



The Hydrogeologist

NEWSLETTER OF THE HYDROGEOLOGY DIVISION OF THE GEOLOGICAL SOCIETY OF AMERICA

SEPTEMBER 1993

Message from the Chairman

If you are like me, you might occasionally reflect on the various professional societies and how well they serve their members. It is no secret that for many of you the Geological Society of America is not at or near the top of the list. Many Division members are also members of the National Ground Water Association and the American Geophysical Union, whose journals are the home for a large proportion of the research papers in hydrogeology. This state of societies raises the interesting question of what should be the role of the Hydrogeology Division and how should it fit with these other organizations.

For the past several years, successive Management Boards have been attempting to describe that rather elusive essence that differentiates us from the other professional societies. Our strategy has been that if we understand what qualities make us unique then we can foster their development within GSA. Interestingly, as we have worked to establish "Progress in Hydrogeology" as an annual volume published through the Division, Nari Narasimhan at the University of California, Berkeley, provided the following thoughtful statement:

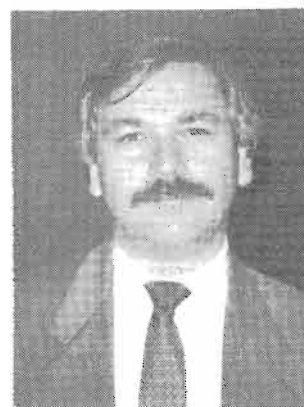
"....hydrogeology includes in its fold such diverse endeavors as soil science and pedology, watershed hydrology and landform evolution, geotechnical engineering, waste disposal, groundwater contamination and remediation, water resources development, genesis of petroleum and ore deposits, subsurface reservoir engineering, evolution of sedimentary basins, land subsidence, triggered earthquakes and seismicity, hydrothermal systems, and tectonic processes. Moreover, in the minds of most of us hydrogeology is still a continental concept. However, the last two decades have enriched us with enormously exciting finds about the hydrology, geochemistry and geophysics of the oceanic crust. Hydrogeology is no longer just a terrestrial notion! In my view today's hydrogeology includes a multitude of earth scientists who have accounted for, in a problem-driven sense, the role of subsurface fluids in the various fields mentioned above.

....What role do we in GSA have to play in the cause of Hydrogeology? We need to abet an educational format in which the earth can be viewed and understood from the process-oriented perspective; dynamic flow of fluids, deformation and failure, transport by flowing fluids and the chemical, biological and energetic interactions between the fluids and the geological host. We

need to devise a forum in which researchers of the traditional genre not only present their findings for the benefit of hydrogeologists but also recognize, in so doing, that they are in fact hydrogeologists themselves and that their own contributions are enhanced by the new complementary viewpoint. It seems to me that these two notions, namely, education on the one hand and integration on the other, are the foundations on which the Division should concentrate for the future."

Several past Chairman's letters have tried to give the members a sense of the Division's progress and of what we saw as major problems. As you read Warren Wood's report on the Boston meeting, note that the number of submitted abstracts was about 200, which is our best ever. Warren has shown beyond a doubt that an outstanding technical program will attract papers, and hopefully member attendance. Creating a more exciting and diverse program at the annual meetings will continue to remain a major focus for the Management Board. As well, the results of the Boston meeting also have shown the real benefits of long-range planning. It is not too soon, therefore, to think about planning your contributions for the Seattle and New Orleans meetings—be sure to talk to Steve Wheatcraft and Van Brahana.

The Management Board is also addressing the fact that we do not have a publication that is relevant to the needs of our members. In their Spring 1992 Meeting, GSA Council approved



Frank Schwartz
1993 Chairman
Hydrogeology Division

adding the Journal of Applied Hydrogeology to the list of journals to which GSA members may subscribe at a rate of about \$43.50. This journal is published for the International Association of Hydrogeologists (IAH). John Moore, one of our members, is IAH President and Acting Editor. John is on the lookout for papers for this journal. You can contact him in Denver. In the coming year, Lenny Konikow will be working with IAH to develop a closer affiliation between IAH and GSA with respect to this journal. We will also continue forward with the "Progress in Hydrogeology" publication initiative. I will provide details concerning this publication at the Boston meeting.

Last year, John Cherry emphasized some of the problems that existed between our Division and GSA Headquarters. Since then, I am happy to report that the relationship has improved markedly—they better understand our problems and priorities and we understand theirs. We continue to push GSA Headquarters to play a more facilitative role in planning for annual meetings. Now that our own planning process is in better shape, we believe the next obvious place for improvement is coordination of activities between related divisions. The present process lies somewhere between random and chaotic, with many divisions unclear what their program is until the first circular is mailed. We have proposed that the meeting theme be used to assist with coordination. Currently, however, the meeting theme is set by the local committees, which with rare exceptions have little interest in environmental topics.

The perception that GSA is the "last bastion of classical geology" is changing. A major contributing factor is that the interests and aspirations of the Division are being effectively represented on Council. To continue this progress requires that we have representatives in the administration of the Society. In this regard, I am pleased to inform you that Dave Stephenson is the candidate for Vice-President, and that John Cherry, Grant Garven, and Keros Cartwright are running for Council positions. If this newsletter arrives before September 27, I would remind you to vote for our candidates. Paraphrasing Jack Sharp, now on Council, he and Karen Prestegard have worked to place Division members on the ballot, now it is our job to vote.

In conclusion, I urge all our members to attend the meeting in Boston and to help us keep the Hydrogeology Division moving onward and upward.



1993 O. E. Meinzer Awardee is Niel Plummer

L. Niel Plummer of the U. S. Geological Survey is the 1993 recipient of the O. E. Meinzer Award. The award to Niel Plummer was based on the following articles:

Plummer, L. N., Busby, J. F., Lee, R. W., and Hanshaw, B. B., 1990, Geochemical modeling of the Madison aquifer in parts of Montana, Wyoming, and South Dakota: *Water Resources Research*, v. 26, no. 9, p. 1981–2014.

