



The Hydrogeologist

NEWSLETTER OF THE HYDROGEOLOGY DIVISION OF THE GEOLOGICAL SOCIETY OF AMERICA, SEPTEMBER 1981

GORDON D. BENNETT, 1981 MEINZER AWARD RECIPIENT

The 1981 Meinzer Award Panel consisting of Philip Cohen (Chairman), Irwin Remson, James J. Geraghty, Frank W. Trainer, and Wayne Pettyjohn, has named Gordon D. Bennett the recipient of the 1981 O. E. Meinzer Award for his book, *Introduction to Ground-Water Hydraulics, a Programmed Text for Self-Instruction*: U.S. Geological Survey,

Techniques of Water Resources Investigations, Book 3, Chapter B2, 172 p., 1976.

The award will be presented at the Division's luncheon-business meeting on Tuesday, November 3, 1981, from 1230-1530 hours in the Bronze Room B, Stouffers Hotel, Cincinnati, Ohio.

MESSAGE FROM THE CHAIRMAN

Dear Colleague:

As you can see elsewhere in this newsletter, the 1981 Annual Meeting in Cincinnati will be an extravaganza of hydrogeologic activities (symposia, sessions, field trips, the Meinzer Award, the Birdsall Lecture, presentations, cocktail parties, etc.). Rarely, if ever, have there been so many events of hydrogeologic interest at a single scientific meeting. I hope you will make a special effort to attend this year!

Opportunities to get better acquainted with friends of hydrogeology at the annual meeting are outstanding. In addition to the well known hallway encounter and the field-trip conversation, there will be Hydrogeology Division cocktail parties both Monday evening and Tuesday noon (immediately preceding the annual luncheon business meeting and immediately following the Birdsall lecture). We are making special plans to have some fun at the business meeting along with our more serious business, but I promise that we will do it expeditiously. I urge you to get your luncheon ticket(s) as early as you can.

Many individuals have contributed mightily of their time and talent this year in carrying on the activities of the Division. Some of this effort is obvious from the newsletter. Among other things, a year-long timetable of events and deadlines and various procedural documents have been compiled to help

future officers and committee members take advantage of past experience. Other items, some rather important, will be reported on at the business meeting. By the way, copies of the bylaws will be available at the business meeting.

The Management Board has been considering the possibility of establishing a new elected or appointed position in the Division, that of editor, who would handle the newsletter and might conceivably handle other Division projects as well. At present Claire Davidson as Secretary/Treasurer very ably produces the newsletter in addition to her other very substantial duties. Having an editor would spread the workload more equitably and would allow us to consider two newsletters a year instead of one. If you have thoughts on this subject or if you might like to be an editor, please contact me at the Department of Geology, Oklahoma State University, Stillwater, Oklahoma 74078 or at (405) 624-6358.

Hope to see you in Cincinnati!

Sincerely,

John Stone

John E. Stone, Chairman
Hydrogeology Division

1981 ANNUAL MEETING AT CINCINNATI

Paul Seaber, Joint Technical Program Chairman, has organized an outstanding program for the 1981 Annual Meeting, Cincinnati, Ohio, November 2-5, 1981. A schedule of Division-sponsored events and other sessions of Division interest follows:

Thursday-Sunday, October 29-November 1

Field trip of Division interest: **Hydrogeology of the Mammoth Cave Region, Kentucky**. J. F. Quinlan, National Park Service, Mammoth Cave, KY; R. Evers, Eastern Kentucky University, Richmond, KY. Limit: 80;

3½ days; cost \$230. Departs Thursday, 0800 hours from the Cincinnati Convention Center (CCC); returns Sunday noon to CCC.

Sunday, November 1

Hydrogeology Division field trip: **Geohydrology of the Ohio River Alluvial Aquifer**. D. S. Mull and R. J. Faust, USGS, Louisville, KY. Limit: 40; 1 day; cost \$75. Departs Breckenridge Inn, Louisville, KY, 0800; arrives, Stouffers, Cincinnati, 0500.

"At Large" Symposium on Ground-Water Flow in Karst Systems. James Quinlan, Convener. Grand Ballroom A, Stouffers, 1300-1700, 12 papers, 20 minutes each.

Monday, November 2

Hydrogeology I: John Kiefer, Horace Collins, and Stan Norris, Presiding. Rooms 27-28, CCC, 0800-1200, 13 papers, 15 minutes each, plus 2 invited talks on the Hydrogeology of Ohio and Kentucky.

