam Milewski (University of Georgia), Vice Chair – Katie Markovich (University of California - Davis), Treasurer – Rory Cowie (University of Colorado), and Secretary - Racha El Kadiri (Middle Tennessee State University). The first meeting was held at the NGWA Ground Water Summit in conjunction with the bi-annual meeting of the USNC.

A kick-off reception will be held at the upcoming GSA meeting in Denver at the Wynkoop Brewery (1634 18th St.) on Tuesday, September 27th from 7-9 pm. Snacks and refreshments will be provided.

In the interim, we would like to continue to identify and recruit Early Career Hydrogeologists in our membership. Please let us know if you meet these criteria so we can include you in membership communications. Contact us at:echn.usa.iah@gmail.com or check out our Facebook page (ECHN USA IAH) and LinkedIn Group (ECHN USA IAH). We will continue to develop content, so check back often. Please feel free to reach out to colleagues and friends about joining the new ECHN and IAH. Student membership prices in IAH are now only €29 (about $32). We look forward to working together to grow the USNC ECHN.

IAH/USNC Launches New Web Site

Vicki Kretsinger Grabert

The IAH U.S. National Chapter (USNC) has enjoyed its own USNC-specific web site since 2009. With increased interest in ease of access to web sites on mobile devices and communicating member information in a variety of

social media platforms, last fall the IAH USNC decided it was time for a redesigned site that would accomplish these objectives and much more. The USNC's web designer, Kevin Blatt of iHappi, in coordination with Suzanne Pierce and I, assessed design and hosting parameters for the new site, and efforts to build the new site began in May 2016. With many thanks to Kevin for his understanding of the USNC's site design objectives, experience in attractive and effective site design, and especially for his hard work, the new site is now fully functional at http://iah-usa.org/.

The visually refreshed and streamlined site uses WordPress Design, which allows mobile-friendly viewing on cell phones, tablets, and other devices. The site is hosted independently of the main IAH site primarily to accommodate the USNC's use of social media options to expedite the delivery of time-critical information and member communications (*e.g.*, Facebook, Twitter, and LinkedIn) and accelerate web site content updates.

In honor of IAH's 60th Anniversary, we have incorporated the special IAH Anniversary logo at the top of the Home page and all interior pages. Since the USNC wishes to engage members and also others interested in groundwater resource planning, management, and protection and who have a broad interest in international perspectives on groundwater resources and hydrogeological issues, we have developed a new, rotating photo banner (see image at top of this article) that highlights IAH's core objectives. The stunning photographs incorporated in the Home page rotating banner and in headers on interior pages are by Michael Wilson of Prescott, Arizona.

Sidebar information on the Home page and interior pages has been restructured and enhanced to include:

- Key event reminders such as for the IAH Congress, the Geological Society of America's Annual Conference, and the World Water Congress;
- Job listings, including a short list of the most current job ads, with other job listings shown on the new Job Board page;
- Membership information at a glance to renew your membership or learn about the benefits of becoming an IAH member;
- Information links such as the "IAH Forward Look 2020."

The Events page has been restructured to add viewing of upcoming international and national events in a monthly calendar or as a list with brief descriptions. Other new functions on this page allow viewers to find events by date or subject matter and to share calendar data with Google Calendar, Microsoft Outlook, and other applications.

We hope you find the new site easy to navigate and a handy resource; we welcome your feedback and particularly content contributions or suggestions!

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About Kevin Blatt and iHappi

Kevin Blatt has provided professional website design, internet marketing, and related IT administrative services to small businesses and non-profit organizations since 1999. He is committed to helping his clients leverage the power of the internet to make their enterprise a resounding success. Additional services include web content creation, search engine optimization, social media marketing, Google AdWords, email marketing, contact management, webinar coordination, database administration, and WordPress coaching. For more information, please visit: http://ihappi.com/.

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Global Hydrogeology

FROM KENT STATE UNIVERSITY TO WESTERN SIBERIA

Yoram Eckstein, PhD

Lenny Konikow, the Editor of this issue of the Newsletter, asked me if I would be willing to write a couple of pages about my "Siberian sojourn." He had in mind the two semesters I spent on a Fulbright award in 2013/14 at Tomsk Polytechnic University in Tomsk, Russia. Little did he know that, actually, my "Siberian sojourn" began about 75 years ago. But, first things first.

In Spring 2013 I was ready to retire after 37 years on the faculty of the Geology Department at Kent State University. It was a rough ride. Through the first 16 years, our graduate program in Hydrogeology thrived, quickly entering the NGWA List of Top 100 Programs and graduating on the average more than 2 MS or PhD students each year. Alas, with changes in the departmental administration in the early 1990s, the program apparently and inexplicably became a target for extinction. The graduate program in hydrogeology practically ceased to exist during the 2000s. My academic life became increasingly difficult, until eventually I saw the writing on the wall, and departed in Summer 2013.

Well–what was a retired professor with a few miles still under his hood, love of teaching and dedication to his research remaining strong to do? I quickly applied to the Fulbright Foundation to participate in a "core" teaching and research program, "Science and Innovation," in Russia. As it happens, I am fortunate to be fluent in four languages, including Russian, so – Russia was an obvious choice… unless I wanted to learn a fifth language! Several other reasons guided my choice. I know the country and its incredible mosaic of peoples, from the Russians in St. Petersburg and Nizhny Novgorod to the Abkhaz and Chechens of The Caucasus, to the Tatars of Urals and Siberia. Instead of choosing the popular academic venues of Moscow or St. Petersburg, I elected Tomsk Polytechnic University in Western Siberia for a particular reason.

