



GSA NEWS & INFORMATION

Monthly Newsletter of
The Geological Society of America

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28th IGC To Convene in Washington, D.C.

Geoscientists around the world are preparing for the 28th International Geological Congress, which will convene in Washington, D.C., July 9–19, 1989. GSA Fellow Charles L. Drake, Dartmouth College, is president of the 28th IGC, and Fellow Bruce Hanshaw, U.S. Geological Survey, Reston, is secretary general.

The 28th IGC will be the first in more than 50 years to be held in the United States (the 16th, in 1933, was also held in the U.S. capital), and it promises to be the biggest ever. The Convention Center is in downtown Washington, close to government buildings, museums, monuments, and hotels and business facilities.

The International Geological Congress has been held about every four years since the 1800s, and the meetings have enabled geologists from all over the world to exchange new concepts and data. These gatherings of broad-based, international groups have promoted the science of geology and the cooperation and collaboration of geoscientists needed for solving the important problems of the earth sciences. This interdisciplinary approach is featured in the IGC science program.

More than 7000 people responded to the 28th IGC First Circular, a worldwide mailing. Responses to the Second Circular are now coming in, with abstracts, plans for poster sessions, and registration forms for short courses and field trips. Registrants are expected to come from more than 125 countries. With the concurrence of the International Union of Geological Sciences, all IGC sessions will be conducted in English, but translators will be available for poster sessions.

1989 Program

The 1989 technical program includes two colloquia, more than 200 symposia dealing with many aspects of the geosciences, several dozen poster sessions, and, as an innovation, several dozen short courses (before and during the congress) and numerous workshops. An extensive selection of field trips is being offered to almost every geologic province in the United States, including Alaska and Hawaii, and to Canada, Mexico, the Bahamas, and the British Virgin Islands and a January excursion to the Scotia Arc and Antarctica. Shorter trips, such as visits to historical sites, museums, government institutions, and laboratories are scheduled; they include city tours and sight-seeing jaunts in and around Washington. Although registration for field trips is possible until May 1, space is limited, and early registration is recommended to reserve your preferences.

In addition to the general program of council and bureau meetings and scientific sessions, there will be a program for

accompanying members and a social program. The social events will start with refreshments in the Exhibits Hall of the Convention Center immediately after the opening ceremonies. Attendees can enjoy an "American-style" evening of entertainment on the Mall, near the Smithsonian museums on Tuesday evening, July 18.

Other Attractions

A special activities plan for young people aged 13–19 is an addition to the IGC program; young people will be able to enjoy events and field trips designed just for them. These activities are intended to be both educational and fun; brief descriptions will be available at the Youth Congress booth, which will be located in the registration area.

Another new feature of the 28th IGC is the Science Theater at the Convention Center; it will show geoscience films continuously during the day from Monday through Friday, July 10–14. Scientific exhibits and a trade fair are planned for the first week; representatives from industry, international geological institutions and associations, universities, and government agencies will host displays in the 5100-square-metre main exhibit hall of the Convention Center. The 28th IGC has been included in the U.S. Department of Commerce 1989 Foreign Buyer Program, which promotes trade shows overseas to increase awareness of U.S. exports. To obtain information and reserve space in the exhibits hall, contact Exhibits Manager, 28th IGC, P.O. Box 727, Tulsa, OK 74101-0727.

The Public Education Committee is another innovation for this IGC; its purpose is to help congress members communicate the importance of their work to the general public and to promote understanding and appreciation of geology and the application of geological information to social needs. The committee will sponsor two public exhibitions: a new Smithsonian Traveling Exhibition on volcanoes and a Library of Congress exhibition "The History of Geologic Mapping." In addition, the committee will be promoting special coverage of geology through magazines, radio, and television. Four evening lectures on current geological topics will be sponsored jointly by the Smithsonian Institution and the IGC.

Information

The 28th Session of the International Geological Congress will be held in collaboration with and under sponsorship of the International Union of Geological Sciences. It will be co-hosted by the U.S. Geological Survey and the National Academy of Sciences

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Hollis D. Hedberg 1903-1988

Hollis Dow Hedberg, 85, Princeton University professor of geology, emeritus, died after a long illness at his home in Princeton on August 14, 1988.

An authority on stratigraphy and petroleum exploration, Hedberg was a member of the Princeton Department of Geological and Geophysical Sciences from 1959 until his retirement in 1971. Concurrently, he held positions at the Gulf Oil Corporation, first as vice-president for exploration and then as exploration advisor.