Hydrogeology II: Paul Seaber and Daniel Spangler, Presiding. Room 23, CCC, 1300-1545, 11 papers, 15 minutes each.

Hydrogeology Cocktail Party: Meet the Meinzer Award Recipient and Birdsall Lecturer, 1800-2100. Held in conjunction with Alumni Cocktail Parties, Continental Room, Netherland Hilton. Cash bar.

Tuesday, November 3

Hydrogeology Poster Session: Exhibit Area, CCC, 0800-1100, 12 posters.

Hydrogeology Division Management Board Meeting: Cabana Room B., Stouffers, 0830-1030.

Birdsall Distinguished Lecture: Management and Modeling Methods in Modern Hydrology by Irwin Remson. Bronze Room B, Stouffers, 1100-1145.

Hydrogeology Division Luncheon and Business Meeting: Bronze Room B, Stouffers, 1230-1530 (cash bar nearby, 1145-1230). Cost \$12; ticket available by preregistration or at GSA registration desk up to 24 hours before the luncheon.

Wednesday, November 4

Geochemistry Division Symposium on Shales and Subsurface Hydrology: Donald Graf and Yousif Kharakha, Conveners. Room 2, CCC, 0800-1200, 12 papers, 20 minutes each.

Symposium on Hydrogeology of High Level Nuclear Waste Isolation: Paul Witherspoon and F. Joseph Pearson, Conveners. Room 2, CCC, 1300-1700, 10 papers, 20 minutes each and panel discussion.

Thursday, November 5

Hydrogeology Division Symposium on Regional Hydrogeology—Past, Present and Future: Harry LeGrand and Wayne Pettyjohn, Conveners. Room 23, CCC, 0800-1200, 11 papers, 20 minutes each and panel discussion.

INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS

The International Association of Hydrogeologists (IAH) is a scientific and educational non-profit international organization established to exchange hydrogeologic information and to advance the science. IAH, which promotes cooperation between scientists who are working on hydrogeologic problems, is affiliated with the International Union of Geological Sciences (IUGS).

The principal activities of IAH are to:

- Promote international interest among scientists in hydrogeologic studies.
- Sponsor hydrogeologic meetings. IAH has held more than 23 scientific conferences in the past 20 years.
- Publish hydrogeologic reports. For example, *Karst Hydrogeology 1977*, *Hydrogeology of Great Sedimentary Basins 1976*, *Hydrogeological Map of Europe*, and *Methods for Evaluation of Ground Water Resources 1979*.
- Establish commissions to investigate topics of concern to hydrogeologists.

The International Association of Hydrogeologists was founded in 1956 during the 20th International Geological Congress in Mexico, and later became an affiliated organization of the IUGS. Since then, the IAH has established chapters (committees) in 55 countries. The United States Committee of IAH was organized in 1974 as a subcommittee of the U.S. National Committee on Geology, which operates under the aegis of the U.S. Department of Interior and the National Academy of Sciences. As of 1981, the United States Commission of IAH has 123 members from Federal, State, and local governments, and the academic and business communities.

The IAH will accept for membership an individual engaged in hydrogeologic investigations, research, or management. Membership is granted on the basis of scientific qual-

ifications, experience, and publications. A membership application can be obtained from Secretary-Treasurer Larry Doyle, 19579 Transhire Road, Gaithersburg, Maryland 20760. Dues (\$17.00 per year) should be sent with the membership application. John Moore is Chairman, David Stephenson is Vice-Chairman.

1982 ANNUAL MEETING AT NEW ORLEANS

The 1982 Annual Meeting will be held October 18-21, 1982, at the Hyatt Hotel, New Orleans, Louisiana. Irwin Kantrowitz will be Program Chairman for the Hydrogeology Division. He can be reached at U.S. Geological Survey, Water Resources Division, 325 John Knox Road, Suite-240, Tallahassee, Florida 32303 (904) 386-7145 and welcomes suggestions for the technical sessions.

Kantrowitz reports that plans are progressing for two Division-sponsored field trips. Ray Wallace and Keith Westhusing will lead a field trip on the occurrence of geopressured-geothermal aquifers of the Gulf Coast. The one-day trip will depart New Orleans and visit one of the long-term research well sites now being drilled by the Department of Energy in Cameron Parish, Louisiana.