My contacts with Tomsk Polytechnic University began in Spring 2009 when I initiated email correspondence with Professor Shvartsev, then Chair of Department of Hydrogeology; subsequently, I visited there for 4 weeks on a small travel grant from my university. My choice of this venue was not purely academic. Aside from scientific interest in the region, I wanted to close an unfinished chapter of my own life, one that began with the 1940 exile of my family from eastern Poland to a Siberian labor camp. At that time I was a little kid; still, a few names, events, and images had remained in my memory, staying with me throughout my life. One of these lasting memories was the camp where we "lived" for over one year, near the village of Beregayevo on the River Chulym.

So, what is Google Earth good for? I quickly located the river and found that Beregayevo lies a little over 300 km from the city of Tomsk. I began "googling" Tomsk and found Professor Shvartsev's (whom I never met before) signed textbook (in Russian) on my bookshelf, sent to me as a professional courtesy.

Prof. Shvartsev quickly responded to my e-mail regarding a short visit to Tomsk to explore the possibilities of a cooperative research with a letter of invitation, and my visit was set for late May and early June 2009. Getting a visa to Russia was fairly simple, although I had to enclose with my visa request form a recent blood test showing that I am HIV free.

The overnight flight from New York to Moscow was uneventful, long, and tedious. Because the only daily flight from Moscow to Tomsk takes off at midnight (Moscow time), a long overlay at Moscow Airport was unavoidable. Despite being dog-tired from more than 24 hours of travel and layovers (from Cleveland), and lacking the ability to sleep in a noisy Tu-154, the 7:00 am landing at Tomsk Airport brought welcome relief. Despite the early morning hour, I found Prof. Shvartsev, his driver, and his

assistant Lena looking for me at the exit gate. They drove me to a comfortable University Guest House, where I promptly fell asleep, only to be awakened 10 hours later by Prof. Shvartsev who awaited my presence for dinner.

I found the Hydrogeology Department at the Polytechnic University surprisingly well equipped (and staffed) to carry out all types of modern hydrochemical research. Seated atop a grand old five-story Russian style building, the department occupied the top floor with the Departments of Natural Resources and Petroleum Technology (drilling and transport) on lower floors.

Tomsk is situated on the western bank of River Tom, a major tributary to the Ob River in the south-eastern corner of the Western Siberian Artesian Basin (Fig. 1). The Basin, filled mainly with Cretaceous sedimentary formations (Fig. 2), is the site of Russia's huge oil and gas deposits (Fig. 3). A short distance to the south lies the Kuznetsk Basin (Kuzbas, Fig. 1), one of the largest coal mining areas in the world, covering an area of around 27,000 square miles (70,000 km^2). To the northwest, just over the Ob River, is the Vasyugan Swamp, the largest boreal wetland occupying a 53,000 km² area. The swamp contains enormous amounts of peat and is a major reservoir of fresh water for the region. The City of Tomsk benefits from excellent groundwater supplied from a well-field situated on the intentionally undeveloped eastern shore of Tom River, while the major cities in the Kuzbas coal-mining region (Novosibirsk, Kemerovo, Novokuznetsk, etc.) are forced to use river water, as the groundwater there is severely contaminated with heavy metals.

Figure 1. West Siberian Basin (approximate boundaries in red).

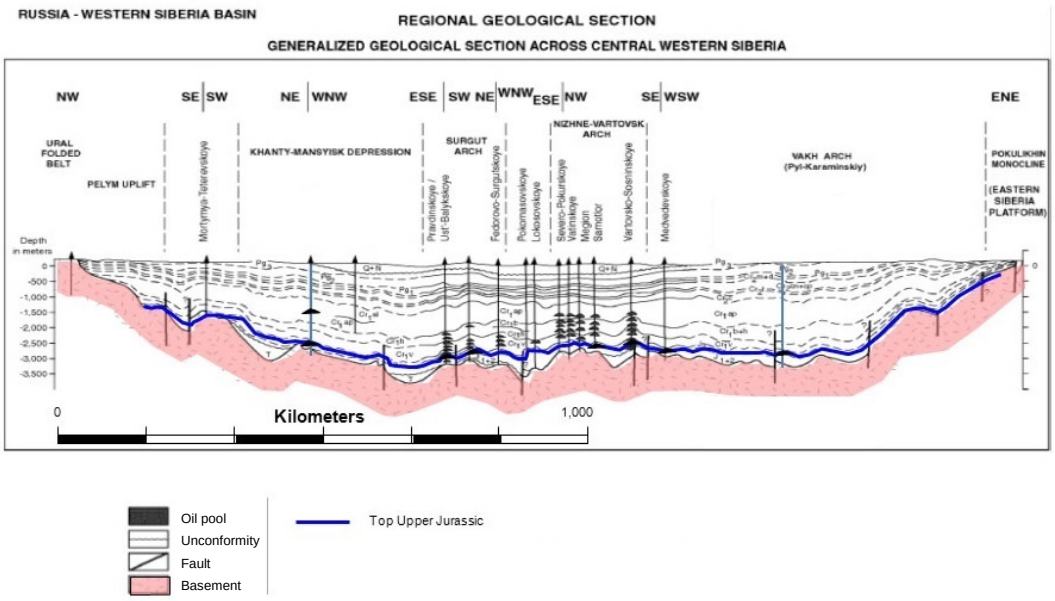


Figure 2. Generalized geological cross section across Western Siberian Basin (*from:* Ulmishek G.F. (2003) Petroleum Geology and Resources of the West Siberian Basin, Russia; U.S. Geological Survey Bulletin 2201-G, 49 p.).

