The Hydrogeologist

NEWSLETTER OF THE HYDROGEOLOGY DIVISION OF THE GEOLOGICAL SOCIETY OF AMERICA SEPTEMBER 1994

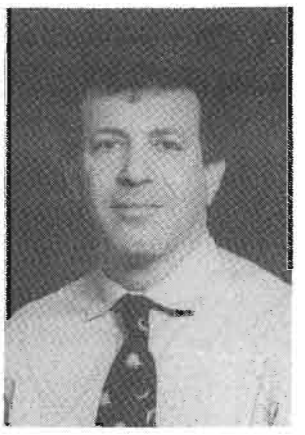
Message from the Chairman

The Hydrogeology Division is now 35 years old and has evolved into a dynamic but stable organization that is the largest Division of GSA (with over 1,900 members). Although "dynamic stability" may sound like a contradiction in terms to some, hydrogeologists recognize certain systems that retain an overall *dynamic equilibrium*. Such systems are characterized by their changes in response to stresses while maintaining the same overall essence. As an organization, I sense the *dynamic* characteristics of the Hydrogeology Division reflect our ability to adapt to changing times, think "young," stay relevant and timely, and serve the needs of our members. Simultaneously, the *stability* of the organization has allowed us to develop worthwhile traditions, and such *stability* is essential for assuring the Division's strength, long-term survival, and effective management, all of which are required to support quality programs and services.

One of the "traditions" that the Management Board has fostered is long-range planning for annual meetings. Steve Wheatcraft has worked hard for two years to put together an exceptionally high quality program in Seattle this October. Van Brahana has a great program outlined for New Orleans in 1995, and Mary Jo Baedecker has already started planning for the 1996 Annual Meeting in Denver. Such behind-the-scenes long-range planning is the only effective means to offer consistently the high-quality technical programs that we want to experience. This has been working well because our Program Committee has taken on an operating philosophy of active collaboration and communication among the Division's previous, present, and next program chairmen. We are grateful for the time and effort that these individuals, along with session convenors, short course instructors, and field-trip organizers, have generously contributed. We want the GSA Annual Meeting to become widely recognized as a professional meeting that hydrogeologists feel they *must* attend—if not every year, then at least once every 2 or 3 years.

Another tradition that we strive to maintain is to encourage, support, and welcome into the family of hydrogeologists those new scientists who have just entered or will soon be entering the field, such as present or recent graduate students. For example, (1) the Division financially and operationally supports GSA's research grant program for graduate students; (2) one of the primary goals of our Distinguished Lecture program is to educate and stimulate hydrogeology students at universities; (3) we offer limited subsidies for students to participate in GSA meetings or functions; and (4) we actively promote "networking" opportunities between new hydrogeologists and established hydrogeologists. We do not undertake and support such activities solely out of altruism or from a sense of moral obligation, but because they contribute significantly to the maintenance of the *dynamic stability* of our Division by attracting new members with new ideas and the latest hydrogeological knowledge. Unfortunately, these worthwhile activities carry a cost, and the Management Board has recommended an increase in Division dues (but only a small increase of $2 per year) to allow us to continue these activities.

On another fiscal matter, I am pleased to report that contributions to the new Shirley Dreiss Memorial Fund during its first six months exceeded all expectations for the entire first year. Your generosity is greatly appreciated! The GSA Foundation reports that, as of August 1, contributions



Lenny Konikow
1994 Chairman
Hydrogeology Division

total more than $10,000. This reflects the affection and esteem with which Shirley was regarded, as well as the value so many people of the Division assign to the newly renamed Birdsall-Dreiss Distinguished Lectureship. The lectureship will be jointly supported by income generated by the Shirley Dreiss Memorial Fund and the John Birdsall Fund. If you haven't yet contributed to the Shirley Dreiss Memorial Fund, please consider doing so this year.

The next Birdsall-Dreiss Distinguished Lecturer is Chris Neuzil, a former Meinzer Award recipient. He is offering two different talks, described in this issue of *The Hydrogeologist*, and I urge you to invite him as soon as possible to visit your university or institution during the coming academic year. In his review of this year's lecture tour for *The Hydrogeologist*, Fred Phillips recommends asking for a visit even before the Annual Meeting.

As part of the Division's dynamism, we are in the process of drafting moderate changes to our Bylaws. The revisions focus on making the Bylaws themselves more readable, concise, and useful. This will be accomplished, in part, by removing detailed operational or logistical specifications from the Bylaws and placing them in a less formal set of Rules and Regulations, which can be amended more easily than the Bylaws. This will allow the Division, the Management Board, and Division committees to be more responsive to changing priorities and conditions. At the same time, our governing principles will remain stable in the Bylaws.

As I look over the names of next year's Management Board, I am pleased to know that the future of the Division is in good hands. I look forward to seeing you in Seattle.

Steve Gorelick is O. E. Meinzer Awardee

Steve Gorelick of the Department of Geological and Environmental Sciences at Stanford University is the 1994 recipient of the O. E. Meinzer Award. The award was based on Steve's work in the application of optimization techniques in the design of contaminant capture systems for aquifer remediation, including the following articles.

Wagner, B. J., and Gorelick, S. M., 1989, Reliable aquifer remediation in the presence of spatially variable hydraulic conductivity: from data to design: Water Resources Research, v. 25, no. 10, p. 2211–2225.

Gailey, R. M., and Gorelick, S. M., 1993, Design of optimal reliable plume capture systems: application to the Gloucester landfill groundwater contamination problem: Ground Water, v. 31, no. 1, p. 107–114.

Tiedeman, C., and Gorelick, S. M., 1993, Analysis of uncertainty in optimal groundwater contaminant capture design: Water Resources Research, no. 29, no. 7, p. 2139–2153.