Elected to membership in the National Academy of Sciences in 1959, he served as president of the Geological Society of America in 1960-1961 and of the American Geological Institute in 1962-1963. He chaired the International Subcommittee on Stratigraphic Classification, the Joint Oceanographic Institution for Deep Earth Sampling Advisory Panel on Pollution Prevention and Safety, and the Panel on Petroleum Prospects of the Deep Oceans of the 9th World Petroleum Congress, as well as various other national committees. Among the foreign scientific societies which made him an honorary member are the Geological Societies of London and Stockholm and the Royal Academy of Science of Denmark.

The 1963 recipient of the Sidney Powers Medal of the American Association of Petroleum Geologists, Hedberg received in 1973 both the National Academy of Sciences Mark Clark Thompson Medal and the American Association of Petroleum Geologists Human Needs Award. The Geological Society of London awarded him its Wollaston Medal in 1975, the same year the Offshore



Hollis D. Hedberg

Technology Conference gave him its Distinguished Achievement Award. The University of Uppsala in Sweden bestowed an honorary degree on him at its 500th anniversary in 1977. He received the Penrose Medal of the Geological Society of America in 1980, the Ian Campbell Medal of the American Geological Institute in 1983, and the William B. Heroy, Jr., Award for Distinguished Service to the American Geological Institute in 1987.

Memorial contributions may be made to the University of Kansas (Lawrence) Department of Geology, to the Princeton University Department of Geological and Geophysical Sciences, or to the Stanford University School of Earth Sciences Crustal Geophysics Project.

Memorial Preprints

The following memorial preprints are now available, free of charge, by writing to GSA, P.O. Box 9140, Boulder, CO 80301.

D. Jerome Fisher, by Julian R. Goldsmith
William Harvey Gross, by Patrick H. O'Neill
Deane F. Kent, by Stuart W. Maher
Vincent Edward Nelson, by Thomas G. Roberts
John Oleksyshyn, by Paul C. Lyons
Carl Robert Swartzlow, by Walter D. Keller, Howard W. Baker, and Harry B. Robinson

28th IGC (continued from p. 305)

in cooperation with dozens of scientific societies and industry organizations. The Second Circular of the IGC is the most complete description of all congress events; to get a copy, write 28th IGC, Box 727, Tulsa, OK 74101-0727. All inquiries and general correspondence concerning the congress should be addressed to Bruce Hanshaw, Secretary General, 28th International Geological Congress, P.O. Box 1001, Herndon, VA 22070-1001.

In Memoriam

Roger C. Baker
Austin, Texas

Reginald A. Barker
Houston, Texas
June 14, 1988

Conrad R. Burri
Bern, Switzerland
June 16, 1987

Hollis D. Hedberg
Princeton, New Jersey
August 14, 1988

Russell F. Kaiser
Kutztown, Pennsylvania
July 26, 1988

Charles J. O'Hara
Vienna, Virginia
May 28, 1988

Thomas Ellis Williams
Dallas, Texas
March 18, 1988

Nikolaus Zygojannis
Cologne, West Germany
July 30, 1988

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*Advertising: Contact James R. Clark or Ann H. Crawford (303) 447-2020.



DNAG NEWS

by Allison R. (Pete) Palmer

DNAG Progress

This month, GSA moves into its second century. Some of the relatively prompt contributors of chapters for DNAG volumes on *The Geology of North America* are beginning to feel the same way about the progress of their volumes. The good news is that there has been important movement toward completion in all of the volumes for which there was light at the end of the tunnel last month, but none has quite moved into the final production phase as of early September when this is being written. There are a lot of promises of the final pieces before the Centennial meeting, and progress toward completion of this massive project is substantive and encouraging. A key chapter for the Cordilleran volume has been received for review, and that volume now joins the group with glimmerings of completion in sight. Also, several world-class laggards (I have been forbidden to use the word "delinquents") are in the process of being replaced or deleted from volumes to which we had hoped they would contribute. The GSA Council has strongly urged such actions because this project has only two more years to run, and we must move forward to complete volumes in as timely a manner as possible. Such actions are being taken with great sadness for what might have been.

With publication of *Sedimentary Cover of the Craton: U.S.*, and with the volume *Hydrogeology* at the printer, 13 books of the DNAG complex have been completed, and 17 more are in process! Eighty-four percent of all chapters to be published in volumes of *The Geology of North America* have been written. The next twelve months will be an exciting time as many of those volumes are wrapped up!