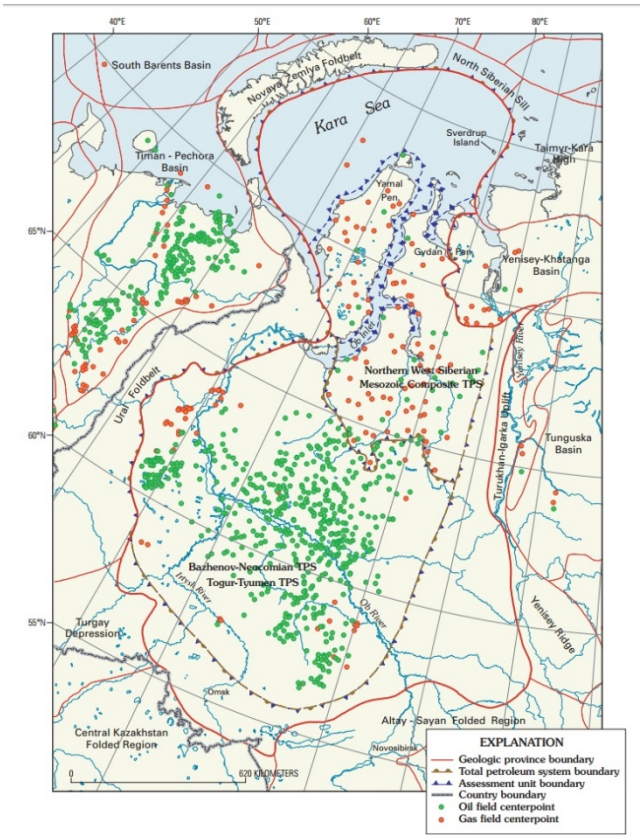


Figure 3. Oil and gas deposits in Western Siberian Basin (*from:* Ulmishek G.F. (2003) Petroleum Geology and Resources of the West Siberian Basin, Russia; U.S. Geological Survey Bulletin 2201-G, 49 p.).

Our proposed research focused on the Vasyugan wetland, particularly on its response to warming trends (Eckstein et al., 2015). New data collection from Vasyugan is in process and the project still continues. During my two semesters (2013/14) in Tomsk I was asked to give two advanced courses to small classes (<20), one in advanced hydrogeology and one in groundwater contamination transport.

Inevitably, when discussions drifted away from our proposed cooperative hydrogeological research, particularly during typical libations with vodka and cold cuts, our conversations shifted to history, often personal. During the 19th century, the city of Tomsk had been a common exile destination. Its skyline is still dominated by a wood-log Catholic Church built by the exiled veterans of the 1863 Polish rebellion against the tsarist regime. Given the range of places from which these exiles came, and often stayed, a current roster of citizen surnames in Tomsk embraces each piece of the Russian mosaic: from the indigenous Tatars, to exiled Poles, Ukrainians, Balts, Belarus, Russians, and Germans. It was time to divulge my own story of my family exile in 1940. After the next shot of vodka, it was Professor Shvartsev's turn to recall his 1950-53 exile from his native Lithuania to a labor camp in the same region as Beregayevo. We quickly settled that one of the remaining days of my visit would be a trip to "my" camp near the village of Beregayevo.

The expedition turned to be an interesting field trip in hydrology. We first drove a little over 3 hours in a "Lazik" (a Russian "jeep"); we travelled over a well-kept dirt road through the taiga. We were to be met by a rope-operated ferry to cross the Chulym River (Fig. 4). Alas, in early June, the river was still swollen from melting snow, which flood the forest well beyond the river's banks (Figure 5 – I am standing in the middle of the road). Undaunted, we switched from the "Lazik" to a flat-bottom, aluminum motor boat for an eerie sail through a flooded forest. On the high bank of the village, another "Lazik" was waiting, along with our Tatar boat captain (Fig. 6).

Figure 4. Extent of Chulym River flooding.

Figure 5. I am standing in the middle of the flooded road (note the road sign in the far left.)

Figure 6. Our motor-boat captain.

The captain took us for a tour of the village and the remnants of the old camp. The village population consisted mostly of descendants of the expropriated farmers exiled from Ukraine by Stalin in 1930s. I asked our boat captain if I could meet the oldest folks in the village. Sure enough, he brought me to two octogenarians. When I asked them if they remembered the 1940/41 inmates from Poland, the woman brightened and responded: “yeah – I remember when they got released; they constructed a big raft from the lumber logs and set down the river hoping to reach the nearest rail station, but we never heard if they did.” I couldn’t help smiling, telling her that it was my Dad who directed the raft construction and I was on that raft. Hearing that, the old lady broke down crying and began kissing me on both cheeks. There was no escape from a commemorative picture (Fig. 7.)

Figure 7. The two that remembered 1940/41.

And so I closed the circle on my “Siberian sojourn,” which began about 75 years ago. And little did I know that the sojourn would mark a memorable occasion for the little boy, an inmate in the Siberian gulag, to return as a hydrogeologist and colleague of a Russian professor, himself a former exile.

REFERENCE: Eckstein, Y., Savichev, O.G., and Pasechnik, E.Y. (2015) Two decades of trends in ground water chemical composition in The Great Vasyugan Mire, Western Siberia, Russia; Environmental Earth Sciences, 73(11), doi:10.1007/s12665-014-3908-z.

Rio Actopan Basin (Veracruz) Groundwater Study Utilizing Dissolved-Gas Tracers Is Unprecedented in Mexico

Juan Pérez Quezadas and Alejandra Cortés Silva

In 2011, the International Atomic Energy Agency (IAEA) approved the technical collaboration project entitled: "Characterizing the sources for water supply in the central region of Veracruz, Mexico," which was awarded to the Universidad Veracruzana (UV), in the collaboration with the Instituto de Geofísica de la Universidad Nacional Autónoma de México (UNAM), for a two-year study (2012-2013). The study objective was to utilize geochemistry and environmental tracers for understanding groundwater resources, recharge processes, and potential sources of contamination in the Rio Actopan Basin.

The financial support given by the IAEA was for scientific visits by technical experts in areas of applied research, along with scholarships for training and equipment. The IAEA's objective for this project was the dissemination of knowledge and development of local expertise in isotopic techniques and their applications in hydrology for better management of water resources.