Buesenberg, E., and Plummer, L. N., 1992, Use of chlorofluorocarbons (CCl₃F₂ CCL₂ F₂) as hydrologic tracers and age-dating tools: the alluvium and terrace system of central Oklahoma: *Water Resources Research*, v. 28, no. 9, p. 2257–2283.

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. For a partial listing, see the notes on the history of the Hydrogeology Division in this and the previous issues of *The Hydrogeologist*. Alan Dutton will have copies of the complete list of the award-cited papers available at the Hydrogeology Division Business Luncheon and business meeting in Boston.

1993 Distinguished Service Awards to Paul Seaber and Dave Stephenson

The Hydrogeology Division's Award for Distinguished Service is presented in 1993 to Paul Seaber and Dave Stephenson in recognition of their long and outstanding service to the discipline of hydrogeology, including positions as Chairman of the Hydrogeology Division. The awards will be presented at the Hydrogeology Division Business Luncheon at the Annual Meeting in Boston. The Award for Distinguished Service honors George Burke Maxey, a distinguished hydrogeologist, co-founder of the Division, and enthusiastic teacher.

1994 Birdsall Distinguished Lecturer to be Fred Phillips

Fred Phillips will be the 1994 John Birdsall Distinguished Lecturer in Hydrogeology. Dr. Phillips received B. A. degrees in Earth Science and History, with honors, from the University of California at Santa Cruz, and M. S. and Ph.D. degrees in Hydrology from the University of Arizona. He is now Professor of Hydrology at New Mexico Institute of Mining and Technology in Socorro, New Mexico. He is interested in practically anything having to do with groundwater, aqueous geochemistry, and the history of the water cycle.

Those interested in Dr. Phillips visiting their institution during the Birdsall Lecture Tour for 1994 should contact him directly at Department of Geoscience, New Mexico Institute of Mining and Technology, Socorro, NM 87801 [phone (505) 835-5540; fax: (505) 835-6436; E-mail: "phillips@nmt.edu"]. Transportation expenses are paid by the Hydrogeology Division; the host institution pays for local expenses of the Lecturer. Dr. Phillips will speak on one or more of the following topics.

Chlorine-36 in fossil rat urine: a key to the chronology of groundwater

Paleomagnetic intensity reconstructions and ¹⁴C calibration studies both suggest that the intensity of the Earth's dipole magnetic field has varied markedly over the past 30,000 years. If this is correct, then the production of all cosmogenic nuclides should also have varied, since the primary cosmic radiation consists mostly of charged, energetic particles. Systematic variations in cosmogenic nuclide production could produce a signal that could be used as a groundwater tracer over time-scales of thousands of years in much the same way that the thermonuclear tritium pulse has served as a tracer for young recharge. To test this idea, it is necessary to locate a natural archive in which the original cosmogenic nuclide signal sampled over some relatively brief, discrete time is preserved in a context that can be independently dated. The ratio of ³⁶Cl to stable chloride in fossil packrat (*Neotoma*) urine

provides such an archive, since the urine can be directly dated by ^{14}C . Our measurements of ^{36}Cl in fossil urine (3 to 30 ka radiocarbon age) extracted from western Nevada packrat middens show a pattern of variation similar to that calculated from the paleomagnetic reconstructions, although the magnitude of the fluctuations is larger than predicted. To assess the utility of this pattern as a groundwater tracer, we have compared it with ^{36}Cl measurements in ^{14}C -dated groundwater from the Carrizo aquifer in south Texas. The groundwater appears to show the same pattern of ^{36}Cl variations, indicating that correlation of groundwater ^{36}Cl fluctuations with the production curve may provide a new method of assessing groundwater ages and flow rates.

A geological approach to characterizing aquifer heterogeneity

Spatial variations in permeability are recognized as the dominant medium-dependent control on the transport and spread of contaminants. The distribution of permeability depends on the geological processes of formation, diagenesis, and other secondary alterations. Numerous geostatistical models have been proposed as mathematical representations of spatially variable aquifers, but relatively little work has been done to assess the manner in which geological processes determine actual permeability geostatistics. In this study we investigated the relationship between alluvial depositional processes and permeability geostatistics in the Plio-Pleistocene Sierra Ladrones Formation (Middle Rio Grande Valley, New Mexico) using two methods: (1) detailed, three-dimensional alluvial architecture mapping and (2) hundreds of in situ permeability measurements obtained with a portable air mini-permeameter. The studies were focused on two scales: sedimentary facies extending over several meters and architectural elements at the kilometer scale. At the small scale we observed that the range of variograms of permeability data was controlled by the first- and second-order surfaces defining the sedimentary facies. We evaluated the controls on the permeability correlation structure at the large scale by comparing variograms constructed by assigning representative log-K values to the ensemble of mapped architectural elements with indicator variograms for the individual elements. The log-K variogram most closely resembled the indicator variogram for the overbank fines element. Based on our observations, we have formulated an algorithm for selecting appropriate geostatistical models to represent specific depositional environments.

Ice-age lakes and glaciers: a history of the hydrological cycle

Human alterations to the atmosphere and biosphere have provoked concern about the possibility of global-scale changes in the climate system. Although popular attention has focused on possible changes in temperature ("global warming"), changes in the hydrological cycle are potentially much more disruptive. Past fluctuations in the hydrological cycle can give us clues to the controls on the global hydrological system. Hydrologically closed basins are particularly useful for reconstructing such fluctuations, inasmuch as changes in the water balance must be reflected in the surface area of terminal lakes. This talk describes paleohydrological research in closed drainages of the western Great Basin (California and Nevada). The drainages contained both glaciers at the

headwaters and lakes at the terminuses. The histories of both the lakes and glaciers have been reconstructed using a combination of dating by ^{14}C , U/Th, and ^{36}Cl , along with stable isotope methods. The application of simple mass/energy balance models permits assessment of the effects on the water balance of changes in temperature and precipitation. The data indicate that the hydrological system experienced major and abrupt fluctuations in the water balance several times over the past 30 ka. Comparison with ice core and marine sediment core data suggest that these fluctuations were driven by global-scale climate system reorganizations.