The second trip will be a four-day trip to the Yucatan Peninsula, Mexico, to study processes of recent carbonate sedimentation and diagenesis, Pleistocene reefs, carbonate stratigraphy, hydrogeology, and living coral reefs. The trip will include stops at Tulum, Coba, and other Mayan archaeological sites. Bill Back, Bruce Hanshaw, Bill Ward, and Al Weidie will lead the premeeting trip, October 14-17, 1982.

HIGHLIGHTS OF THE 1980 ANNUAL MEETING AT ATLANTA

Paul R. Seaber, Program Chairman, organized an outstanding program for the 1980 Annual Meeting, Atlanta, Georgia, November 17-20, 1980. The Division-sponsored

technical sessions and events are summarized in the minutes of the annual business meeting (attendance, 95 people) prepared by Claire B. Davidson, 1980 Secretary-Treasurer.

The 1980 annual business meeting of the Hydrogeology Division was called to order by Chairman Robert Dingman at 1:00 p.m. Tuesday, November 18, 1980, in the Grand Ballroom (Center), Marriott Hotel, Atlanta, Georgia. Dingman introduced the people at the head table: Keros Cartwright, Past Chairman; Leonard Wood, Second Vice-Chairman; Claire Davidson, Secretary-Treasurer; Richard Cooley, Meinzer Award recipient, and his wife Sharon Cooley; Roger Wolff, citationist for the Meinzer Award; David Stephenson, Third Birdsall Distinguished Lecturer; Paul Seaber, Program Chairman; Bruce Hanshaw, Councilor, GSA; Victor Stringfield and Joseph Poland, symposium honorees; and Robert Maclay and William Back, late arrivals for the fully subscribed luncheon-business meeting, who were asked to join the head table.

Secretary-Treasurer Davidson asked for approval of the minutes of the 1979 annual business meeting as published in the 1980 *Hydrogeologist*. The minutes were approved. Davidson gave the treasurer's report. As of June 30, 1980, the Division had a balance of \$3,020.77 in the treasury, \$1,912.52 from dues and \$1,108.25 from earnings on the Birdsall bequest.

Davidson read the necrology of affiliates of the Division compiled since the 1979 business meeting. A minute of silence was observed for Robert K. Fahnestock and Jean V. Molleskog.

Dingman announced the results of election of officers: The 1981 Management Board consists of the following: John Stone, Chairman; Leonard Wood, First Vice-Chairman; David Stephenson, Second Vice-Chairman; Claire Davidson, Secretary-Treasurer. Robert Dingman, Past Chairman, continues as a member of the Board. A total of 215 ballots was cast.

Chairman Dingman introduced Roger Wolff, citationist for the 1980 Meinzer Award, which was presented to Richard L. Cooley for his paper, *A Method of Estimating Parameters and Assessing Reliability for Models of Steady State Groundwater Flow, Theory and Numerical Properties*; Water Resources Research, v. 13, no. 2, p. 318-324, 1977. Wolff briefly summarized Cooley's background. After receiving his PhD at Pennsylvania State University he worked with the U.S. Corps of Engineers, Davis, California, and the Desert Research Institute, Reno, Nevada, before joining the U.S. Geological Survey. His research has been concerned with the physics of ground-water motion and the solving of the resulting differential equations. In particular, Wolff noted that Cooley's research has been "concentrated on numerical methods of estimating parameters involved in the equations, methods of assessing the reliability and significance of the parameter estimates and the model produced by the equations, and methods of assessing the reliability and predictive capability of the model."

In his acceptance speech Cooley thanked the Meinzer Panelists for naming him the recipient of the 1980 Meinzer Award, which he considered one of the highest professional honors that a hydrogeologist can achieve. He also thanked his parents, his wife, his thesis advisor, Richard Parizek, and the late Burke Maxey, Desert Research Institute, for their interest and support of his work on quantitative hydrogeology. Cooley summarized his research on the problems of parameter estimation in ground-water modeling and the steps that led to his theory and development of numerical properties of regression methodology that provide greater capability and reliability of the model. Finally, he pointed out that the application of the regression modeling procedure is a powerful tool not only for understanding water resources problems but for understanding other scientific problems as well.

Chairman Dingman announced that Irwin Remson, Professor of Applied Earth Sciences and Geology, and Chairman of the Department of Applied Earth Sciences at Stanford University, is the Fourth Birdsall Distinguished Lecturer. David Stephenson, coordinator for the lecture program, reported that 12 invitations from universities and institutions had been received and more groups had indicated an interest. A firm schedule will be announced in the near future. Remson will present two lectures; a general lecture on *Modern Hydrogeology—Capabilities and Challenges* and a more specialized lecture on *Optimal Ground Water Management*.