The O. E. Meinzer award is given to the author of a paper or body of papers of distinction that has advanced the science of hydrogeology or a related field. The award has been given since 1965, as detailed in the past several issues of *The Hydrogeologist*. For copies of the complete list of the award-cited papers, contact the editor.

Darryll Pederson and Joe Rosenshein to Receive Distinguished Service Awards

The 1994 Hydrogeology Division Award for Distinguished Service will be presented to Darryll Pederson (University of Nebraska) and Joe Rosenshein (U.S. Geological Survey). The Award for Distinguished Service was established in 1984 and honors George Burke Maxey, a distinguished hydrogeologist, cofounder of the Division, and enthusiastic teacher. Darryll and Joe have given long and outstanding service to the discipline of hydrogeology and especially to the Hydrogeology Division of GSA. The awards will be presented at the luncheon and business meeting of the Hydrogeology Division on Tuesday, October 25, 1994, at the Annual Meeting in Seattle.

Chris Neuzil to be 1995 Birdsall-Dreiss Distinguished Lecturer

Chris Neuzil will be the 1995 John Birdsall-Shirley Dreiss Distinguished Lecturer in Hydrogeology. Dr. Neuzil received a Bachelor of Arts degree in geology from the State University of New York at Binghamton and a Ph.D. in hydrogeology from Johns Hopkins University. He has worked since 1977 as a research hydrologist at the U.S. Geological Survey in Reston, Virginia. His research interests include the hydrogeology of clays and shales, problems of characterizing low-permeability environments, and the interaction between groundwater and geologic processes.

Please contact Dr. Neuzil as soon as possible to arrange a visit to your institution during the 1995 Birdsall-Dreiss Lectureship [U.S. Geological Survey, 431 National Center, Reston, VA 22092, phone: (703) 648-5880, fax: (703) 648-5274, e-mail: ceneuzil@usgs.gov]. Transportation expenses are paid by the Hydrogeology Division; the host institution is expected to provide for the lecturer's local expenses. Dr. Neuzil will speak on one or both of the following topics. Both talks are aimed at audiences with a hydrogeology background but are also appropriate for others in the earth sciences.

Groundwater Hydrodynamics of an Ultra-Low-Permeability Shale, South Dakota

We are beginning to understand the hydraulic properties of large bodies, such as shale units, that are composed of intrinsically low permeability media. It appears that shale permeability can be "ultra-low" (10^{-20} to 10^{-22} m^2 or hydraulic conductivity between 10^{-13} and 10^{-15} m s^{-1}) and that it is not necessarily scale dependent. In other words, permeability does not always increase with an increase in the scale being considered. Groundwater flow in shale of ultra-low permeability has distinct and sometimes surprising characteristics. Far from being simple static barriers, shales frequently host dynamic flow regimes that are slowly responding to natural changes in their surroundings. Studying them allows us to better understand large-scale, long-term groundwater flow and geologic change.

Strongly subhydrostatic pressures were discovered in the Pierre Shale of South Dakota using a specially developed

measurement technique. A hydraulic-head minimum is present within the shale itself, and flow is occurring into the shale at its boundaries. This accumulation of fluid mass is indicative of transient flow, apparently a lagging hydrodynamic response to decompaction and cooling caused by erosion of overburden. Removal of the overburden load caused the shale pores to expand, lowering the fluid pressure. The permeability is low enough that the rate of pore volume increase exceeds the rate at which groundwater is able to flow into the shale, hence the low pressures. This interpretation of the flow regime rules out the possibility of transmissive fractures in the vicinity of the study site.

Studies for siting waste repositories in some instances might emulate this approach because such information could be useful for documenting site suitability. The Pierre Shale study was unusually well constrained. Independent estimates of permeability and mechanical expansivity of the shale, as well as geologic estimates of the region's rate of downwasting in the last 2 Ma, support the interpretation just described. However, the study raises interesting questions about the chemical evolution of the groundwater in the shale, which has presumably been sequestered for millions to tens of millions of years.

Abnormal Pressures as Hydrodynamic Phenomena

So-called abnormal pressures, subsurface fluid pressures that differ significantly from hydrostatic, have excited speculation about their origin since subsurface exploration first encountered them. Two distinct conceptual models for abnormal pressures have gained acceptance among earth scientists. The static model, which seems to have originated among petroleum explorationists, sees abnormal pressures generally as static, relict features preserved by a virtual absence of fluid flow over geologic time. The hydrodynamic model, which is usually (but not exclusively) the province of hydrogeologists, instead envisions abnormal pressures as hydrodynamic phenomena in which flow generally plays an important role.

Abnormal pressures can be explained as occurring in flow regimes that are both equilibrated and disequilibrated hydrodynamically. The former are "adjusted" to their geologic and hydrologic surroundings while the latter are not. Equilibrium-type abnormal pressures generally result from topographically driven flow (as in artesian basins) but may also occur as a result of osmosis or large fluid density contrasts. The more common and varied disequilibrium-type abnormal pressures are caused by natural geologic processes such as compaction, diagenesis, and deformation. These processes act like distributed fluid sources or sinks and can arise from actual fluid sources or sinks or from virtual ones involving changing porosity or temperature. Disequilibrium-type abnormal pressures can be characterized using three quantities: the size and permeability of their domains, the vigor of the "geologic forcing," and the magnitude of the source term. Published estimates reveal a surprising number of distinct geologic processes sufficient to maintain abnormal pressures in dynamic systems. This observation is crucial to understanding why abnormal pressures are not necessarily relict conditions preserved over geologic time.