Hydrogeology Program 1993 Annual Meeting in Boston

Warren Wood, Division Program Chairman

There were 200 abstracts submitted for this year's Hydrogeology Division meeting, which is the largest abstract submittal in our history (figure 1). Thanks go to Kent Keller and Steve Wheatcraft for their assistance in evaluating this large number of abstracts. An attempt was made to have a hydrogeology program at every time slot, partly in response to comments that there were not enough sessions to justify attending GSA. Faced with a full hydrogeology technical program and related symposia and theme sessions, well-organized hydrogeologists will be buying the Abstracts volume before the meeting and planning their week's schedule.

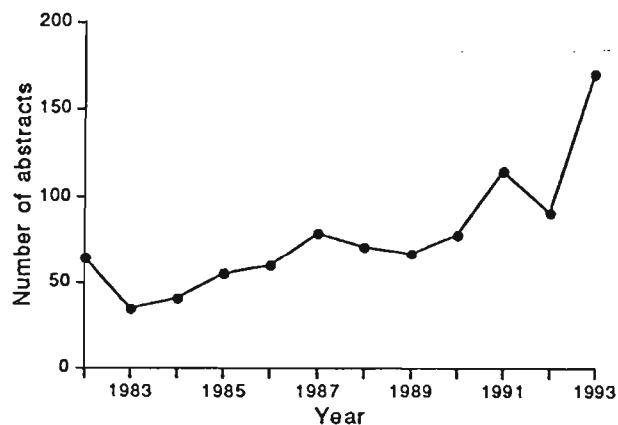


Figure 1. Number of abstracts submitted for Hydrogeology at GSA Annual Meetings.

The program starts on Friday, October 22, with a two-day pre-meeting field trip (No. 19), "Methods of characterizing fluid movement and chemical transport in fractured rocks," at Hubbard Brook experimental forest in New Hampshire. We end our meeting on Friday, October 29, with a post-meeting field trip (No. 35), "Ground-Water contamination and solute transport research at the U. S. Geological Survey's Cape Cod Field Site." As space is limited and filling rapidly, you should register ASAP for either or both.

On Sunday, three Continuing Education courses of interest to hydrogeologists will be offered: (1) Isotope Hydrology, (2) Contaminant Hydrogeology: Practical Monitoring, Protection, and Cleanup, and (3) Application of Sedimentological Information to Hydrogeological Problems. On Tuesday, the Division is sponsor-

Hydrogeological Problems. On Tuesday, the Division is sponsoring a workshop "Introducing... Contaminant Hydrology," for those without a hydrogeology background. On Wednesday from 5:45 to 7:30 p.m., the Division is co-sponsoring a Special Program "The Great Flood of '93."

The Technical Program for the week is as follows:

Symposium #3 Geologic Insight and Ground-Water Modeling	8-12 Monday
Isotopic and Geochemical Hydrology (Hydro I)	1-5 Monday
Introducing... Contaminant Hydrology (Workshop)	8-12 Tuesday
Theme #35 Flow and Transport in Variable-Density Ground Water	8-12 Tuesday
Poster #T35 Flow and Transport in Variable-Density Ground Water	1:30-5:30 Tuesday
Quantitative Hydrology (Poster Session)	1:30-5:30 Tuesday
Quantitative Hydrology (Hydro II)	8-12 Wednesday
Theme #37 Advances in Age Dating Young Ground Water	10-5:30 Wednesday
Theme #7 Hydrogeochemistry Related to Health and Disease	1:30-5:30 Wednesday
Hydrogeochemistry (Poster Session)	8-12 Thursday
Theme #42 Hydrogeology of Fractured Glacial Sediments and Fractured Crystalline Rock	8-3 Thursday
Geology and Hydrology (Hydro III)	1-5 Thursday

Other symposia and theme sessions of interest to hydrogeologists include: Geology and health: Keynote symposium (S1); Fluids and flow in the Earth's crust (S5); Sedimentological and stratigraphic framework of ground-water resources (S8); Chlorine and fluorine as monitors of fluid-rock interactions (S17); Fractal geometry and chaos theory, and their use in the earth sciences (S2); Fractal geometry, self-organized criticality, chaos theory, and their application in the earth sciences (T1); Geochemistry of large rivers (T5); Environmental geology: the voice of warning (T10); Environmental geology: the voice of reason (T11); Health implications of metals in soils (T16); Fate and transport of contaminants in Boston Harbor and Massachusetts Bay (T22); Environmental issues in urban settings (T33); Metamorphism fluid flow and ore deposits (T34); and Geologic disposal of nuclear waste and risks to public health and safety (T36).

\$50 Scholarship Award Offered to Early-Registering Students

Cash rebates of \$50 will be awarded to the first student members of the Hydrogeology Division who register for our three short

courses sponsored by the Division. This will be the fourth Annual Meeting at which this offer was available. In previous years the early registrants have sent in their registration by June or July.

Student Members Invited to Breakfast

Student members of the GSA Hydrogeology Division are invited to a breakfast meeting of the Past-Chairmen Long-Range Planning Committee at Annual Meeting in Boston. The purpose of the meeting is to create a semiformal opportunity for students to meet and talk with some of the senior members of the hydrogeology profession. Attending the meeting will be past Chairmen, Meinzer Awardees, Birdsall Lecturers, and Distinguished Service Awardees of the Division. These professionals are known as authors of papers, books, and reports that have provided a foundation for ongoing hydrogeologic studies. They represent a wide range of interests and jobs, including college professors, state, local and federal agency employees, consultants, research and applied scientists, and some retirees.