Dingman reported that Stephenson, who was the Third Birdsall Distinguished Lecturer, had visited 11 institutions from February to May 1980. He congratulated Stephenson on his outstanding tour and noted that the Division has received favorable comments on his program from professors of institutions where Stephenson had lectured. Dingman, on behalf of the Division, thanked Stephenson's company, Woodward-Clyde Consultants, San Francisco, California, for its generosity in supporting his program as Third Birdsall Lecturer.

Stephenson in turn expressed his gratitude for the generous support that he received from his company, Woodward-Clyde Consultants, for granting him time, salary, and supplemental travel expenses, all of which made his tour such a success. He remarked that he thoroughly enjoyed the opportunity to visit the various institutions and to talk to the promising students who will be our future hydrogeologists.

Stephenson cited financial constraints on the program at the present time because of constant inflation and pointed out that a successful program will be jeopardized in the future without increased funding from other sources. Dingman said that the Management Board had voted to raise Division dues in accordance with GSA policy, and that the increased revenue could supplement income from the Birdsall bequest. It is anticipated that \$3,000 will be available in 1981 for transportation; as in the past, the host institution will fund the lecturer's local expenses. Thomas Holzer suggested a scheme to reduce transportation costs by selecting a lecturer from the eastern and western United States in alternate years, the intent being that the lecturer would restrict his travel to his geographic area. There was some discussion but no action at this time.

Bruce Hanshaw, newly elected 1981-1983 GSA Councilor, announced that he has been appointed liaison between Council and the Division. Hanshaw reported on Council meetings and noted the great responsibility and dedication of the Society's Councilors and Officers. An eight-member committee has been appointed to establish future publication policy for the Society. Hanshaw said that in the future the Division should turn to GSA for publication of special volumes such as the George Burke Maxey Memorial Volume. T. N. Narasimhan, coeditor with R. Allan Freeze, reported that a volume of invited papers for the symposium commemorating Paul Witherspoon's 60th birthday will be published as a GSA Special Paper titled *Recent Trends in Hydrology*.

Hanshaw summarized progress of the "Decade of North American Geology" (DNAG), which will celebrate the centennial of the Society in 1988. Twenty-six volumes on the geology of the North American plate and adjacent areas will be published; A. R. (Pete) Palmer is coordinator of DNAG; Gerald Meyer designed the logo for DNAG.

Paul Seaber, 1980 Program Chairman, discussed Division-sponsored events at the Atlanta meeting. A record number of 102 abstracts were submitted of which 84 were accepted. Twenty-eight

papers, 15 minutes each, were scheduled for two half-day sessions, and 32 presentations in a half-day poster session. In addition, 14 invited papers, 15 minutes each, were scheduled for the *V. T. Springfield Symposium: Process in Karst Hydrology*, and 10 invited papers, 20 minutes each for the *Joseph F. Poland Land Subsidence Symposium* cosponsored with the Engineering Geology Division. The cocktail party in honor of Springfield and Poland was so well attended that Seaber suggested that the Division should continue sponsorship of a cocktail party as an annual event. Eighteen stalwart participants took the cold, rainy raft trip on the Geohydrology of the Chattahoochee River led by Howard Gill, Charles Cressler, Michael Higgins, and Rodney Cherry. Dingman thanked Seaber for organizing the Division's outstanding program and reported that he had appointed Seaber to be cochairman of the 1981 Cincinnati Annual Meeting.

John Stone, 1981 Program Chairman, was not present. Wayne Pettyjohn outlined plans for the 1981 Cincinnati Annual Meeting. Harry LeGrand and Wayne Pettyjohn will convene a symposium on *Regional Hydrogeology, Past, Present, and Future*. The Division and the Coal Geology Division plan to cosponsor a symposium on Coal Hydrogeology to be convened by Lyle Sendlein. James Quinlan, Ralph Evers, and Este (Pat) Hollyday will lead a field trip on the Hydrogeology of the Mammoth Cave Region, Kentucky, to be cosponsored by the Division and Friends of the Karst. Steven Cordova reported that a Division request for cosponsorship of a coal-hydrology field trip was not feasible because the request was too late to meet deadlines. Keros Cartwright announced that a symposium of Division interest on *Shales and Subsurface Hydrology* will be convened by the Geochemical Society.