Low-permeability regions play key roles in both equilibrium- and disequilibrium-type abnormal pressures. Extensive low-permeability strata are usually required to generate abnormal pressures in topographically driven regimes, whereas osmotically driven flow and hydrodynamic disequilibrium occur only within regions isolated by low permeability. Analyzing abnormal pressures as hydrodynamic phenomena often allows these low permeabilities to be estimated, something that is otherwise difficult to do. In some instances, hydrodynamic analyses also yield information about rates of geologic processes and a region's geologic history.

Hydrogeology Program 1994 Annual Meeting in Seattle

Steve Wheatcraft,
Hydrogeology Division Program Chairman

The 1994 Annual Meeting in Seattle (October 24–27) promises to be one of the best ever, having something for everyone all week long. Along with the Division symposium, we have 14 theme sessions that are sponsored or cosponsored by or of general interest to the Hydrogeology Division. Our premeeting field trip explores island and coastal hydrogeology of Hawaii. We kick off the Seattle program on Monday morning with our theme session "Computational hydrology and data visualization/animation," which showcases new uses of visualization and animation in understanding hydrologic processes. On Monday afternoon the Division symposium, "The Shirley Dreiss Memorial Symposium: recent trends in studies of coupled hydrodynamic, tectonic, and thermal processes," focuses on interactions between hydrogeologic processes.

Two theme sessions are on Tuesday morning. "Relation of depositional environments to chemical and physical heterogeneity within sedimentary aquifers" continues the theme from Monday's symposium on coupled hydrogeologic processes. "Geochemistry of contaminant transport" offers interesting insights from a physical perspective. On Tuesday afternoon are the Hydrogeology Division luncheon, business meeting, Birdsall-Dreiss Distinguished Lecture by Fred Phillips, and a reception sponsored by the Past Chairman's Long-Range Planning Committee.

On Wednesday morning, we have two general hydrogeology sessions that focus on quantitative hydrogeology and a fourth theme session titled "Stable environmental isotope application in groundwater systems." On Wednesday afternoon is another general hydrogeology session that focuses on aqueous geochemistry and a theme session called "Integration of hydraulic and geochemical approaches in vadose-zone transport studies."

On Thursday there are additional theme sessions and two all-day poster sessions. "The role of geology in characterization, contaminant transport, and remediation of hazardous waste sites" is scheduled for the morning theme session, and "Geologic significance of microbial processes" is scheduled for the afternoon one. Our postmeeting field trip discusses the geohydrologic setting of the Hanford site, South-Central Washington.

Check the GSA Annual Meeting Program to make sure that you don't miss other interesting theme sessions. Our goal

for the 1994 Annual Meeting in Seattle is to keep you so busy and interested in the sessions that you won't even have time for a visit to the Pike Street Market! If you want to see Seattle, you will have to make time before or after the meeting!

$50 Scholarship Award Offered to Early-Registering Students

1994 will be the fifth Annual Meeting for which cash rebates of $50 will be awarded to the first student members of the Hydrogeology Division who register for our two short courses. In previous years the early registrants have sent in their registration by June or July.

GSA Short Courses

Among the many interesting short courses offered at the Seattle meeting are the following of particular interest to hydrogeologists.

"Applied groundwater flow modeling: conceptualizing hydrogeologic systems and calibrating models," will assist model users to refine their approach. Presented by M. P. Anderson and W. W. Woessner, Sunday, October 23, $245 professional, $225 student registration.

"Isotope hydrology," focuses on practical applications of environmental isotopes for a better understanding of hydrologic systems. Presented by Carol Kendall and N. L. Ingraham, Sunday, October 23, $190 professional, $170 student registration.

"Phase I Environmental Site Assessments," includes overview of all aspects of an assessment based on NREP and ASTM standards. Presented by R. C. Kimbrough and D. R. Gillespie, Saturday and Sunday, October 22–23, $285 professional, $265 student registration.

"Soil and groundwater remediation," emphasizes practical approach to cost-effective cleanup. Presented by J. L. Peterson and D. M. Lundquist, Saturday and Sunday, October 22–23, $280 professional, $260 student registration.

"Geowriting: guidelines for ·riting and referencing technical articles," highlights r ds of technical writing and bibliographic research. C nsored by the Geoscience Information Society, Am n Geological Institute, and Association for Earth S Editors, Saturday, October 22, $140 professional, $99 nt registration.

Cancelled

Student Members Invited to Reception in Seattle

Student members of the GSA Hydrogeology Division are especially invited to attend the Past Chairman's Student Reception, which will be held on Tuesday, October 25, 5:00–6:30 p.m., immediately following the Birdsall-Dreiss Lecture by Fred Phillips. The purpose of the gathering is to create an opportunity for students to visit with other members of the hydrogeology profession, including Past Chairmen, Meinzer Awardees, Birdsall-Dreiss Lecturers, and Distinguished Service Awardees. There will be a cash bar for regular members and free drinks for student members. We hope that all members are able to attend this function and support the growth of the Hydrogeology Division.

Student Research Grant Awards

The Hydrogeology Division Management Board has selected four of the top-rated 1994 recipients of GSA research grants to qualify for the Outstanding Student Award from the Hydrogeology Division. In addition to the financial research grant from GSA, the Hydrogeology Division will award these graduate students with payment for their registration at the Annual Meeting in Seattle and a ticket to the Hydrogeology Division luncheon. The following identifies the research award recipients, research title, GSA award amount, and supervisor.

Ian C. Jones, Ph.D. candidate, "Geochemical evolution of groundwater in the Pleistocene limestone aquifer of Barbados, West Indies," $1,800, supervised by Jay Banner, The University of Texas at Austin.

Marcia K. Schulmeister, Ph.D. candidate, "Naturally occurring groundwater nitrate: an evaluation of nitrate degradation mechanisms in carbonate and alluvial aquifers," $1,600, supervised by Gwendolyn Macpherson, University of Kansas.