Student Research Grant Awards

Submitted by John Harsh

The Management Board of the Hydrogeology Division has selected five of the top-rated 1993 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 five graduate students with payment for their 1994 GSA membership dues, registration at the Annual Meeting in Boston, and a ticket to the Hydrogeology Division Business Luncheon. The following identifies the research award recipients, proposal title, GSA award amount, and supervisor. All of the requested support amounts of less than \$2,000 were awarded.

Susan J. Altman, Ph.D. candidate, "Transport of nutrients in groundwater flowing through porous media and shallow bedrock beneath farmland and removal of nutrients in the riparian zone," \$1,200, supervised by Richard Parizek, Pennsylvania State University.

Sandeep Burman, Ph.D. candidate, "Mathematical and physical scale for determination of ground-water sensitivity to surface generated contaminants," \$1,800, supervised by Hans-Olaf Pfannkuch, University of Minnesota.

Marc J. Hinton, Ph.D. candidate, "The role of groundwater flow on stream discharge and chemistry in glacial till watersheds," \$750, supervised by Sherry Schiff and Michael English, University of Waterloo.

Barbara Mahler, Ph.D. candidate, "Sediment-contaminant transport in karst terrains," \$1,848, supervised by Phillip Bennett, The University of Texas at Austin.

Piyush Srivastav, Ph.D. candidate, "Wetlands' impact on water quality in sandhills of Nebraska," \$1,800, supervised by Darryl Pederson, University of Nebraska.

Hydrogeologist Mugs for Student Research

The Historical Committee of the Hydrogeology Division will offer its second Hydrogeologist coffee mug this year, imprinted with a photograph of O. E. Meinzer and accompanied with a certificate and biography prepared by Jerry Meyer. The Meinzer

graduate student research fund (suggested amount of \$25). More than \$1,250 for the hydrogeology student research scholarships was raised through donations prompted by the 1992 mug that featured Henry Darcy. This is a deserving endowment, and past contributors appreciate the fine-quality mug given in appreciation. The Meinzer mugs will be available in Boston at the Past-Chairmans' Breakfast on Monday and before and after the Business Meeting on Tuesday. Please bring your checkbook to pay for your contribution.

The Historical Committee plans to offer a third mug in 1994. What eminent hydrogeologist would you suggest be celebrated on the next coffee mug? Send or pass along your suggestions to Bill Back [U.S. Geological Survey, WGS Mail Stop 431, Reston, VA 22092, phone: (703) 648-5856, fax: (703) 648-5274].

1993 Birdsall Lecturer to Speak at GSA

Don Siegel will present one of his Birdsall Lectures, "The Hydrogeology of Wetlands: Paradigm Lost," at the Boston GSA Meeting on Tuesday, October 26, after the Division luncheon and business meeting. Following are Don's reflections on his 1993 Birdsall Lecture Tour.

First, I want to thank all the universities and colleges that hosted me this past year. I was able to take advantage of airfare discounts (e.g., short-term price wars) only because host schools were flexible and gracious enough to change their seminar schedules on short notice (some of my colleagues may never forget the bombardment of "URGENT" fax communications to arrange my travel!). I so far have visited 29 schools and will visit a few more before GSA. I tried very hard to accept all invitations, but my budget could not accommodate every invitation, even with the most creative travel agent and additional support from Syracuse University. I extend my regrets again to those schools I missed.

Previous Birdsall Lecturers have used this forum to present some insights that they gained on our discipline from their travels on the lecture circuit, and I will continue in this tradition. Although the story is now all too familiar, I also found that many of my hydrogeology colleagues, from younger faculty to leaders of our field, still feel intellectually isolated from their non-hydrogeology colleagues. The recent editorials by John Cherry and Bob Farvolden (in *Geology*) and Charlie Kreitler (in *Geotimes*) on the need to restructure geology curricula were often brought up to me for discussion on my tour. On my trip I was often asked by non-hydrogeologists, "When do you think the boom in hydrogeology will be over?" Geophysicists and sedimentary geologists are valiantly teaching hydrogeology at some geology departments that have recognized their students' interest. Like other hydrogeologists, I am concerned that geology departments are not moving fast enough to center hydrogeology under their auspices, especially since Environmental Engineering and Science Departments are rapidly including hydrogeology—even "non-contaminant" hydrogeology—as integral parts of their programs.

So what can be done? One suggestion I have is that hydrogeologists might spend more effort to educate our non-hydrogeology colleagues about how hydrogeology "fits" into the geologic disciplines. For example, I tried to show in my Birdsall lectures how the study of oil contamination in aquifers can lead to insights on global cycling of silica at long time scales and how studying peatland hydrogeology and groundwater isotopes can lead to insights on paleoenvironments, global climate issues, and

possibly even the Cretaceous-Tertiary extinction event! A common response to my talks was astonishment that hydrogeology can integrate so many facets of geology. Many of our geologic colleagues are also unfamiliar with the mathematical methods and assumptions we use and consequently are sometimes suspicious of the results and the validity of the science. I recall a seminar given by Pat Domenico when he dissected one of the more complicated differential equations governing solute transport by first presenting each mathematical term in simple language and then showing by simple algebra how the term contributed to the solution [Ed. note: Pat Domenico was the Birdsall Lecturer in 1982.] The general geologic audience really appreciated Pat taking the time to show them what the modeling was all about in a way they could understand, and he did it without diminishing the content for the hydrogeology crowd. Given economic demand and society needs, it is obvious that hydrogeology should be very important in geologic curricula. But, whether we like it or not, I think we have to go the extra distance to reach our non-hydrogeologic colleagues if we want to convince them to restructure traditional geologic curricula. My Birdsall trip experience leads me to think that economic necessity may not always lead to change.

Without restructuring, it seems certain to me that some geology departments will lose resources because of declining student interest in the traditional geologic topics (because of poor employment opportunities) and the difficulty of faculty to obtain grant support for acquiring and maintaining instruments. At some schools the integration of geology within other programs may not be as bad as some may initially think. I visited a number of places where Geology and Hydrogeology programs were parts of larger combined Environmental and Engineering Science programs (such as North Carolina State University) and I was very surprised to see how well these programs seemed to work. Students and faculty seemed very happy in a clearly multidisciplinary environment where intellectual "turf" by discipline was minimized.