Paul Witherspoon said that he and Joseph Pearson planned to convene a symposium tentatively titled *Hydrogeology of High Level Radioactive Waste Isolation*. Although the Division can officially sponsor only one symposium at the annual meeting, Witherspoon requested endorsement of their symposium by the Division in anticipation that it would qualify for GSA's "at-large" category based on merit, criteria of timely issues, and regional significance. Robert Bean moved to endorse the symposium. Stephenson seconded; the motion passed unanimously.

Bruce Hanshaw, Chairman, GSA Committee on Penrose Conferences, reported that only three Penrose Conferences were convened in 1980, seven are scheduled for 1981, and two for 1982. John Sharp discussed his proposed Penrose Conference on *Hydrogeological Controls on Formation of Economic Deposits in Sedimentary Environments*, which will be of interest to hydrogeologists, economic geologists, and geochemists.

Dingman announced that he has appointed Keros Cartwright to be the regional representative of the North Central Section and David Stephenson the representative of the Cordilleran Section. Dingman, Paul Seaber, Allen Winslow, and Joseph Rosenshein will continue to be representatives of the Northeastern, Southeastern, South Central, and Rocky Mountain Sections, respectively. The Management Board proposed that representatives consult with chairmen of their Sections to ensure participation of hydrogeologists in Section meetings. In order to facilitate this proposal the Secretary-Treasurer will send the GSA Five-Year Section Meeting Schedule (updated twice a year) to representatives to keep them informed.

Dingman solicited discussion from affiliates on the question—should a recipient receive the Meinzer Award twice? Specifically, should an author be denied the award if his coauthor is a previous recipient? Hanshaw noted that GSA has no policy on such restrictions. Bean, however, said that because there are so many excellent papers, the award should be given only once to any one person. Stephenson recommended that the decision be left to the discretion of the Meinzer Award Panel. This recommendation seemed to be the consensus of affiliates.

Chairman Dingman opened the meeting to other business. Gerald Meyer recommended that revenue from a dues increase be restricted to Division expenses and that other sources of funding be solicited as a supplement for Birdsall Lecturer expenses; for example, contributions

from consultants. Considerable discussion by Stephenson, Holzer, Hanshaw, Poland, Meyer, Bean, Ivan Johnson, and Wendell Marine followed. Bean finally moved that the Division increase dues, and also solicit contributions from consultants and affiliates for the Birdsall fund; Cartwright seconded; the motion passed with two opposing votes.

Joseph Rosenshein announced that he and Gordon Bennett will convene the *John Ferris Symposium on Groundwater Hydraulics* at the annual meeting of the American Geophysical Union (AGU), May 25–29, 1981, in Baltimore, Maryland. The symposium will be sponsored by the Groundwater Committee of the AGU and the U.S. National Committee of the International Association of Hydrogeologists. Rosenshein requested papers for the symposium, the purpose of which is to "explore the broad application of hydraulics to the solution of groundwater problems through review of methods used in the last three decades and through presentation of the latest research and sophisticated state-of-the-art techniques." The symposium papers will be published in an AGU monograph. Gerald Meyer announced that he will convene a symposium on *Groundwater Quality Management—Science, Technology, and Policy* at the AGU Spring Meeting.

William Back moved that the Division formalize selection of the Birdsall Lecturer by establishing a three-member committee for this purpose; Wolff seconded. Considerable discussion by Back, Cartwright, Bean, Dingman, George Davis, and Narasimhan was concerned with the present selection procedure, and whether the Meinzer Committee or the nominating committee could assume the responsibility. Back recommended a separate committee for the selection procedure; his intent was that when possible, the three most recent Birdsall Lecturers would form the committee each year. Back then amended his motion as follows: that the Division chairman appoint a three-member committee (previous Birdsall Lecturers when possible), each member with a tenure of three years and overlapping terms to provide continuity, to recommend to the chairman a candidate for the Birdsall Lecturer. The motion passed with one opposing vote.

Joseph Poland asked affiliates whether the term "ground water" was still considered two words. Meyer reaffirmed that it was. (It should be noted some organizations use one word.)

Back reported that plans are progressing for a 4-day trip to Yucatan, Mexico, before the Annual Meeting, New Orleans, October 25–28, 1982. Al Weidie, Bill Ward, Hanshaw, and Back will lead the trip to study processes of recent carbonate sedimentation and diagenesis. Pleistocene reefs, carbonate stratigraphy, hydrogeology, and living coral reefs. Stops will include the archaeological sites of Chichen Itza, Tulum, and Uxmal.