Vikas Tandon, Ph.D. candidate, "The vertical component of contaminant transport in groundwater systems," $1,346, supervised by Vitaly Zlotnik and Roy F. Spaulding, University of Nebraska-Lincoln.

Robert J. Swartz, M.S. candidate, "Occurrence of arsenic in the Kern Water Bank, southern San Joaquin Valley, California," $960, supervised by Geoffrey Thyne, California State University, Bakersfield.

Hydrogeologist Mugs for Student Research

The Historical Committee of the Hydrogeology Division will offer its third collectible hydrogeologist coffee mug; this one is imprinted with a photograph of C. V. Theis. We greatly appreciate the biographical sketch prepared by Al Clebsch to accompany the mug and the artwork and printing done by Lev Ropes and Darryll Pederson.

The fine-quality hydrogeologist mugs are given free in appreciation for contributions to the graduate student research fund (suggested amount of $25). Donations prompted by the previous two mugs that featured Henry Darcy and O. E. Meinzer raised more than $2,250 for this deserving endowment. Plenty of Meinzer mugs are still available, but only a few Darcy mugs remain. The C. V. Theis mugs will be available before and after the business meeting in Seattle and at the Past Chairman's Student Reception following the Birdsall-Dreiss Lecture. Please bring a check for making your contribution. The mugs can also be ordered by contacting John Harsh [U.S. Geological Survey, 100 West Capitol Street, Suite 710, Jackson, MS 39269, phone: (703) 648-5782, fax: (703) 648-5582].

The Darcy, Meinzer, and Theis nominations were obvious, but who should be celebrated on the next coffee mug? Send your suggestions to Bill Back [U.S. Geological Survey, WGS

Mail Stop 431, Reston, VA 22092, phone: (703) 648-5856, fax: (703) 648-5274].

Fred Phillips Recaps 1994 Birdsall-Dreiss Lecture

Fred Phillips will present one of his Birdsall-Dreiss Lectures, "Chlorine-36 in fossil rat urine: a key to the chronology of groundwater," at the Seattle GSA meeting on Tuesday, October 25, at 3:30 p.m., after the Division luncheon and business meeting. Following are Fred's reflections on his 1994 Birdsall Lecture Tour.

The 1994 Birdsall Lecture season started off on a very sad note with the news that Shirley Dreiss, the 1992 Birdsall Lecturer, had been killed in an automobile accident December 14, 1993. Shirley was an exemplary hydrogeologist, and our profession will feel the loss. She was also an unusually warm and caring person, and I felt privileged to count her among my closest friends in the field. I dedicated all of my lectures during the tour to her memory. The Birdsall Lectureship has been renamed the Birdsall-Dreiss Distinguished Lectureship in Hydrogeology. During my tour I solicited contributions to the memorial fund established in her name at GSA, and I will use this opportunity to repeat that appeal. Income from the fund will be used to support the Birdsall-Dreiss Distinguished Lectureship. [Contributions should be made to the Dreiss Memorial Fund, GSA Foundation, Geological Society of America, 3300 Penrose Place, P.O. Box 9140, Boulder, CO 80301.]

Other than this sad event, the 1994 tour proceeded smoothly. I visited 25 institutions during the tour and gave over 30 lectures. I offered a choice of three different topics: "Ice-age lakes and glaciers: a history of the hydrological cycle," "A geological approach to aquifer heterogeneity," and "Chlorine-36 in fossil rat urine: a key to the chronology of groundwater." Rather to my surprise, the "Ice-age lakes and glaciers" was the most often requested talk, followed fairly closely by the heterogeneity talk, with chlorine-36 in fossil rat urine a distant third. Requests had a distinct geographical bias. The "chlorine-36 in fossil rat urine" was the most popular title in the western United States, but only one school west of the Rocky Mountains asked for that talk! Evidently many schools were concerned that the title hid some satirical diatribe. I applaud those schools bold enough to venture such a scatological topic, and for those of you who wish you had taken the plunge (metaphorically speaking, of course), I will give that talk at GSA in Seattle.

I enjoyed many memorable moments on the tour. Probably the most exciting happened at David Elmore's house outside of West Lafayette, Indiana. As I was preparing to get in the car to drive to campus for the usual round of meetings with students and faculty, a wave of flames swept over the hilltop and began advancing toward the house! Everybody present grabbed shovels and wet sheets and rushed up the hill to battle the flames. After twenty minutes of life-threatening, hand-to-hand combat with the wildfire, the Elmore's house was saved. (Please forgive me if I exaggerate slightly, but because this is, so far as I know, the only thing of practical significance that a Birdsall Lecturer has ever done, I think that it deserves to be dramatized appropriately.) The memorable low point of the tour also arrived at a house in the Midwest (not named to protect the guilty). I was given a loft bedroom under the ridge crest of the house. When I entered the room about midnight and flicked on the light, the walls were crawling with wasps! Secure in the knowledge that wasps are exclusively diurnal, I turned off the light, got into bed, and slept soundly. I rose early in the morning and slipped out before the wasps became active. My host then went up and killed over 30 wasps in the room (but I understand that he later sued his supplier of "Killer Wasps"). This incident occurred after my talk at this school and should serve as a warning to future lecturers to avoid letting the quality of their presentations slip.

The hospitality was uniformly delightful and more than outweighed the risk from wildfires and wasp attacks. One very pleasant trend (also noted by Don Siegel, my predecessor) is the increasing number of brew pubs becoming available for the refreshment of itinerant lecturers. Especially memorable evenings include exceptional meals hosted by John Cherry in Waterloo and Steve Wheatcraft in Reno. Steve Fritz of West Lafayette presented me with one of the world's largest contiguous pieces of prime rib. An impromptu late-night repast with Frank Schwartz in Columbus and the cookout on Pat Burkhard's patio in Williamsburg also stand out in my mind, but everywhere both the food and the warmth of those who served as my hosts were outstanding. I'm sorry I don't have the space to mention everybody.