I think that the ability to modify intellectual directions to partly take advantage of technological and scientific advances (maybe even trends?) will be extremely important for hydrogeologists in the future. Indeed, I am beginning to wonder if the hydrogeology "boom," largely based on the need for hydrogeologists to investigate groundwater contamination, may have reached some sort of steady-state. I am struck by how the hydrogeology marketplace has tightened up during the last year or so. More than a few recent Ph.D. and M. S. students from excellent hydrogeology programs are having a fairly difficult time obtaining employment. The current softness in the hydrogeology market probably is a transient reflection of the soft overall economy. Nevertheless, I am beginning to think that the employment picture in the future will be best for those students having clearly broad scientific backgrounds rather than specialized backgrounds. This perception will not be that surprising to my academic colleagues. Because of fiscal limitations, those geology departments fortunate enough to hire new faculty commonly seek young scientists that cross disciplinary boundaries. I think this multidisciplinary demand may now also be extending into the private marketplace for hydrogeologists. Likely intellectual combinations that would be attractive in the consulting marketplace are combinations of hydrogeology with biology, organic chemistry, public policy, and geophysics.

One thing seems sure to me. The diversity of hydrogeology assures its future as a major discipline in the earth sciences. The

assures its future as a major discipline in the earth sciences. The breadth of hydrogeologic research I saw on my Birdsall Tour was truly staggering and included studies of groundwater flow at crustal plate boundaries, organic acid-groundwater interactions, the coupling of biologic processes and groundwater chemistry, paleohydrogeology, hydrogeologic evolution of sedimentary basins, contaminant transport of solutes, gases, and colloids at all conceivable scales, field studies on groundwater resources, groundwater-wetland studies, and even theoretical studies of chemical bonding at grain surfaces in groundwater. I learned a great deal in my travels, and in light of some new data even had to modify a favorite hypothesis related to my paleohydrogeologic research. I love it! This is what science is all about!

Finally, I have to thank the host schools for the wonderful "material" hospitality. Most of my colleagues know I enjoy a good dinner. Colleagues at Western Washington University provided me with the best salmon dinner I've ever eaten. The University of Arizona group gave me excellent "carne-seca." I had great beer at various micro-breweries (a new and welcome culinary trend), and a fine lemon-sautéed calamari steak courtesy of USC. Now and then on my trips, I yearned for something of home, and I want to especially thank the undergrads at Indiana University who took me to a fine bar in Bloomington that served authentic Buffalo-style chicken wings. Hot stuff!

I thank the GSA Hydrogeology Division for the privilege of being a Birdsall Distinguished Lecturer and look forward to seeing all of you again in Boston.

Public Outreach Program on Geology and the Environment

The Geological Society of America's Institute for Environmental Education (IEE) is seeking individuals and organizations to participate in activities that heighten public understanding of geoscience as it relates to environmental issues.

IEE is presently developing a public outreach program to incorporate relevant geoscience information in environmental decision making at the community-to-national levels, heighten comprehension of geoscience, and increase the efficiency and effectiveness of disseminating geoscience information for use by the public and decision makers.

The IEE approach involves several key steps: (1) to identify individuals and organizations who can contribute to meeting program objectives; (2) to identify local or regional environmental issues and potential audiences and individuals who can benefit from the program; and (3) to develop theme sessions, forums, and/or workshops in association with Geological Society of America Section meetings.

A network of individuals and organizations is now being formed to assist in meeting the objectives of the Public Outreach Program. Persons interested in participating, suggesting individuals or topics, commenting, or simply learning more about this new program are encouraged to write to IEE, Geological Society of America, P.O. Box 9140, Boulder, CO 80301.

1994 Annual Meeting in Seattle

Steve Wheatcraft, Division Program Chairman

So far the following topics have been suggested for the Hydrogeology Program at the 1994 Annual Meeting in Seattle,

Washington. Please contact Steve Wheatcraft [Department of Geological Sciences, Mackay School of Mines, University of Nevada-Reno, Reno, NV 89557-0138, phone: (702) 784-1973, fax: (702) 784-1766, E-mail: "steve@redbaron.hydro.unr.edu"] with your suggestions for this program, or to volunteer to help as session chairs and theme advocates. Note that filing deadlines to GSA will be approximately December 1, 1993, for short courses and theme sessions and January 2, 1994, for symposia.

Short Courses: Introduction to the geochemistry of aqueous systems; Putting the geology into groundwater modeling; Isotope geochemistry.

Workshops: Fluids and geological processes.

Symposia or Theme Sessions: Hydrogeology of arid zones; Island and coastal hydrogeology; Advances in computer applications in hydrogeology; New techniques for field investigations; Geothermal/hydrothermal systems.

Field trips: Hydrogeology of Columbia River basalts, including a visit to the Hanford Site; Island and coastal hydrogeology of Hawaii.

Island and Coastal Hydrogeology of Hawaii

The Hydrogeology Division proposes to run a field trip to Hawaii as part of the 1994 Annual Meeting in Seattle. The trip will include stops on the Big Island of Hawaii and Oahu to examine the unique hydrogeology that is associated with island and coastal regions and the hydrothermal activity on the Big Island of Hawaii. Island and coastal hydrogeologic processes are often overlooked and understudied, even though a very large proportion of the world's population lives less than 25 km from oceans and large lakes. Hawaii provides an ideal setting for such a trip. There are more than enough potential field stops for a 3- to 4-day field trip: geothermal areas on the Big Island; the Kona coast, where fresh water is exiting into the ocean (thus illustrating important sea-water intrusion concepts); flow basalts, which have extremely high permeabilities; interesting interactions between hydrology and climate (rain forest to desert on the same island); and interesting erosional features.