Dingman expressed his pleasure in serving as 1980 Chairman of the Division. He turned the meeting over to First Vice-Chairman-Elect Wood who adjourned the meeting at 2:45 p.m.

PATRICK A. DOMENICO, FIFTH BIRDSALL DISTINGUISHED LECTURER

The 1981 Birdsall Distinguished Lecture Committee consisting of William Back (Chairman), David Stephenson, and Irwin Remson, has named Professor Patrick A. Domenico, Department of Geology, University of Illinois, the Fifth Birdsall Distinguished Lecturer.

Educated at Syracuse University and the University of Nevada, Dr. Domenico's research has been concerned with ground-water hydrology with emphasis on simulation and optimization, and on mass and energy transport in porous media. His numerous publications include a book, *Concepts and Models in Groundwater Hydrology*, and a paper on "Energy Transport in Thick Sequences of Compacting Sediment" for which he received the Division's 1979 O. E. Meinzer Award.

Dr. Domenico will present two lectures:

Hydrogeology and Geologic Processes

In this general lecture, subsurface flow is examined as a geologic agent and not within the more usual context of water supply. In particular, the principles of mass and energy transport that have been so successful in water resource and contaminant transport problems are examined within the context of geologic processes associated with the chemical and thermal evolution of sedimentary basins, with emphasis on the hydrocarbon bearing excess pressure environments.

Some Preliminary Assessment Techniques in Solid and Radioactive Waste Disposal

The recent proliferation of environmental protection laws and the need to dispose of both solid and radioactive wastes seems to coincide in time with a corresponding proliferation of complex transport models with a predictive capability for environmental impact. In this lecture, some simple operational models are discussed that have been designed specifically to evaluate the dilution potential for waste sites prior to intensive investigations, and to evaluate the mechanical and fluid pressure response in thermally loaded repository rocks of various kinds.

A complete itinerary has not been established at this time, but it will coincide with the 1981-82 academic year. If you would like your institution to be considered a part of Dr. Domenico's Birdsall Distinguished Lecture Program, inquiries should be sent to Professor Irwin Remson, Coordinator, Birdsall Lecture Program, Department of Applied Earth Sciences, Stanford University, Stanford, California 94305, (415) 497-0847. Transportation expenses are paid by the Division; the host institution is expected to cover the lecturer's local expenses.

The Birdsall Distinguished Lectures are funded through an endowment from the late John Birdsall, hydrogeologist, to honor outstanding professionals in the field of hydrogeology. Former recipients of the annual award are Jacob Bear, TECHNION, Israeli Institute of Technology, Haifa, Israel; William Back, USGS, Reston, Virginia; David Stephenson, Woodward-Clyde Consultants, San Francisco, California; and Irwin Remson, Stanford University, Stanford, California (see next item).

SUMMARY OF FOURTH BIRDSALL LECTURE PROGRAM

David Stephenson, Coordinator, Fourth Birdsall Distinguished Lecture Program, reports that Professor Irwin Remson, Department of Applied Earth Sciences, Stanford University, Stanford, California, visited thirteen universities February, March, and April, 1981: University of Wisconsin at Madison, University of Nebraska at Lincoln, University of Kansas at Lawrence, University of Iowa at Iowa City, South Dakota School of Mines and Technology at Rapid City, University of Texas at El Paso, University of Arizona at Tucson, University of Indiana at Bloomington, Purdue University at Indianapolis, Ohio State University at Columbus, Drexel University at Philadelphia, Pennsylvania State University at University Park, and California State University at Los Angeles.

The visits involved two formal presentations and informal discussions with faculty and students. The abstracts of his lectures follow:

Modern Hydrogeology—Capabilities and Challenges

Society is confronted by a growing shortage of well-trained hydrogeologists. Case histories are used to demonstrate

the nature of hydrogeology, the exciting new challenges and the tools that the modern hydrogeologist needs.

Fatehpur Sikri, the city of Akbar the Great, was built in India in the late 16th century. It was abandoned after only eleven years because its location on the thin edge of the sediments of the Indo-Gangetic Plain did not permit the development of an adequate water supply. The Hawaiian island of Maui illustrates the hydrogeology of a thick pile of basaltic lavas in a humid climate. The Island of Capri provides an example of limestone hydrogeology.

The San Jacinto Valley of California illustrates how modern computer simulation models may be used to solve a water supply problem. An area near Salt Lake in Utah illustrates the use of models to solve a pollution disposal problem. Finally, a hypothetical problem illustrates the growing capabilities for solving groundwater management problems.