Call for Papers

First SME and Australasian IMM Joint Conference, World Gold '89

In autumn 1989, a major symposium focusing on all aspects of the gold mining industry of North America and Australia will be sponsored jointly by the Society of Mining Engineers of AIME and the Australasian Institute of Mining and Metallurgy. The technical symposium will be held in Reno, Nevada, November, 5-8, 1989; a premeeting field trip will be held in Australia and a postmeeting trip in North America.

Four sessions (20 papers) will be devoted to gold exploration. Papers are solicited in the following areas: New Discovery Case Histories; Hydrothermal/Metamorphic Fluid Concepts and Gold Mineralization; Geophysics in Gold Exploration; Design and Practice of Sampling and Analyzing for Gold. Previously unpublished papers are requested and will be published in a high-quality conference volume that will be available at the conference.

Those interested in presenting papers in Reno are invited to submit a 200-word synopsis in care of Society of Mining Engineers, AIME, Caller No. D, Littleton, CO 80127.

Association for Women Geoscientists Foundation Announces International Science Fair Awards

The Association for Women Geoscientists Foundation (AWGF) presented four awards at the 1988 International Science and Engineering Fair held in Knoxville, Tennessee. Judging the entries were Judith B. Moody, Columbus, Ohio; Debra S. Stakes, Columbus, South Carolina; and Marilyn J. Suiter, Washington, D.C.

The AWGF Award winners are: First Place—Dawinka Fillmore, Bountiful, Utah, for "Effects of West Desert Pumping on the Mineral Extraction Industries of the Great Salt Lake"; Second Place—Leigh A. Eubanks, Pensacola, Florida, for "Effect of Man-Made Structures on Beach Erosion"; Third Place—Geoffrey S. Siemerling, Tulsa, Oklahoma, for "Movement of Heavy Metals in Salvage Yard Soil"; and Honorable Mention—Danita K. Baggs, Shreveport, Louisiana, for "Effect of Acid Rain on Building Materials."

The AWG Foundation was established in 1983 to develop and fund innovative programs designed to encourage women and girls to study earth science and to investigate career opportunities and advancement in the geoscience professions.

Donations to support activities such as the International Science and Engineering Fair and others may be sent to AWG Foundation, 10200 West 44th Avenue, Wheatridge, CO 80033. All donations are tax deductible under the 501(C)3 IRS organization classification.

AGI Offers Scholarships for Minority Geoscience Students

The American Geological Institute's Minority Participation Program (AGI-MPP) expects to offer scholarship aid to outstanding geoscience majors for the academic year 1989-1990. Thirty-eight scholarships were awarded for the 1988-1989 academic year. Funding for support and financing of this program has come from geoscience societies (including GSA) and industries (petroleum, mining, environmental, etc.), and from individuals.

Those eligible are geoscience and geoscience education majors who are United States citizens and members of one of the following ethnic minority groups, which are under-represented in the geosciences: American Black, Hispanic, and Native American (American Indian, Eskimo, Hawaiian, and Samoan). The applicant must have good academic records, meet financial-need criteria, and be currently enrolled in an accredited institution as either an undergraduate or graduate student majoring in geoscience. The term "geoscience" is used broadly to include major study in the fields of geology, geophysics, geochemistry, hydrology, meteorology, oceanography, and planetary geology, as well as geoscience education with specific focus in these disciplines.

An official transcript, three letters of recommendation, and a fully completed AGI-MPP application form must be received no later than **February 1, 1989** (all application materials postmarked after January 31, 1989 will be invalid). It is the *applicant's responsibility* to follow up on those persons who have agreed to write letters of reference, and to ensure that all materials are received prior to the deadline.

NOTE: Current recipients of AGI-MPP scholarships **MUST** reapply in order to be considered for 1989-1990 awards. Scholarships are **NOT** automatically renewed.

For more information or for scholarship application materials, contact AGI Minority Participation Program, American Geological Institute, 4220 King Street, Alexandria, VA 22302; (703) 379-2480.

Geological Society of America



CONGRESSIONAL SCIENCE FELLOWSHIP 1989-1990

The Geological Society of America invites applications for the 1989-1990 Congressional Science Fellowship. The Fellow selected will spend a year (September 1989-August 1990) in the office of an individual member of Congress or a congressional committee advising on a wide range of scientific issues as they pertain to public questions. Guided by the American Association for the Advancement of Science, the Fellow selects a congressional staff position in which he or she can work on major legislative issues.

CRITERIA

The program is aimed at highly qualified earth scientists in early or mid-career. Candidates should have exceptional competence in some area of the earth sciences, cognizance of a broad range of matters outside the Fellow's particular area, and a strong interest in working on a range of public policy problems.