I found it interesting to compare my experiences with those of earlier Birdsall Lecturers. John Cherry and others reported that in many cases hydrogeology was still a stepchild in the geosciences and that many departments persisted in hiring faculty in traditional geological specialties in spite of hydrogeology being the main source of employment for students. I found a much broader acceptance of hydrogeology but also a long way for it to go. I came away with the impression that most departments have hired at least one hydrogeologist or are at least looking for one. But I did encounter too many instances of the one-person department syndrome: e.g., the average advising load for the faculty is five students, the hydrogeologist has twenty-five, but the next faculty member to be hired will be an igneous petrologist! Another fairly common problem I encountered was that of overly rigid course requirements. In some traditional geology departments, it was virtually impossible for students to take all the required geology courses, get the background they needed in math and physics to be accepted to a groundwater-studies program in graduate school, and still graduate in four years. I think it is critical for geology departments to realize that their graduates may end up in a wide variety of fields and that they need to make their requirements flexible enough that the students have the option of being competitive in any of these fields. In my opinion, a firm foundation in basic quantitative science will do much more to meet this goal than will numerous courses in traditional specialties.

Finally, I'm going to conclude with some advice to those who would like to invite a Birdsall-Dreiss Lecturer to their institution. (1) Invite early, even before the Annual Meeting. I was able to accept only about half of the invitations I received because of limitations in both money and time. (2) Invite in writing. Your friendly lecturer will be reeling under a blizzard of invitations; it is easy to lose track of casual phone conversations. (3) Arrange geographical linkage. Stretching the

Division airfare budget as far as possible is always a major consideration. Desirable situations are where there are two institutions in one city or where several cities are close together. If you network locally and regionally with other hydrogeology groups, you increase the chances of getting the lecturer. (4) Don't give up. The Birdsall-Dreiss Committee is setting up a mechanism to give preference the next year to places that put in invitations but could not be visited. (5) Use your lecturer's visit well. I found that my most profitable time was spent with students, particularly graduate students, but also undergrads. The least rewarding time was with bored department heads and deans; the visit is not a job interview. If your department has no or only a small hydrogeology program, the lecturer should be able to give students useful advice about graduate schools, career opportunities, and so on. If you have a strong program, the lecturer should be able to give a useful outside perspective on research activities. (6) Care and feeding of the Birdsall-Dreiss Lecturer: lecturers are hardy and self-sufficient. They will prosper on a diet of simple fare such as champagne and caviar. After all, what better use have you for that department entertainment budget?

It was a great way to spend the spring. I made lots of new friends, learned a lot, and, I hope, was able to give out a few new ideas myself. Thanks!

Applied Hydrogeology

This year *Applied Hydrogeology* was adopted as the Division's sponsored journal. GSA members can subscribe for less than $50 per year when renewing their GSA membership. Because *Applied Hydrogeology* is also the official journal of the International Association of Hydrogeologists (IAH), it has a significant worldwide as well as U.S. and North American readership. We are pleased with the initial interest of Hydrogeology Division members, many new subscriptions, and submissions of articles from members.

The journal's emphasis is hydrogeology. This is in distinct contrast to groundwater journals that specialize, for example, in development of mathematical theory or numerical methods, chemistry of contaminant transport, or engineering aspects of groundwater systems. Rather, a mainstream paper in *Applied Hydrogeology* integrates subsurface hydrology and geology with the other supporting disciplines to explain phenomena measured in the field.

We encourage you to submit your work to *Applied Hydrogeology*. For information, a free copy of *Applied Hydrogeology* to peruse, or submission of papers, please contact Clifford I. Voss–Editor [U.S. Geological Survey, 431 National Center, Reston, VA 22092, phone: (703) 648-5885, fax: (703) 648-5274, e-mail: cvoss@usgs.gov].

Theis Manuscripts Published

Two previously unpublished manuscripts on groundwater by the late C. V. Theis have been published by the U.S. Geological Survey in Water-Supply Paper 2415, "Selected contributions to groundwater hydrology by C. V. Theis, and a review of his life and work." The paper also includes commentaries on each of the Theis manuscripts, a biographical sketch, and a bibliography of Theis's writings. The publication was planned and edited by Alfred Clebsch, who screened Theis's files and personal papers for candidate manuscripts. Although neither of the two manuscripts had been completed to Theis's satisfaction prior to his death in 1987, they have been published with only minimal revision, as explained in the commentaries. Al Clebsch also prepared the biographical sketch that accompanies this year's C. V. Theis hydrogeologist mug, made available through the Division historical committee in support of the graduate student research fund.

New GSA Environmental Journal in 1995

GSA has entered into an agreement with the Association of Engineering Geologists to cosponsor a quarterly journal, to be called *Bulletin of Environmental and Engineering Geoscience*. The first issue is scheduled to appear in 1995. GSA is currently in the process of identifying an environmental geologist or hydrogeologist to serve as coeditor of the publication on behalf of the Society.