Modern hydrogeology is faced with new problems involving water supply, pollution disposal, containment of nuclear and hazardous wastes, economic management, thermal management, and geotechnical aspects of fluid flow. Geology Departments are faced with the challenge of meeting society's growing need for applied geologists.

Optimal Groundwater Management

The state-of-the-art of modern hydrogeology involves the use of computer simulation models to predict the effects of proposed management plans. Our research team uses them also as aids to exploration. Furthermore, we are actively developing management models that combine the use of linear programming and numerical simulation.

The Old Bridge Sand of New Jersey, the San Jacinto Valley of California, and the Tooele area of Utah illustrate the use of computer simulation models in support of exploration. They keep the hydrogeologist aware of his data inadequacies. If he incorporates erroneous hydrogeologic or inconsistent data, his model will not be able to generate historical water levels using historical flow data. Furthermore, the inverse methods of parameter estimation are rapidly becoming essential exploration tools.

A hypothetical situation shows how combined linear programming and numerical methods can solve very complicated water management problems. The purpose is to maximize some objective function while meeting physical and other constraints. The solutions locate wells and identify optimal operational schedules.

A dewatering problem in Taiwan illustrates the use of a fixed-charge model as well as method for identifying the best use of exploration funds. A hypothetical situation illustrates management methods for optimal use of an aquifer for both water supply and pollution disposal. Linear and nonlinear and transient and steady-state problems are discussed. The availability of linear programming codes makes the method quite easy to use.

Professor Remson's comments on completion of his program are of interest to hydrogeologists:

The lecture tour has reinforced my perceptions of why hydrogeology is not flourishing as a discipline in academia. Everywhere, hydrogeology groups showed enthusiasm, talent and considerable enrollment pressures. Yet, despite the external resources and needs, academic hydrogeology programs are lagging together with other applied earth sciences disciplines such as engineering geology, mineral economics and even economic

geology and petroleum geology. I am convinced that this is because of their academic situations as parts of traditional Departments of Geology, which have other academic obligations.

A traditional Department of Geology has many missions. It must contribute to an understanding of all phases of earth sciences and must service general educational needs. It is not in a position to shift faculty billets from a fundamental geologic discipline to an applied discipline such as hydrogeology. Thus, it cannot take advantage of the external resources currently available in these applied fields.

Hydrology is flourishing at the University of Arizona, where a separate Department of Hydrology and Water Resources has been established. We think that even greater flexibility is possible under the concept of a Department of Applied Earth Sciences such as exists here at Stanford University. We are able to make appointments in applied disciplines such as Geostatistics or Mineral Economics without starving the essential geologic offerings. Thus, we can take advantage of the external resources available for academic growth in areas of critical technology. However, we must always recognize that a Department of Applied Earth Sciences is dependent on the presence of a firm geologic foundation. Therefore, if such departments proliferate, they must use their greater accessibility to resources to further the missions of their sister geology departments in providing sound and well-rounded geology programs.

JOHN G. FERRIS HONORED BY AGU AND IAH

John G. Ferris, Hydrologist with the U. S. Geological Survey for 43 years, was honored by the American Geophysical Union and the International Association of Hydrogeologists during the Spring Meeting of AGU, May 25-29, 1981, in Baltimore, Maryland. The *John Ferris Symposium on Ground Water Hydraulics*, convened by J. S. Rosenzweig and G. D. Bennett, included 20 papers in morning and afternoon sessions. The papers were invited by the Ground Water Committee of AGU's Hydrology Section. The Symposium was well-attended (the meeting room was 80-100 percent filled all day) by John's friends, colleagues, pupils, and students of pupils.

Most of the practicing hydrogeologists in the United States today have learned some of their ground-water hydraulics either from John or his students; he has taught short courses on ground-water hydraulics within the USGS and for other Federal and State agencies and academic groups since the early forties. He was chosen to help launch the School of Hydrology at the University of Arizona and served as a Professor for seven years before returning to the USGS in Reston in 1967. Even though John retired in February 1980, he still works part time at the USGS.

John was trained as a Civil Engineer at Lehigh University, but he has always been a student of geology, quick to point out hydrologic conditions that don't fit the described geology. His questions and comments have caused more than one geologist to go back and rethink their concept of the geology of their project. John has been a member of GSA Hydrogeology Division since 1970.