In December 2014, Juan Pérez Quezadas (UV) and Alejandra Cortés Silva (UNAM) hosted a visit by Victor Heilweil (USGS) to Veracruz to assist with the interpretation of the results of environmental tracer sampling of springs and wells previously conducted with Luis Araguas (IAEA). The objective of this sampling and interpretation was to use age dating and noble-gas thermometry to better understand the complex groundwater system within the Actopan River basin, located in the central part of the State of Veracruz and draining towards the Gulf of Mexico. The application of this suite of environmental tracers (particularly noble and industrial gas tracers) was unprecedented in Mexico.

Figure 1. Field work in the Rio Actopan Study Area with (a) Rocío Salas Ortega, Juan Pérez Quezadas, and Victor Heilweil; (b) Luis Araguas and the Universidad Veracruzana Study Team.

The study found that total dissolved solids are lower in wells and springs located in the basin uplands compared with those closer to the coast, likely associated with rock/water interaction. Geochemical results also indicate some saltwater intrusion near the coast and increased nitrate near urban centers. Stable isotopes show that precipitation is the source of recharge to the groundwater system. Interestingly,

some high elevation springs are more isotopically enriched than average annual precipitation at higher elevations, indicating preferential recharge during the drier but cooler winter months when evapotranspiration is reduced. In contrast, groundwater below 1,200 m elevation is more isotopically depleted than average precipitation, indicating recharge occurring at much higher elevation than the sampling site. Relatively cool recharge temperatures, derived from noble gas measurements at four sites (11–20 °C), also suggest higher elevation recharge.

Environmental tracers indicate that groundwater residence time in the basin ranges from 12,000 years to modern. While this large range shows varying groundwater flow paths and travel times, groundwater ages using different tracer methods (^{14}C, $^{3}H/^{3}He$, CFCs) were generally consistent. Comparing multiple tracers such as CFC-12 with CFC-113 indicates piston flow to some discharge points, yet binary mixing of young and older groundwater at other points. In summary, groundwater within the Rio Actopan Basin watershed is relatively young (Holocene) and the majority of recharge occurs in the basin uplands and moves towards the coast (Perez Quezadas *et al.*, 2016, doi:10.1007/s10040-016-1445-4).

Member News and Notes

Modeling the Art and Engineering of Roman Aqueducts with Lego Bricks

Gary Robbins

I teach an undergraduate water resources class at the University of Connecticut that covers ancient Roman aqueducts. After spending time in Rome exploring a number of aqueduct sites, I scoured the internet looking for models I might use in class to illustrate both their art and engineering but did not find much. Then while playing with Lego bricks with my grandsons, I put together a simple aqueduct arcade. This started my Lego Roman aqueduct modeling journey. I built some 30 models illustrating aqueducts and water related structures from all over the ancient Roman world. Although not to scale (constrained by Lego brick dimensions and shapes), the models illustrate the diversity of architectural and engineering elements the Romans used, such as single, double, and triple arches in the aqueduct arcades. One of the models I use in class is a working model of the Aspendos inverted siphon in Turkey. The Romans used inverted siphons to cross deep or long valleys. Another aqueduct arcade model is that of the High Bridge in New York City, which was part of the city's first aqueduct system—the old Croton Aqueduct—which was modeled after those of ancient Rome. In 2014, the models along with pictures of the real aqueducts went on display at an art exhibit on water at the University of Connecticut. You can see the exhibit on YouTube (see the link below) and listen to the music of Jeff Beal from the HBO series Rome.

Modeling the Art and Engineering of Roman Aqueducts with Lego Bricks exhibit:

https://www.youtube.com/watch?v=xAcQ1r3UEAQ

Here are two post-exhibit action models on YouTube illustrating how the Romans used water for work:

Roman Watermill made with Lego Bricks https://www.youtube.com/watch?v=8CbHClJtiq4

Roman Water Wheel Made with Lego Bricks https://www.youtube.com/watch?v=QAmYv10rzPc

LEFT: A working model of the Aspendos Inverted Siphon. Water flowed from an aqueduct to a tank then flowed across the valley in stone pipes to overflow tanks that regulated the pressure until reaching another tank on the other side of the valley.

RIGHT: A model of the Claudia and Anio Novus aqueduct arcade still visible in Aqueduct Park in Rome, Italy.

LEFT: A model of a pressure tank used in Pompeii to maintain a constant water pressure throughout the ancient city. Water flowed from an uphill distribution tank charged by the Serino Aqueduct through lead pipe into a lead tank on top of a column of brick. The water then overflowed into a fountain maintaining a constant head and also discharged to the next tank downhill by lead pipe, which in turn discharged to the next downhill tank, and so on.

Gary Robbins Receives Univ. of Connecticut Teaching Innovation Award

Dr. Gary Robbins, Hydrogeologist in the Department of Natural Resources and the Environment and Center of Integrative Geosciences at the University of Connecticut was awarded the 2016 University of Connecticut Teaching Innovation Award. Gary has been instrumental in integrating novel methods of pedagogy into undergraduate and graduate hydrogeologic education. These include the use of computerized "hands-on" simulations of hydrogeologic related field testing, such as slug tests and borehole flow metering; the use of virtual field trips; the development of an online water resources course; the introduction of a study abroad water resources course (Water Systems of Rome: Ancient to Modern); and the use of Lego™ blocks to illustrate the art and engineering of ancient Roman Aqueducts (see related stories above and below).

Gary explores underground section of ancient Roman aqueduct near Rome, Italy.