AWARD

The GSA Congressional Science Fellowship carries with it a \$28,000 stipend and a limited relocation and travel allowance. The fellowship is funded by GSA and by a grant from the U.S. Geological Survey. (Employees of the USGS are ineligible to apply for this fellowship.)

TO APPLY

Procedures for application and detailed requirements are available in the geology departments of most colleges and universities in the United States or upon request from

Executive Director
Geological Society of America
P.O. Box 9140
Boulder, Colorado 80301



Deadline for receipt of all application materials is March 15, 1989

Resource Conservation and Recovery Act

by Jim Evans
GSA Congressional Science Fellow



According to the Environmental Protection Agency (EPA), the United States produces 150 million tons of solid wastes annually. Approximately 90% of these go to landfills, about 5% are recycled, and 5% are incinerated. Landfill disposal is becoming more difficult, for two reasons. Concerns about groundwater contamination have closed a significant number of landfills over the past 5 years. The remaining landfills are rapidly reaching capacity. The EPA estimates that about 30% of available landfills will close within 5 to 7 years and 70% will close within 15 years.

The Resource Conservation and Recovery Act (RCRA) is the major law governing the disposal of solid wastes and toxic wastes. The authorization for RCRA expired on September 30, 1988. When RCRA was reauthorized in the past, most of the attention focused on hazardous waste management. This year, because of problems with landfills, the widely publicized wanderings of the Islip (New York) garbage barge, and the closing of beaches on the New Jersey coast due to the dumping of medical wastes, most of the attention is on solid waste issues.

Legislative History

Background. The federal government became involved in solid waste issues with enactment of the 1965 Solid Waste Disposal Act, which provided technical and financial assistance to local governments. One of the main goals of the act was to help municipalities convert open dumps to sanitary landfills. In 1970 the amendments to the Solid Waste Disposal Act (called the Resource Recovery Act) focused on recycling and called upon the newly formed Environmental Protection Agency to conduct a comprehensive investigation of hazardous waste management.

Ironically, stricter environmental protection laws enacted during the 1970s had the effect of worsening the solid waste management problem. The Clean Water Act significantly restricted aquatic disposal practices and created new sources of solid wastes such as sewage sludge. The Clean Air Act reduced permissible air emissions from incinerators, and restricted open-air burning. Thus, concern for reducing air and water pollution resulted in a greater reliance on land disposal. During the early 1970s there was increasing realization that hazardous wastes required specialized treatment and handling independently of other classes of solid wastes.

Resource Conservation and Recovery Act. The 1976 reauthorization and amendment of the Solid Waste Disposal Act was called the Resource Conservation and Recovery Act (RCRA). The intent of this statute was to establish a comprehensive framework for safe disposal of solid and hazardous wastes. The lengthiest section of the law is subtitle C, which creates a "cradle-to-grave" regulatory system for tracking hazardous waste from its generation to ultimate disposal. Subtitle D, concerning nonhazardous waste, prohibits open dumping and requires disposal in sanitary landfills that comply with EPA criteria. Subtitle E contains provisions for promoting resource recovery technology and markets. Other provisions of the law require that federal agencies comply with RCRA (subtitle F), authorize civil actions against RCRA violators (subtitle G), and authorize research (subtitle H).

Hazardous Waste Issues. Since the 1976 enactment of RCRA, most of the subsequent attention has been on hazardous waste issues. In 1978 a state of emergency was declared at Love Canal, where a former dump site was found to leak 82 different toxic chemicals. Clean-up of the site required relocating 1000 households at a cost of \$30 million. Subsequent investigations by the EPA and by Congress revealed that Love Canal was simply one of many abandoned toxic waste sites around the country. Congressional interest in the problem led to passage of the 1980 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which set up the Superfund program to clean up abandoned hazardous waste sites. Superfund was intended to complement RCRA such that, if RCRA was working well, no new sites would be created requiring eventual CERCLA actions. RCRA was also amended in 1980, to include provisions dealing with disposal of used oil and recycling.

Congress began the last reauthorization process for RCRA with concern about loopholes in subtitle C. By 1984 the EPA had completed studies showing that over 264 million metric tons (71 billion gallons) of hazardous waste are produced annually, but that fewer than 25% of the 60,000 companies that identified themselves as hazardous waste generators were subject to subtitle C provisions. Congress was also displeased with the fact that many of the detailed hazardous waste guidelines required by earlier legislation were overdue by five or six years.