This field trip is being proposed as a premeeting trip. Attendees would fly into Hawaii on the Monday prior to the start of GSA. The trip will start with two days (Tuesday and Wednesday) on the Big Island, then fly to Oahu for two more days (Thursday and Friday). By leaving Saturday free, attendees have the opportunity to exercise their personal interests before flying to Seattle on Sunday for the start of the meeting.

Clifford Voss, U.S. Geological Survey, and Frank Peterson, University of Hawaii, have agreed to co-lead the field trip. Both Dr. Voss and Dr. Peterson have extensive experience doing field work and quantitative modeling of the variable density (sea-water intrusion) processes in Hawaii. Dr. Peterson is very well aware of current activities of hydrogeologic interest that can be incorporated into the trip.

Early feedback from possible participants is needed to indicate whether to plan for one or two busloads. The optimum number of participants, in terms of logistics, might be 20 to 25, but as many as 50 people could be accepted. Please contact Steve Wheatcraft (see above notice on Seattle meeting for address) as soon as possible to express your interest in attending this field trip.

1995 Annual Meeting in New Orleans

John Van Brahana will head up the planning for the Hydrogeology Program at the 1995 Annual Meeting in New Orleans, Louisiana. Please feel free to contact Van [Department of Geology, 118 Ozark Hall, University of Arkansas, Fayetteville, AK 72701, phone: (501)-575-3355, fax: (501)-575-3846] with your ideas, as it is never too early to begin planning. Filing deadlines to GSA will be approximately June 1, 1994, for field trips; December 1, 1994, for short courses and theme sessions; and January 2, 1995, for symposia.

GSA Penrose Conference

A Penrose Conference on "Fractured Unlithified Aquitards: Origins and Transport Processes" will be held June 16–20, 1994, at the Racine Marriott in Racine, Wisconsin. The Conference is co-sponsored by the Waterloo Centre for Groundwater Research and Department of Geology and Geophysics, University of Wisconsin-Madison. Convenors are John A. Cherry, Waterloo Centre for Groundwater Research, University of Waterloo, Waterloo, Ontario CANADA N2L 3G1, Phone: 519-885-1211, Ext. 2892 [fax: 519-746-5644]; David M. Mickelson, Department of Geology and Geophysics, University of Wisconsin-Madison, Weeks Hall for Geological Sciences, Madison, Wisconsin 53706, Phone: 608-262-8960 [fax: 608-262-0693]; and William W. Simpkins, Department of Geological and Atmospheric Sciences, 253 Science Hall I, Iowa State University, Ames, Iowa 50011, Phone: 515-294-4477 [fax: 515-294-6049]. The goal of this conference is to bring together researchers from various disciplines such as hydrogeology, glacial geology, soil science, aquifer-aquitard hydraulics, soil mechanics, aqueous geochemistry, isotope geochemistry and hydrology, and clay mineralogy to discuss and debate data, concepts, hypotheses and dilemmas pertaining to unlithified, fine-grained aquitards. The conference will include field trips to some excellent exposures of fractured till in eastern Wisconsin. Participation in the conference will be limited to 120 persons. Application to attend the conference should be made to John Cherry by December 1, 1993. The registration fee is expected to be \$550 per person and includes field trip expenses, meals, and lodging. Some student applications will be subsidized. Formal invitations will be mailed by mid-January 1994. Please direct questions to the convenors listed above. An abstract of the conference follows:

Fine-grained aquitards comprise much of the overburden of the northern glaciated regions of the world. In some areas, they protect underlying aquifers from contaminant spills and leaks, and in other areas they govern rates of flow to and water chemistry in underlying aquifers. Conceptual models developed for groundwater flow and solute transport in aquifers are being challenged in the study of aquitards. For example, the behavior of naturally occurring groundwater tracers such as environmental isotopes, major ions, and gases, is much different in fine-grained aquitards. Use of these tracers now requires detailed analysis of aquitard lithology and mineralogy, and information about the depositional history of the deposit in order to understand cycling of tracers. In addition, few studies have been done on solute transport in aquitards. Present evidence suggests that while, in some aquitards, transport may be controlled by molecular diffusion, transport is controlled by advection in fractures in others.

Why some aquitards are fractured and others are apparently not, and to what depth such fractures remain open, are much-debated issues among scientists working in the field.

Recent GSA Hydrogeology-Related Articles

Following are hydrogeology-related articles published in *Geology* and the *GSA Bulletin* during the past several months:

- Lander, R. H., and Hay, R. L., 1993, Hydrogeologic control on zeolitic diagenesis of the White River sequence: *Geological Society of America Bulletin*, v. 105, no. 3, p. 361–376.
- Byerlee, J., 1993, Model for episodic flow of high-pressure water in fault zones before earthquakes: *Geology*, v. 21, no. 4, p. 303–306.
- Tobin, H. J., Moore, J. C., MacKay, M. E., Orange, D. L., and Kulm, L. D., 1993, Fluid flow along a strike-slip fault at the toe of the Oregon accretionary prism: Implications for the geometry of frontal accretion: *Geological Society of America Bulletin*, v. 105, no. 5, p. 569–582.
- Bein, A., and Dutton, A. R., 1993, Origin, distribution, and movement of brine in the Permian Basin (U.S.A.): A model for displacement of connate brine: *Geological Society of America Bulletin*, v. 105, no. 6, p. 695–707.

News of Hydrogeology Division Members

John E. Moore has been elected President of the International Association of Hydrogeologists (IAH). The objective of IAH is to promote the science of hydrogeology by finding opportunities for cooperation between scientists of all nations. IAH was founded in Mexico in 1956 and now has 2,600 members in 80 nations. Its most recent meetings have been held in China, Spain, Russia, France, and Switzerland. Dr. Moore has worked for 33 years with the U.S. Geological Survey and as a technical advisor to the Congress and the U.S. Environmental Protection Agency, and now is a hydrogeologic consultant in Denver, Colorado, with J. W. Patterson and Associates.