Call for Conference Papers

Conference on Sinkholes and Engineering and Environmental Impacts of Karst

The fifth Multidisciplinary Conference on Sinkholes and Engineering and Environmental Impacts of Karst will be held April 2–5, 1995, in Gatlinburg, Tennessee. Papers are being invited from engineers, geologists, hydrogeologists, geographers, planners, and all interested parties dealing with applied science and engineering in karst terrane. International contributions are especially encouraged. The conference will include a special session on governmental regulations specific to karst terrane, a field trip, and a banquet with guest speaker Dr. Andrew Merritt, an internationally recognized expert on dams and tunneling in karst terrane. Deadline for receipt of abstracts is September 2, 1994. Abstracts and requests for information should be sent to Dr. Barry Beck [P. E. LaMoreaux & Associates, Inc., Box 4412, Oak Ridge, TN 37831, phone: (615) 483-7483].

Water Resources at Risk

The 1995 Annual Meeting of the American Institute of Hydrology (AIH) will have the theme of "Water Resources at Risk." The conference will be held May 14–18, 1995, in Denver, Colorado. AIH invites abstracts to be considered for presentation as talks or posters. Proceedings papers will be published and available at the meeting. Field trips will visit the Rocky Mountain Arsenal, Rocky Flats, Rocky Mountain National Park, the Carlin Trend mine dewatering site, and historic mining sites at Leadville, Minturn, and Idaho Springs. Symposia include the Stan Lohman memorial symposium on groundwater, the Robert Averett memorial symposium on water quality/riparian studies, the Luna Leopold symposium

on interdisciplinary hydrology, and the IMWA symposium on mining hydrology and reclamation. Abstracts and requests for information should be sent to James Kunkel [Advanced Sciences, Inc., 405 Urban St., Suite 401, Lakewood, CO 80228, phone: (303) 980-0036].

1995 GSA Annual Meeting in New Orleans

Van Brahana,
Hydrogeology Division Program Chairman

Van welcomes your comments and suggestions of additional topics for the hydrogeology program at the Annual Meeting in New Orleans in 1995. The New Orleans meeting will cover the broad range of interests of Division members and offer hydrogeologists the opportunity to share recent accomplishments and research with scientists that have traditionally been more active in AAPG than GSA. Please visit with Van at the Seattle meeting or send a message [U.S. Geological Survey, 118 Ozark Hall, University of Arkansas, Fayetteville, AR 72701, phone: (501) 575-2570, fax: (501) 575-3846, e-mail: jbrahana@jungle.uark.edu]. *Note that filing deadlines to GSA will be approximately December 1, 1994, for short courses and theme sessions and January 2, 1995, for symposia.*

The overall theme of the New Orleans meeting is "Bridging the Gulf," and the program tentatively includes the following.

Short Courses and Workshops: Organic geochemistry; Hydrogeology and geochemistry of wetlands; Groundwater tracing in karst terranes.

Symposia or Theme Sessions: Hydrochemical interaction between ground and surface water in karst terranes; Application of radionuclides to hydrogeology; Contaminant hydrogeology case studies—from theory to application; Hydrogeology and geochemistry of wetlands; West Indies—carbonates and karst; Hydrogeology of rocks of low permeability; The future of hydrogeology—the perspective of Meinzer Awardees; Politics/environment/economics—preparing hydrogeologists for the future; Geochemistry of brine

Field Trips: Hydrology of wetlands—South Louisiana; Hydrogeology, engineering geology, and environmental geology of New Orleans; Selected hydrogeologic research of the U.S. Army Corps of Engineers Waterways Experiment Station

Penrose Conference

Fractured, Unlithified Aquitards:
Origins and Transport Processes

This Penrose Conference, sponsored by the Hydrogeology Division and convened by John Cherry, Dave Mickelson, and Bill Simpkins in Racine, Wisconsin, June 16–21, 1994, was attended by approximately 80 international professionals and students. Ten U.S. and Canadian students received scholarships from GSA to attend. Twelve keynote speakers each presented a 30-minute talk, each followed by an hour-long interesting and lively discussion among 5-member panels. Keynote topics included: "Genesis of fractures in unlithified aquitards," "Nature of contaminant transport in fractured unlithified aquitards," "Status of groundwater flow and transport modeling in fractured unlithified aquitards," "Hydrogeochemistry of fractured and nonfractured unlithified aquitards," "Overview of Danish research in fractured unlithified aquitards," "Large undisturbed columns for laboratory studies of flow and contaminant transport," "Biogeochemistry of aquitards," "Problems in fractured unlithified aquitards: the consultant's viewpoint," "Application of isotopes to hydrogeological investigations in fractured unlithified aquitards," "Movement and fate of DNAPLs in fractured unlithified aquitards," "Integration of laboratory and field studies and mathematical models in the study of fractured unlithified aquitards," and "Are fractured unlithified aquitards good waste disposal sites or not?"

One highlight of the conference was the 1994 AGWSE Darcy Lecture presented by Ed Sudicky, Waterloo Centre for Groundwater Research. A second was our day-long field trip, first to the bluffs of the western shore Lake Michigan south of Milwaukee to examine fractures in till and lake sediment and watch demonstrations of downhole gamma logging and azimuthal resistivity surveying, and then to the Pheasant Run Landfill, a zone-of-saturation landfill in Kenosha County, to examine freshly exposed till fractures. A lively discussion was held at the bottom of a nonvegetated landfill waste cell concerning how well geology and hydrogeology are known or should be known at such sites. Thanks go to Dave Mickelson and Ken Bradbury for organizing the field trips. A third highlight was the "Consultant's Symposium," in which environmental consultants from several companies provided case histories and horror studies about the effects of fractures on contaminant transport. One interesting discussion concerned how "academics" and "consultants" target their separate peer groups and publish in different journals such as *Water Resources Research* and *Ground Water Monitoring and Remediation*. It appears that information on innovative research and case histories is not crossing this publication barrier.