UCONN Offers New Study Abroad Water Course in Rome, Italy

Gary Robbins

The development of modern municipal water systems, going from private sources that provided water to a few large scale public sources that gather water from huge watersheds to satisfy the thirst of millions, perhaps best exemplifies the major concepts of environmental history. That is, the study of human interaction with the natural world over time. The science, engineering, and architecture of most modern municipal water systems are founded on principles developed or expanded upon in ancient Rome. Although we often think of resource protection, management, and sustainability as modern concepts, they were also important in ancient Rome. Nowhere but in Rome can you study some 2000 years of municipal

water resource development history. Dr. Glenn Warner, Professor and Water Resources Engineer and myself, a Professor of Geology, specializing in Hydrogeology, developed a new study aboard field course at the University of Connecticut for science and engineering students entitled, Water Systems of Rome: Ancient to Modern. Because students in science and engineering have heavy course loads, they often cannot find time for a study aboard experience. To help them gain the experience, we designed a course over 17 days in May between spring and summer sessions. We gave the course this past spring and took 16 students to Rome. The major objective of this course is to enhance students' overall understanding of human interactions with the environment in the development of modern municipal water systems. We developed a faculty-lead field course with excursions and field exercises each day. We took students on excursions in Rome, Ostia Antica, Tivoli, Pompeii, and to the major spring in the Apennines that supplies water to modern Rome. Students learned how the water system of Rome evolved over the last 2000 years and saw key elements, including the Tiber River, aqueducts, piping, springs, wells, baths, and fountains. With help from faculty at U. Roma Tre and the American Institute of Roman Culture and assistance by Roma Sotterranea, the students conducted a variety of water related exercises. These included: making observations of water related structures in the Roman Forum and on Palatine Hill to understand the important role water played in the history of Rome and how a gravity fed water system works; mapping the geologic structure and geographic features in the historic area of Rome and correlating them with the occurrence of springs and groundwater flow (Rome is the largest city in the world that relies completely on groundwater from springs); making hydraulic-related measurements above and below ground in aqueduct channels to determine aqueduct discharge rates; measuring the water quality of springs and water discharging from an aqueduct; measuring past flood heights to assess how flooding played an important role in Rome's history; conducting stream gauging; and making water balance calculations to evaluate water needs and sustainability. They also had plenty of time for cultural immersion and, of course, to sample Italian food and beverages.

Dr. Darius Arya, Director of the American Institute of Roman Culture, explains the importance of springs to the development of the Roman Forum.

UCONN Water Systems of Rome class standing under an arch of the Anio Novus/Claudia Aqueducts in Aqueduct Park in Rome.

The multiple private and public baths in ancient Rome created an enormous demand for water. Here the students visit the Baths of Caracalla, the best preserved Roman Bath in the city.

We will be offering the course again—tentatively scheduled for May 8 through May 24, 2017. The course is open to both undergraduate and graduate science and engineering students from any academic institution. The course is limited to 20 students. For more information see: http://abroad.uconn.edu/program/uconn-water-systems-of-rome-ancient-to-modern-rome-italy-summer-faculty-led/

We are also planning to offer a Water Systems of Rome excursion for interested professionals and adults to be given from May 26 to June 4th, 2017. The excursion will consist of trips in Rome, Ostia Antica, and in the nearby countryside to experience 2000 years of Roman water system development. If you are interested, please contact me at gary.robbins@uconn,edu to get on our emailing list to receive more information.

WESTERN MICHIGAN UNIVERSITY TO OFFER APPLIED HYDROGEOLOGY CERTIFICATE

According to a press release from Western Michigan University (WMU), beginning Fall 2016, they will offer a graduate certificate program in applied hydrogeology. The certificate is built on WMU's esteemed hydrogeology program, which provides analytical, field and technical skills to prepare students for successful careers in hydro- and environmental geology. The 15-credit graduate certificate program will help fill the need for applied training in hydrogeology and environmental consulting.

Through online, lab, and field courses, students will gain problem-solving skills and learn the principles and practices of near-surface geophysics, drilling and water well installation methods, and environmental assessment and hydrogeologic measurement techniques. Students will also study water and sediment sampling techniques, field geochemistry, scientific writing, and data collection, presentation and analysis.

The certificate requires students to take WMU's six-week summer hydrogeology field course. Applications are now being accepted for the applied hydrogeology certificate program. Contact Duane Hampton, associate professor of geosciences, at (269) 387-5496 or duane.hampton@wmich.edu for more information.

Groundwater News of Interest

Nuclear Waste Disposal Status in Finland

According to a Dec. 2015 news article in *Nature* (doi:10.1038/nature.2015.18903), Finland has become the first nation to approve an underground repository for storage of spent nuclear fuel. Waste canisters will be emplaced into a network of tunnels mined in granite bedrock about 400 meters below the land surface. Disposal operations are expected to start in 2023. The story is available at: http://www.nature.com/news/why-finland-now-leads-the-world-in-nuclear-waste-storage-1.18903

World Bank Report Discusses Water Scarcity

According to a news release from AGI (American Geosciences Institute), a new World Bank report titled "High and Dry: Climate Change, Water, and the Economy" highlights the importance of water for food, energy, and urban and environmental systems. The report projects that water scarcity will increase globally and impact economies, migratory patterns of populations, and create geopolitical conflict. A key figure in the report estimates that by 2050 at a "business as usual" pace, water scarcity will result in a loss of 6 percent gross domestic product (GDP) in large number of sub-Saharan and northern African, Middle-Eastern, and Asian countries. Compared to a global scenario of efficient water policies put in place by 2050, Northern Africa and the Middle East would still see a 6 percent loss. The World Bank report recommends that nations adopt three general water policy priorities in order to combat the imminent effects of water scarcity: (1) optimize water use through planning and incentives; (2) expand water supply and availability by investing in storage infrastructure and water recycling and reuse; and (3) address resilience in order to reduce the impact of extremes, variability, and uncertainty of water resources. The report and related information can be accessed at: http://www.worldbank.org/en/topic/water/publication/high-and-dry-climate-change-water-and-the-economy

The Groundwater Visibility Initiative

Michael E. Campana, William M. Alley, Lisa Beutler, Sharon B. Megdal, and John C. Tracy

Respectively, Technical Director, American Water Resources Association; Director of Science and Technology, National Ground Water Association; Executive Facilitator, MWH Global; Director, Arizona Water Resources Research Center; Director, Texas Water Resources Institute

What is the Groundwater Visibility Initiative?