[Send news items that you would like to share with readers of *The Hydrogeologist* to the editor; see instructions on page 10 of this issue.]

GSA Sectional Hydrogeology News

Cordilleran

Jack Hess, Section Representative

The GSA joint Cordilleran-Rocky Mountain Section meeting took place in Reno, Nevada, May 19–21, 1993. Three sessions dealt in part with hydrogeology. A Hydrogeology Division Breakfast held on Thursday morning was attended by five division members. We discussed ideas for symposia, sessions, and field trips for future Cordilleran Section meetings.

North-Central

Bill Simpkins, Section Representative

The GSA North-Central Section Meeting was held in Rolla, Missouri, on March 29–30, 1993. A total of 345 papers were presented in 40 sessions, which was up 38 percent from last year's meetings in Iowa City. Three groundwater symposia were titled "Agricultural Chemicals in Groundwater" (7 papers), "Geologi-

cal Site Characterization: Essential to Waste Facility Siting and Remediation" (10 papers), and "Groundwater and Karst" (9 papers). The Groundwater and Karst Symposium was the most well attended, with an average of about 40 people. The quality of the papers in that symposium was very good, and students of Lyle Sendlein at the University of Kentucky should be specially commended for their presentations.

Bill Simpkins now is a member of the GSA North-Central Section Management Board and is a "voice" for the Hydrogeology Division at the section level. Section meetings during the next 3 years at Western Michigan University, University of Nebraska, and Iowa State University will benefit from active groundwater programs at the host schools. Suggestions for symposia are welcome.

History of the Hydrogeology Division

The Hydrogeology Division was founded as a Hydrogeology Group within GSA in 1958. Following is more information on the people who have made a difference to the Hydrogeology Division through their service, publications, and lectures. This issue lists past Division Chairpersons, O. E. Meinzer Awardees, Distinguished Service Awardees, and Birdsall Lecturers for the years 1986 to 1990. Previous issues of *The Hydrogeologist* cover the earlier years. The O. E. Meinzer Award began in 1965, the Birdsall Distinguished Lecture Series began in 1978, and the Distinguished Service Award was instituted in 1984.

Year	Division Chairpersons	Annual Meeting Location
1986	William Back	San Antonio, Texas
1987	Wayne A. Pettyjohn	Phoenix, Arizona
1988	John M. Sharp, Jr.	Denver, Colorado
1989	Robert N. Fervolden	St. Louis, Missouri
1990	Joseph S. Rosenshein	Dallas, Texas

Award for Distinguished Service

1986	Ralph Heath Harry LeGrand Philip E. LaMoreaux, Sr.
1987	John C. Ferris I. Wendall Marine Philip E. LaMoreaux, Sr.
1988	William Back
1989	Jerry D. Vineyard Gerald Meyer Charles L. McGuinness (posthumous award)
1990	George Davis

John Birdsall Distinguished Lecturers

[Ed. note: The April 1993 issue of *The Hydrogeologist* omitted citation of David A. Stephenson as the 1980 John Birdsall Distinguished Lecturer. Stephenson's talks included "Hydrogeologic Aspects of Energy Development" and "The Challenge for Earth Scientists in Water Resources."]

1986	Leonard Konikow	U.S. Geological Survey
	• Predictive Accuracy of Ground-Water Models—Lessons from a Postaudit	
	• Modeling Solute Transport and Dispersion in Ground Water	
1987	Shlomo Neuman	The University of Arizona
	• Reflections on Contaminant Transport Modeling	
	• Recent Trends in Fractured Rock Hydrology	

- What is Stochastic Hydrology?
- The AVRA Valley Case Study

1988	Keros Cartwright	Northern Illinois University
	• Large-Scale Experiments in Hydrogeology	
	• Safe Landfills—Can We Succeed? [We Must]	
1989	Warren W. Wood	U.S. Geological Survey
	• Geologic Questions—Hydrologic Solutions	
	• Lakes, Solutes, and Ground Waters	
1990	J. Leslie Smith	University of British Columbia
	• Groundwater and Tectonic Processes	
	• Solute Transport in Fracture Networks	

Papers Cited in O. E. Meinzer Award

- 1986 Narasimhan, T. N., Multidimensional numerical simulation of fluid flow in fractured porous media: *Water Resources Research*, v. 18, no. 4, p. 1235–1247, 1982.
- 1987 Gelhar, L. W., Stochastic subsurface hydrology from theory to application, in *Trends and directions in hydrology*, Burges, S. J. (ed.): *Water Resources Research*, v. 22, no. 9, p. 135s to 145s, 1986.
- Gelhar, L. W., Stochastic analysis of flow in heterogeneous porous media, in *Fundamentals of transportation phenomena in porous media*, Jacob Bear and M. Y. Corotcioglu (eds.): Dordrecht, The Netherlands, Martinus Nijhoff Publishers, p. 673–720, 1983.
- Gelhar, L. W., and C. L. Axness, Three-dimensional stochastic analysis of macrodispersion in aquifers: *Water Resources Research*, v. 19, no. 1, p. 161–180, 1983.
- 1988 Winograd, I. J., Archeology and public perception of a transscientific problem — disposal of toxic wastes in the unsaturated zone: *U.S. Geological Survey Circular* 990, 9 p., 1986.
- Winograd, I. J., B. J. Szabo, T. B. Coplen, A. C. Riggs, and P. T. Kolesar, Two-million-year record of deuterium depletion in Great Basin ground waters: *Science*, v. 227, no. 4686, p. 519–522, 1985.
- Winograd, I. J., and F. N. Robertson, Deep oxygenated ground water: anomaly or common occurrence?: *Science*, v. 216, no. 4551, p. 1227–1230, 1982.
- Winograd, I. J., Radioactive waste disposal in thick unsaturated zones: *Science*, v. 212, no. 4502, p. 1457–1464, 1981.
- 1989 Davis, S. N., Campbell, D., Bentley, H. W., and Flynn, T., Ground water tracers: Worthington, Ohio, National Water Well Association Press, 200 p., 1985.
- Davis, S. N., and Murphy, E., Dating ground water and the evaluation of repositories for radioactive waste: U.S. Nuclear Regulatory Commission, Report no. NUREG/CR-4912, 181 p., 1987.
- 1990 Hem, J. D., Study and interpretation of the chemical characteristics of natural water: *U.S. Geological Survey Water-Supply Paper* 1473, 269 p., 1985 (also 1959 and 1970 editions).