General conclusions of this Penrose Conference were that (1) probably all fine-grained deposits are fractured to some degree; (2) the degree of fracturing and function of fractures might differ appreciably between till units, depending on their geological history; and (3) many additional disciplines than were represented might have contributed to this conference. Local cuisine, brew pubs, and especially frozen custard in downtown Milwaukee were a definite plus for the hot month of June. It was an excellent conference, even though it was not held at a mountain resort or an island location. The Hydrogeology Division should sponsor more multidisciplinary Penrose Conferences.

GSA Sectional Hydrogeology News

Southeastern–Stuart Rojstaczer, Section Representative

Upcoming events in the Southeastern Section include "Workshop on coupling geosphere transport models with regulatory policies," being held in Athens, Georgia, September 22–23, 1994, sponsored by the Georgia Research Alliance. The workshop will focus on models of fluid and contaminant migration and their use in demonstrating regulatory compliance. Both

scientists and regulatory administrators will be attending. For information contact Todd Rasmussen at the University of Georgia [phone: (706) 542-4300, e-mail: trasmuss@uga.cc.uga.edu].

Another event is the GSA Southeastern Sectional Meeting in Knoxville, Tennessee, April 5–7, 1995, with an interesting symposium, "Hydrogeology and hydrogeochemistry of saprolite," and a field trip on "Geology and hydrology of the DOE Oak Ridge Reservation and associated waste management issues." For information on the symposium contact William Sanford [Oak Ridge National Laboratory, phone: (615) 576-3464] and for information on the field trip contact William Dunne [University of Tennessee, phone: (615) 974-6005, e-mail: bill@tanasi.gg.utk.edu].

North Central–Bill Simpkins, Section Representative

The 28th Annual Meeting of the North-Central Section of GSA was held April 28–29, 1994, at Western Michigan University in Kalamazoo, Michigan. The general chairman of the meeting, Dr. Alan Kehew, is a member of the Hydrogeology Division. Local environmental companies provided exhibits during the meeting and sponsored the icebreaker on Wednesday evening. Short courses addressed hydrocarbon monitoring and recovery and building groundwater flow models. A field trip focused on the hydrogeology of Kalamazoo and Cass Counties, Michigan. Four sessions included 25 papers, including 8 student papers, on hydrogeology, aquifer systems of the Great Lakes area, and geology and hydrology of glacial outwash systems. Of eight student best-paper awards, two were presented to hydrogeology students: (1) Beth Johnson of Iowa State University for "Where's the nitrate? Evidence for geological control of denitrification in the Walnut Creek basin of central Iowa," and (2) Carrie Nuoffer of Albion College for "Geochemistry and geophysics of a series of natural springs in Albion, Calhoun County, Michigan."

Rocky Mountain–Bill Woessner, Section Representative

The 24th Annual Rocky Mountain Groundwater Conference (RMGWC) will be hosted by the Desert Research Institute September 26–28, 1994, in Las Vegas, Nevada. The conference brings together the private, state, and Federal communities to discuss groundwater issues of the Rocky Mountain area. The RMGWC includes an all-day field trip to the Nevada Test Site and Yucca Mountain; a discussion about water-quality and water-quantity concerns headed by a panel of environmental, natural resource, and regulatory officials from eight Rocky Mountain states; and another panel discussion concerning mining and groundwater, water use and water law, the role of consultants in Federal and state programs, and the role of hydrologic models in regulatory and management decisions. The program also includes poster sessions and exhibits related to Rocky Mountain groundwater issues. Special guest speakers will include Susan Trager, Attorney at Law, California; Dr. Robert Farvolden, Senior Groundwater Scientist, Association of Groundwater Scientists and Engineers and Professor Emeritus, University of Waterloo; and the Honorable Mark James, Nevada State Senator. The organizing committee consists of Paul Seaber, Nate Cooper, Juana Blackburn, Doug Duncan, Terry Katzer, Marty Mifflen, Bill Quinn, Rick Waddell, Ken Rehfeldt, and Doug Trudeau.

South Central–Joe Yelderman, Section Representative

The 1994 South-Central Sectional Meeting of GSA was held at the University of Arkansas in Little Rock, Arkansas, March 21–22. There was a full-day symposium with 19 papers on hydrogeology and environmental geology and several other hydrogeological papers and posters throughout the meeting. The South-Central GSA gives awards for best student poster and the top three student papers. The best student poster and the first- and third-place papers were hydrogeology theses.

The 1995 South-Central Sectional Meeting will be held jointly with the North-Central Section in Lincoln, Nebraska. Darryll Pederson is planning a field trip to the Sand Hills, and we hope to have several hydrogeology sessions.

Biographies of Candidates

Following are biographies of the slate of officers for the Hydrogeology Division presented by the Nominating Committee. Please fill out the attached ballot, and return to GSA no later than October 1, 1994. Election results will be announced at the Division business meeting in Seattle.

Nominee for Chairman

Donald I. Siegel, born in New York City on October 24, 1947. Member since 1984. Education: University of Rhode Island, Honors B.S. 1969; Penn State University, M.S. 1971; University of Minnesota, Ph.D. Hydrogeology 1981. Professional experience: Exploration geologist, Amerada Hess Corporation, 1972–74; Hydrologist, U.S. Geological Survey, Water Resources Division, 1976–82; Assistant Professor (1982–87), Associate Professor (1987–91), Professor (1992–present), Syracuse University, New York. Author or coauthor of more than 50 publications on hydrogeology. Service to GSA and the Hydrogeology Division includes: Birdsall Distinguished Lecturer, 1993; Cochairman Northeastern Section meeting, 1990; Meinzer Award Committee, 1989–90; First Vice-Chairman, 1994. Other professional activities: member of NRC panel on assessing ground-water contamination, 1991–present, and NRC panel on wetland characterization, 1993–present; member of AGU, NGWA, and Association of Wetland Scientists. Professional interests include paleohydrology, wetland hydrogeology and geochemistry, and various aspects of contaminant hydrogeology.