On 28 April 2016 in Denver, CO, a group of 25 water experts partook in a day-long *Groundwater Visibility Initiative* workshop convened by the American Water Resources Association (AWRA) and the National Ground Water Association (NGWA). This seminal event sought to elevate groundwater's status in the international discourse on water policy, governance, and management by crafting recommendations for action.

Why the title, 'Groundwater *Visibility* Initiative'? There are two components to the answer: (1) groundwater, and the boundaries that define it as a water management unit, are physically invisible to humans; unless you're in a cave, you can't see it; and (2) its lack of physical visibility has contributed greatly to its lack of visibility in many discussions of water policy, governance, and management. The attendees were ineffectual at rectifying (1), but feverishly tackled (2) through an agenda consisting of provocative talks by an all-star group of specialists, panel discussions, and breakout sessions. Ways were discussed to more fully integrate groundwater into integrated water resources management and incorporate it into policies for agriculture, energy, environment, land-use planning, and urban development.

Given groundwater's vast reserves, broad geographical distribution, generally good quality and frequent availability at or near the point-of-use, it has become the foundation of many water management systems for drinking water, irrigation, and municipal and industrial uses. Rural areas are often 100% dependent on groundwater. Groundwater also provides enormous environmental benefits by keeping streams flowing during dry periods and supporting wetland and spring habitats. With a growing population and changing climate that threaten to desiccate surface water supplies, the world needs groundwater more than ever and a number of recent popular media articles have dealt with groundwater depletion.

Corporate users are becoming more aware of groundwater. Consider this statement from a decidedly corporate vantage point in a recent report by the Earth Security Group:

> *"The exposure of multinational companies to depleting and degrading groundwater is increasing. The rapid depletion of aquifers is a systemic risk to one billion people in the world's growing economies. Aquifers are shared across national borders and have the potential to spark conflict. Companies must act beyond their site operations and help improve groundwater governance if they are to ensure their sustainable growth."* – Foreword, 'Global Depletion of Aquifers', Chapter 4 *in* *Earth Security Index 2016 Report* http://tinyurl.com/zdot9dp

Workshop Findings and Recommendations

Despite its importance, groundwater is largely undervalued and narrowly perceived. The interrelationship between groundwater and surface water is well established by science. Yet, institutions at all levels have struggled to effectively incorporate these concepts into laws, regulations, management, and planning. Workshop findings and recommendations include:

1. Managing groundwater requires working with people

Governance is an important part of resilient aquifer management. Groundwater sustainability is a societal decision that involves tradeoffs and should be made through informed, transparent public participation.

Multidisciplinary teams and alliances among multiple governance/ management associations can provide greater expertise to solve these problems. Communications programs are required to help overcome misperceptions about groundwater and surface water interactions. Communications must demonstrate the connectivity between groundwater and surface water. Examples of good management and governance should be provided to decision-makers and other stakeholders.

2. Data and information are keys

Better data and information on water withdrawals and consumptive use are needed for both groundwater and surface water management. Different aquifers behave differently because of different geology, extent, and hydroclimatic settings. This means monitoring and evaluation at appropriate spatiotemporal scales are necessary to understand trends in both quality and quantity. Data collection and analyses should be transparent.

3. Some mysteries are real

Groundwater and climate are inextricably linked through recharge rates and demand. Science needs to improve understanding of climate impacts on both supply (quantity and quality) and demand for groundwater and its interaction with surface water. Long lag times for groundwater impacts and system responses must be accommodated and understood.

4. We need to care for what we have

Ensure planning and investment incorporates infrastructure rehabilitation and maintenance.

5. Effective groundwater management is critical to an integrated water management portfolio adaptive and resilient to drought and climate change

A diverse water management portfolio, including groundwater, surface water, conservation, recycling, etc., will contribute to greater water security and less risk. Groundwater can support instream flows, endangered species, recreation, sustainable supply for water users, and subsidence avoidance. Groundwater also supports surface-water quality and mediates its temperature.

Managed aquifer recharge is a potentially critical element of drought mitigation planning. Groundwater systems should be analyzed for their resilience and vulnerability to climate perturbations. Projects should be reviewed from a long-term resilience perspective not a short-term one. In this context, groundwater management is especially important as a tool to buffer extremes, even if groundwater is not necessarily a readily-available backup supply.

Models need to be reviewed and adaptive. Collaborative modeling can be an effective tool to obtain buy-in from stakeholders.

In a fully integrated system, repurposing dams and flood control operations for recharge is another opportunity.

6. To be robust, agriculture, energy, environment, land-use planning, and urban development sectors policies must incorporate groundwater considerations

Groundwater problems typically do not have a single solution. Return flows from different sectors have significant intersection with groundwater management issues. Planning and management need to be integrated across all of the sectors. This means matching quality, quantity, and use.

Land-use planning can be used to protect or enhance base flow of streams, floodplain management, and groundwater recharge. Agricultural and open space districts can be an opportunity for a win-win: overlay zones for scenic protection, agricultural preservation, etc., to enhance recharge.

Water managers should consider innovative ways of education and outreach to the agricultural sector, including: (1) key role of agricultural extension agents; (2) subsidy-based conservation programs; (3) self-

regulation with performance-based criteria; (4) “grow-off challenges” through crop yield competitions with guarantees; (5) early adopter programs; and (6) professionally facilitated communication.