PENROSE CONFERENCE OF DIVISION INTEREST

Hydrodynamics and geochemistry of ore generation in sedimentary environments

A GSA Penrose Conference on "Hydrodynamics and Geochemistry of Ore Generation in Sedimentary Environments" will be held in late May 1982 in the Lake of the Ozarks area, Missouri. Conveners for this conference are William C. Kelly, Department of Geological Sciences, University of Michigan, Ann Arbor, MI 48109; John H. Sharp, Department of Geology, University of Missouri, Columbia, MO 65211; and Donald E. White, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025.

The purpose of the conference is to bring together economic geologists, geochemists, hydrogeologists, and other scientists with overlapping interests to discuss how fluid dynamics, mass transport, and geochemical factors control the formation of mineral deposits in sedimentary rock environments. Economic geologists have amassed extensive data on and numerous field examples of such deposits. Recent advances in quantitative analysis of regional flow systems, the chemical evolution of fluids, and diagenesis should be capable of providing insights into the mechanisms responsible for mineral deposits formed contemporaneously with the enclosing sediment (syngenetic), later than sediments but prior to their lithification (diagenetic), and after the sediments were lithified (epigenetic).

Recent advances in such areas as quantitative modeling of sedimentary basins, regional flow systems, non-

equilibrium thermodynamics, mass and energy transport, sediment diagenesis, tectonic controls on heat flow, the properties of hydrothermal fluids, and so forth are all exciting concepts that can be applied to the formation of economic mineral deposits. On the other hand, economic geologists and others must provide critical age relationships and other data needed to properly calibrate the new quantitative models. Such models often represent theoretical extrapolations based upon short-time, small-scale data. Application of different scales to these systems may provide a new understanding of the strengths and limitations of these models.

Therefore, this Penrose Conference provides an opportunity to exchange new concepts and data from a number of fields, to provide contacts for new interdisciplinary research (within the overall geologic framework), and, hopefully, to stimulate new and exciting lines of research.

The conference is scheduled for five days; present plans call for a one-day, mid-conference, field trip to one or more Mississippi Valley-type deposits in Missouri. The registration fee is expected to be between \$350 and \$400 per person, including food and lodging. Those desiring to attend the conference are requested to contact the conveners at the above addresses. Include a brief description of topic(s) you wish to contribute. Application deadline is **December 15, 1981**.

Impact of Richards's Equation: Semi-Centennial Session

In 1931, L. A. Richards proposed an equation for transient flow of water in partially saturated soils (Capillary conduction of liquids through porous mediums: Physics, 1, 318-333, November 1931). In modern notation this equation is

$$\nabla \cdot \frac{k k_r(p)}{\mu} (\rho g \nabla z + \nabla p) = \frac{\partial \theta}{\partial p} \frac{\partial p}{\partial t},$$

where k is intrinsic permeability, k_r is the relative permeability as a function of capillary pressure, ρ is fluid density, g is acceleration due to gravity, z is elevation above datum, p is fluid pressure, θ is volumetric moisture content, and t is time. Richards's equation can be considered as the forerunner of modern analysis of transient fluid flow in porous media, used in such earth-science disciplines as hydrogeology, soil science, soil mechanics, and petroleum engineering. Fifty years after the publication of Richards's equation it is worthwhile to step back and reassess its impact, its validity and limitations, its extensions and applications.

Accordingly, a day-long special session entitled "Impact of Richards's Equation: A Semi-Centennial Session" is being organized by the Hydrology Section of the American Geophysical Union. The session will consist of invited as well as contributed papers dealing with theoretical aspects, laboratory studies, field applications, and mathematical solutions. The Chairman of the Special Session is T. N. Narasimhan, Lawrence Berkeley Laboratory, Berkeley, CA 94720, phone (415) 486-5655. The session is being co-sponsored by appropriate sections of the American Society of Civil Engineers, the Geological Society of America, the Soil Science Society of America, and the American Society of Agricultural Engineers. It will be held during the Fall Meeting of AGU, December 7-11, 1981, in San Francisco, California.

TREASURER'S REPORT

As of June 30, 1981, the Division had a balance of \$2,266.14 in the treasury.

Income:

Balance brought forward 12/31/80	\$1,439.22
Dues 1981 (938 affiliates)	\$1,876.00
Birdsall Fund balance 12/31/80	\$1,977.90
(Total \$11,977.90 minus \$10,000 restricted)	\$5,293.12

Expenses:

To GSA from dues	\$1,049.08
From Birdsall Fund	\$1,977.90
	\$3,026.98

Balance:

Dues	\$2,266.14
Birdsall Fund (\$10,000 restricted)	0
	\$2,266.14

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