Nominee for First Vice-Chairman

John W. Hess, born in Lancaster, Pennsylvania, on May 6, 1947, has been a member since 1974. Educated at Pennsylvania State University, he received the Bachelor of Science degree in 1969 as well as the Ph.D. in 1974. At the Water Resources Center, Desert Research Institute, University and Community College System of Nevada, John was an Assistant Research Professor (1974–78), Associate Research Professor (1978–86), Research Professor (1986–present), Director of the Environmental Isotope Laboratory (1981–87), Deputy Executive Director

(1987–89), and Executive Director (1989–present). John also was an Honorary Research Fellow at the University of Glasgow, Scotland, 1980–81. He was an Associate Professor (1982–86) and Professor (1986–present) at the University of Nevada, Las Vegas. John has also been a Professor at the University of Nevada, Reno, 1986–present. His publications include more than 80 technical reports, book chapters, and journal articles on hydrogeology and geochemistry. He is a Fellow of GSA and member of AGU, AIH, GS, IAGC, and IAH. Service to GSA and the Hydrogeology Division includes being Field Trip Chairman in 1984, Program Chairman in 1987, Nominating Committee, 1989–91, Cordilleran Section Representative, 1992–93, symposium coconvenor in 1984 and 1990, and member of Committee on Committees and Second Vice-Chairman of the Hydrogeology Division in 1994. Other professional activities include membership in the IAH Karst Commission and cochairmanship of IGCP 299, Geology, Climate, Hydrology, and Karst Formations. Professional interests are focused on the use of environmental isotopes, hydrogeochemistry, and geophysics in hydrogeologic investigations pertaining to carbonate terrains, regional flow systems, site characterization, and groundwater monitoring systems.

Nominee for Second Vice-Chairman

Warren W. Wood, born in Pontiac, Michigan, on April 9, 1937, has been a member since 1961 and Fellow since 1980. Educated at Michigan State University, he received the Bachelor of Science degree in 1959, Masters of Science degree in 1961, as well as the Ph.D. in 1969. He was Geophysics Party Chief, Michigan Highway Department, 1961–62; Hydrologist, U.S. Geological Survey (USGS), 1963–78; Associate Professor, Department of Geoscience, Texas Tech University, 1978–81; and Research Hydrologist, USGS, 1981–present. Warren's publications include more than 70 journal articles, book chapters, and USGS reports. Service to GSA and the Hydrogeology Division includes being Birdsall Distinguished Lecturer in 1989; Chairman of Birdsall Lecture Committee, 1992 and 1994; and Annual Meeting Hydrogeology Program Chairman, 1993. Other professional activities include being Associate Editor of *Water Resources Research*, 1983–1988; Associate Editor of *Ground Water*, 1992–present; Associate Editor of *International Journal of Salt Lakes*, 1992–present; Chairman of a science adviso ry committee, University of Waterloo, 1988–92; member of a Michigan State University advisory committee, 1990–present; Director of Association of Ground-Water Scientists and Engineers (AGWSE), 1982–86; Chairman of Darcy Lecture Committee, AGWSE, 1983–present; Cochairman of Annual Meeting of AGWSE, 1986–87; Chairman of symposium on groundwater tracers, American Geophysical Union (AGU), 1980; and Chairman of symposium on use of isotopes in hydrology, AGU meeting in Kanazawa, Japan, 1992. Honors include being recipient of the U.S. Department of Interior Meritorious Service Award and the AGWSE Keith Anderson Award. Professional interests are focused on the use of geochemistry to constrain and gain insight into flow in aquifer systems.

Nominee for Secretary-Treasurer

John F. Harsh, born in Lancaster, Pennsylvania, on May 2, 1937. Member since 1964. Education: Franklin and Marshall College, B.S., 1959; South Dakota School of Mines and Technology, M.S., 1964; University of Nevada-Reno, Ph.D. Hydrogeology, 1969. Professional experience: U.S. Army Corps of Engineers, Hydrologic Engineering Center, 1968–70; Associate Professor, State University of New York at Cortland and Binghamton, 1970–77; Supervisory Hydrologist, U.S. Geological Survey, Water Resources Division, 1975–88; Technical Director, Roy F. Weston, Inc., 1988–89; Senior Hydrologist, Environmental Resources Management, 1989–92; Supervisory Hydrologist and Assistant District Chief, U.S. Geological Survey, Water Resources Division, 1992–present. Author or coauthor of more than 25 publications on hydrology and hydrogeology. Registered Professional Geologist, Virginia. Service to GSA and the Hydrogeology Division: Secretary-Treasurer, 1990–94. Other professional activities and honors: member of NRC panel on assessing ground-water contamination, 1991–present; GSA Fellow and member of AGU and NGWA. Professional interests include physical and chemical hydrogeology and application of ground-water flow models.

Hydrogeology Division Organization

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Second Vice Chairman
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Secretary-Treasurer
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Nari Narasimhan, Hydrology Division of American Geophysical Union (AGU)

Joe Rosenshein, American Institute of Hydrology (AIH)

Warren Wood, Association of Ground-Water Scientists and Engineers (NGWA)

Tom Holtzer, GSA Engineering Geology Division

Paul Seaber, GSA History of Geology Division

James Quinlan, GSA Quaternary Geology and Geomorphology Division

Jack Sharp, U.S. Committee for the International Association of Hydrogeologists (IAH)

Section Representatives

Cordilleran–Kent Keller

North Central–Bill Simpkins

Northeastern–Bob Melvin

Rocky Mountain–Bill Woessner

South Central–Joe Yelderman

Southeastern–Stuart Rojstaczer

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