Next Steps

The Denver workshop is intended as only a first step in efforts by NGWA, AWRA, and the workshop participants to make groundwater more visible. The following are recommended next steps:

1. Encourage fellow professionals to present the Groundwater Visibility Initiative (GVI) to their respective professional societies for possible adoption and other actions.
2. Present the GVI to non-professional groups.
3. Build a coalition with other professional societies and similar organizations to support the GVI.
4. Distribute the GVI statement to members of Congress and appropriate state and local political leaders and agency personnel; discuss the GVI with the aforementioned persons.
5. Give presentations and convene sessions on GVI-related topics at state, regional, national, and international meetings.
6. Write Op-Ed columns and articles in print and other media; engage journalists.
7. Produce journal articles on the GVI topics.
8. Propose a groundwater-focused agenda for the 8th World Water Forum.

This latter item has already been accomplished and was submitted by AWRA, NGWA, and IGRAC (International Groundwater Resources Assessment Centre). The agenda can be viewed here: http://bit.ly/29aMVCs

Last Words

Now is the time to disabuse society of its approach to groundwater, that ‘secret, occult, and concealed’ resource. The path identified above will help provide the tools to do just that. The hard work of making groundwater more visible has just begun.

The GVI workshop final report, list of attendees, and formal agenda have been posted online at: http://bit.ly/2b9Vglw

Comments on the GVI and support of Item (8) above are welcome. Contact Michael.Campana@oregonstate.edu

USGS Online Mapper for Groundwater Quality

According to a news release from the U.S. Geological Survey, a new online interactive mapping tool (http://nawqatrends.wim.usgs.gov/decadal/) provides summaries of decadal-scale changes in groundwater quality across the Nation. The mapper shows how concentrations of 24 contaminants, such as nutrients, pesticides, metals, and volatile organic compounds, are changing over decadal periods in 67 groundwater networks across the Nation. Each network consists of about 20 to 30 wells selected to represent water-quality conditions in a given geographical area, aquifer, and in some cases, a specific land use. Groundwater quality data were collected in about 5,000 wells between 1988 and 2001 by the USGS National Water Quality Assessment Project (http://water.usgs.gov/nawqa/). About 1,500 of these wells were sampled again between 2002 and 2012 to evaluate decadal changes in groundwater quality.

Upcoming 2016/2017 Meetings and Conference Notes

Geological Society of America Annual Meeting

Denver, Colorado | September 25-28, 2016

If you can't make it to the IAH Congress in Montpellier, then meet with other IAH members and attend the U.S. National Chapter Board Meeting at the GSA Annual Meeting in Denver. More information and program details are available at: http://community.geosociety.org/gsa2016/home

The **IAH U.S. National Chapter** (USNC) will be sponsoring the following events at the 2016 Geological Society of America (GSA) Annual Meeting this year. The meeting will be held September 25th to 28th at the Colorado Convention Center in Denver, Colorado.

Our semi-annual ***IAH USNC Business Meeting*** will be Sunday, September 25th at 5:15 - 6:45 pm in the Hyatt Regency Denver, Quartz Room. The meeting is open and all are welcome to attend.

The 2016 *IAH USNC International Service Award* will be presented at the GSA Hydrogeology Division Luncheon, which will be held Tuesday, September 27th at 11:30 am -1:30 pm in the Mile High Ballroom 1B-E. This is a ticketed event and the cost is $55.

We are also sponsoring two Topical Sessions this year. The first is *"T100: Approaches to Characterizing Groundwater Flow Systems at the Watershed-Scale for Water Management and Regulation,"* which is scheduled for Sunday, September 25th at 8:00 am -12:00 pm in Room 502. The session will be convened by Brian Smerdon and Payton Gardner. The second is *"T110: Hydrogeological and Geomorphological Responses to El Niño, Extreme Weather Events, and Landscape Disturbances,"* which is scheduled for Wednesday, September 28th at 1:30 - 5:30 pm in Mile High Ballroom 3B. The session will be convened by Brian Ebel, Abe Springer, and Andy Manning. Both of these oral sessions have companion poster sessions that will be held the same day in Exhibit Hall E/F. We anticipate some very interesting science to be presented in these sessions and encourage everyone to attend!

Hope to see you in Denver!

43rd IAH Congress, Groundwater and Society: 60 Years of IAH

Montpellier, France | September 25-29, 2016

Come join all of IAH for this historic celebration! See the website for more information: http://www.60iah2016.org/en/.

44th IAH Congress, Dubrovnik, September 2017

The 44th IAH Congress will be held in Dubrovnik, Croatia, Sept. 25-29, 2017. The main theme is "Groundwater Heritage and Sustainability." Eight main congress topics have been established under this theme. The city of Dubrovnik is the jewel of Croatian tourism, occupying a spectacular location on the eastern Adriatic coast. The city was declared a World Heritage Site by UNESCO in 1979. The congress will take place in the Dubrovnik Palace hotel—a short distance from the historic center of Dubrovnik, where you can enjoy the renaissance architectural and cultural monuments. *Plan ahead!* Abstracts are due in February 2017. More details and updated information are available on the Congress website at: http://iah2017.org/ .

American Geophysical Union Fall Meeting

San Francisco, California | December 12-16, 2016

AGU will be hosted once again in San Francisco. Detailed information about the program and events are available at: https://fallmeeting.agu.org/2016/.