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 it to GSA *no later than October 15, 1993*. Election results will be announced at the Division business meeting in Boston on October 26.

Nominee for Chairman

Leonard F. Konikow, born in Far Rockaway, New York, on January 26, 1946. Member since 1974. Education: Hofstra University, B. A., 1966; Pennsylvania State University, M. S. in 1969 and Ph.D. in 1973. Professional experience: Research Hydrologist, U.S. Geological Survey, Water Resources Division, 1972–present; Lecturer, Department of Environmental Sciences, University of Virginia, 1991–92. Publications include more than 50 technical reports on hydrogeology and contaminant transport. Fellow of GSA and member of AGU, GSW, IAH, and NGWA, as well as a member and former chairman of the AGU Ground Water Committee; Associate Editor, *Ground Water*, 1993–95; AGU Spring Meeting Program Chairman for Hydrology, 1984–87; member of the U.S. Committee for IAH, Executive Committee, 1986–90; Associate Editor, *Water Resources Research* 1981–84; Birdsall Distinguished Lecturer, 1986; Recipient of NWWA Science Award, 1989.

Nominee for First Vice-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; Pennsylvania 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; Professor, Syracuse University, New York, 1982–present. Author or co-author of more than 50

publications on hydrogeology. Service to GSA and the Hydrogeology Division includes: Birdsall Distinguished Lecturer, 1993; Co-chairman NE Section meeting, 1990; Meinzer Award Committee, 1989–90. Other professional activities include Member of NRC panel on assessing groundwater contamination, 1991–present; Member of AGU, NGWA, Association of Wetland Scientists. Professional interests include paleohydrology, wetland hydrogeology and geochemistry, and various aspects of contaminant hydrogeology.

Nominee for Second Vice-Chairman

John W. Hess, born in Lancaster, Pennsylvania, on May 26, 1947. Member since 1974. Education: Pennsylvania State University, B. S. 1969; Ph.D. 1974. Professional experience: Water Resources Center, Desert Research Institute, University of Nevada, Reno. 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. Honorary Research Fellow at the University of Glasgow, Scotland, 1980–81. Associate Professor, 1982–86 and Professor, 1986–present, the University of Nevada, Las Vegas. Publications include more than 80 technical reports, book chapters, and journal articles on hydrogeology and geochemistry. 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 from 1989–91, Cordilleran Section Representative from 1992–present, and symposium co-convenor in 1984 and 1990. Other professional activities include membership in the IAH Karst Commission and co-chairman 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.

Hydrogeology Division Organization

1993 Management Board

Chairman

Frank Schwartz, Ohio State University

First Vice Chairman

Leonard Konikow, USGS-Reston

Second Vice Chairman

Don Siegel, Syracuse University

Secretary-Treasurer

John Harsh, Environmental Resources Management, Inc.

Past Chairman

John Cherry, University of Waterloo

Division Liaison to Council

Jack Sharp, The University of Texas at Austin

1993 Committees

O. E. Meinzer Award Committee

Christopher Neuzil (Chairman),
Martin Mifflin, John Bredehoeft,
Leslie Smith, Stavros Papadopoulos

Birdsall Lecturer Committee

Robert Farvolden (Chairman),
Shirley Dreiss (Coordinator),
Don Siegel (Lecturer)

Distinguished Service Award Committee

Keros Cartwright (Chairman),
Paul Witherspoon, Phyllis Garman

Nominating Committee

Robert Farvolden (Chairman),
Olaf Pfannkuch, Jack Sharp

Joint Technical Program Committee

Warren Wood (Chairman),
Steve Wheatcraft, John Van Brahana

Short Course Committee

Frank Schwartz (Chairman),
Warren Wood, Steve Wheatcraft

Penrose Conference Committee

Leonard Konikow (Chairman),
John Cherry, Nari Narasimhan

Publications Committee

John Cherry (Chairman),
Leonard Konikow, Frank Schwartz

Research Grants and Student Awards Committee

Darryll Pederson (Chairman),
Noel Krothe, Don Siegel

Fund-Raising Committee

Philip LaMoreaux (Chairman),
Lon Ruedisili, Stavros Papadopoulos

Past Chairmen's Long-Range Planning Committee

John Cherry (Chairman)

Division Historical Committee

William Back (Chairman),
Claire Davidson, Alan Dutton,
Phyllis Garman, John Harsh,
Darryll Pederson, Joe Rosenshein,
Paul Seaber

Representatives to Other Societies

Joe Weihaupt, American Association for
the Advancement of Science, Section W

Nari Narasimhan, Hydrology Section 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

James Quinlan, GSA Quaternary Geology
and Geomorphology Division

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

Sectional Committee Chairmen

Cordilleran—Jack Hess

North Central—Bill Simpkins

Northeastern—Bob Melvin (Acting)

Rocky Mountain—Bill Woessner

South Central—Joe Yelderman

Southeastern—Stuart Rojstaczer

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News items for *The Hydrogeologist*
are appreciated submitted in electronic
mail or saved text only on computer diskette.
Microsoft Word is used for newsletter com-
pilation on a Macintosh computer. Deadline
for submitting items for the Spring 1994 issue
of *The Hydrogeologist* is January 31, 1994.

Printed in the USA



The Geological Society of America

3300 Penrose Place • P.O. Box 9140 • Boulder, Colorado 80301

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