Groundwater Resources Association of California

The USNC/IAH has been a cooperating organization for a number of Groundwater Resources Association of California (GRA) events. As members of a cooperating organization, IAH members enjoy GRA member rates to attend these events. Learn more about GRA, or the programs in which IAH is participating with GRA as a cooperator, on the GRA web site at http://www.grac.org. A few events include:

- **GRA's 25th Annual Meeting and Conference,** 2016: Groundwater Supply, Quality, and Sustainability: The Challenges Ahead, September 28-29, 2016
- California Oil, Gas, and Groundwater, November 2-3, 2016

World Water Congress

The XVIth World Water Congress (http://www.worldwatercongress.com/) will take place in Cancun, Mexico, May 29 – June 2, 2017. This triennial event, organized by the International Water Resources Association, is one of the principal global water events featuring opportunities for

interdisciplinary presentations, collaborations, and other events. Since 1971, these Congresses have been the breeding ground for major themes and trends in the global water agenda. They have also brought together a large cross-section of stakeholders to share experiences, present new knowledge, and explore implementation of policy decisions around the world. Congresses typically attract 1,000 or more attendees including leading academics from the natural and social sciences, practitioners and industry leaders, policymakers and intergovernmental officials, and students from around the world.

And YES, groundwater resources are a critical component of the Congress agenda. While it may not be explicit, groundwater issues will be incorporated into the various sessions and panels (including High Level Panels) and featured in a number of Special Sessions. Gabriel Eckstein, a long-time member of the IAH-U.S. National Chapter, serves as Chair of the International Scientific Committee and welcomes all inquiries and proposals from IAH-U.S. National Chapter members. He can be reached at gabrieleckstein@law.tamu.edu.

FLORIDA AQUIFER CONFERENCE

"ASR 16" - Sixteenth year of this annual water management issues conference
Florida Hotel & Conference Center – 1500 Sand Lake Road, Orlando, Florida 32809
This is a "must attend" program for Florida water professionals
September 21-22, 2016, Orlando, FL
Convened by: American Ground Water Trust

TOPICS WILL INCLUDE:
~ Salinization of coastal aquifers
~ Groundwater risk from "fracking"
~ Aquifer recharge permit regulations
~ Latest aquifer microbiology research
~ Future for ASR in Everglades Restoration
~ Rising sea levels: Florida water supply 2050
~ Recharge source water quality and treatment
~ Validity of models for Minimum Flows calculations
~ Contractor, client and consultant roles in well design

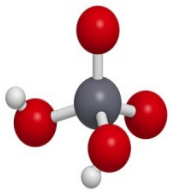
www.agwt.org/events

WATER SUPPLY SYSTEMS WORKSHOP

Correct design, operation and maintenance of water wells
Florida Hotel & Conference Center, 1500 Sand Lake Rd, Orlando, FL 32809
American Ground Water Trust Program – September 23, 2016

TOPICS WILL INCLUDE:
~ Adding "intelligence" to pump system VFD controls
~ How drilling methods can impact water well performance
~ Chemical and microbiological processes that occur in wells
~ Declining performance—is it the pump the well or the aquifer?
~ O & M costs for submersible vs. line-shaft for high yield wells
~ What aquifer experts need to know about well design & pumps
~ Consultant's view on importance of well design and construction
~ Selection of screens, gravel pack, pumping rates for max yield

www.agwt.org/events

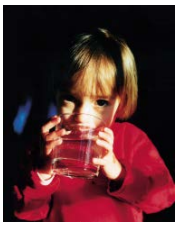


CHROME 6 TECHNOLOGY UPDATE

EVERYTHING WATER MANAGERS NEED TO KNOW ABOUT TREATMENT OPTIONS AND OPERATION COSTS

AN INFORMATION EXCHANGE WORKSHOP

Tuesday September 27th, 2016 – Sacramento, California



A program for all water professionals involved with characterizing groundwater impacted by hexavalent chromium, for engineers designing treatment systems, regulators at local and state levels and local units of government that have authority and responsibility for drinking water health issues.

Convened by: American Ground Water Trust

www.agwt.org/events

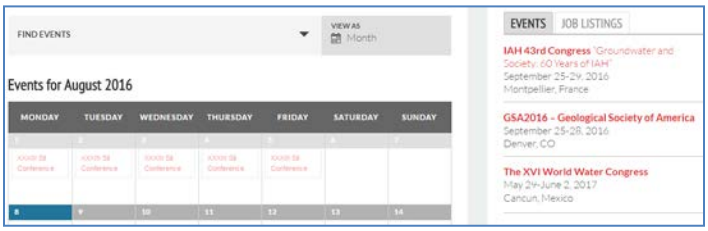
15th Sinkhole Conference

A news release from the National Cave and Karst Research Institute (NCKRI) offers early notice about the *15th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst*, which is generally known as "The Sinkhole Conference." It will be held in Shepherdstown, West Virginia, on 26 April 2018. For over 30 years this conference series has been the premier conference for all aspects of karst geoscience and related engineering and environmental issues—and not just sinkholes. This next Sinkhole Conference will visit the middle Appalachian region for the first time. The venue will be the National Conservation Training Center, a beautiful facility that is conveniently located for field trips in the karst along the Potomac River, and only a short drive from major airports in the Washington, D.C., and Baltimore areas. More information is available on the Conference website: http://www.sinkholeconference.com/. Save the date!

THE SINKHOLE CONFERENCE
Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst

IAH USNC Website Events Page

Check out the brand new Events page on the IAH/USNC website at http://iah-usa.org/events/. The Events page provides several options for quickly identifying upcoming events. You can find events by looking at a month-to-month calendar (see partial image below) or by choosing the "List" option, which provides event titles, dates, locations, and brief descriptions of upcoming events – especially international events. Also, each web site page shows brief reminders for very important events, including IAH's 43rd Congress, GSA's 2016 Annual Meeting, and the XVI World Water Congress.



Contributions Invited for the Spring 2017 Newsletter

Have an interesting hydrogeologic story? Have you been working at places that might be of interest to our members? Have you received an award for your work? Let us know. Please send contributions to the IAH/USNC Newsletter editor, Lenny Konikow, at the following email address: lfkonikow@gmail.com. **Articles are welcome anytime.** Please send feedback or ideas anytime, by email, to either lfkonikow@gmail.com or gary.robbins@uconn.edu.

Check out the USNC website at: http://iah-usa.org/

Thank You!