Both RCRA and CERCLA were amended and reauthorized in 1984. RCRA legislation (the Hazardous and Solid Waste Amendments) prohibits hazardous waste disposal in certain geologic mediums, requires containers for liquid hazardous wastes, prohibits certain chemicals from land disposal, regulates underground storage tanks, and imposes minimum technology standards on new landfills (two or more liners, leachate collection system, and groundwater monitoring system). In addition, the EPA was required to establish regulations for small-quantity generators (that produce between 100 and 1000 kilograms of hazardous waste per month). The Superfund Amendments and Reauthorization Act (SARA) contains important funding provisions, accelerates the clean-up schedule, and has provisions for community right-to-know and emergency response efforts.

Current Legislation and Issues

Aboveground Storage Tanks. This year the collapse of an aboveground oil tank near Pittsburgh raised concerns about this type of facility. Underground tanks storing petroleum or hazardous

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Report from Washington (continued from p. 309)

wastes are covered by RCRA, but aboveground tanks are not. Provisions of the Clean Water Act require a detailed plan for leak and spill prevention, but present law lacks requirements for tank design, construction, and testing. H.R. 4098 (Rep. Walgren, D—Penna.) and S. 899 (Sen. Daschle, D—S.D.) are companion bills that require the EPA to issue performance standards for all above-ground tanks with a capacity greater than 4200 gallons that contain petroleum or other substances regulated by RCRA. The bills also require EPA to enforce standards by testing, make owners liable for spills, and require owners to provide local governments with data about each tank (location, capacity, age, and use).

Incinerator Ash. One of the more controversial issues concerns whether ash from municipal incinerators should be treated as hazardous waste (under subtitle C) or solid waste (under subtitle D). Bottom ash (the residue of incineration) is mostly melted glass, but it can also contain trace metals (lead and cadmium) and dioxins. Fly ash (ash trapped in the stacks by scrubbers) typically has much higher concentrations of toxic materials. The 111 municipal incinerators currently in operation produce 4 million tons of ash annually, about 10% being fly ash. There are 210 additional incinerators in planning or construction phases, so ash disposal questions will become more significant in the future.

Present practice is to combine bottom and fly ash for disposal. Ash from incinerators that accept only household waste is treated as solid waste, while ash from incinerators that accept industrial waste is treated as hazardous waste. The EPA uses a toxicity test, in which mobility of toxic substances is measured from acid-treated ash. The agency estimates that about one-third of tested ash fails the toxicity test, but it also believes that the test is more rigorous than actual field conditions. The agency also contends that dioxins do not leach and therefore pose no threat to groundwater.

Several bills attempt to clarify the status of incinerator ash. H.R. 2517 (Rep. Florio, D—N.J.) and S. 1566 (Sen. Stafford, R—Vt.) are companion bills that require that the EPA promulgate criteria and testing for incinerator ash. A suite of tests would include mobility of toxic materials from leaching, respirability, and effect on health. Permits would be required for new and existing facilities, which must include testing and monitoring, plans to minimize dispersion of ash, and protection of workers.

H.R. 4357 (Rep. Luken, D—Oh.) would classify all incinerator ash as solid wastes. The bill would establish a special regulatory framework under subtitle D for ash, requiring special minimum technological requirements for ash disposal. Monofills (landfills receiving only ash) would be required to use single composite liners with a leachate collection system; landfills with ash and other waste would require double composite liners and leachate collection systems. Ash that passes a test for toxic mobility would be classified as solid waste and could be disposed of in ordinary landfills. H.R. 4255 (Rep. Johnson, R—Conn.) is similar to H.R. 4357.

Medical and Infectious Wastes. New Jersey beaches were closed 15 times last summer when tons of medical wastes, including hypodermic needles, washed up on shore. Laws regarding these types of wastes are uneven; 11 states entirely lack any medical waste disposal laws, and there are no federal guidelines. In Congressional hearings, the medical community sought to allay fears about infectious wastes, saying that diseases are unlikely to be spread in this fashion. Several bills have been introduced in the House. H.R. 3515 (Rep. Luken, D—Oh.) requires that the EPA promulgate regulations for proper handling, treatment, and transportation of medical wastes. H.R. 3478 (Rep. Saxton, R—N.J.) is similar but amends the Ocean Dumping Act to prevent ocean disposal of these wastes.

Federal Facilities. Five bills in the House seek to clarify that federal hazardous waste laws are applicable to federal facilities (H.R. 3781 to 3785). I discussed these bills in detail in an article about defense waste clean-up (*GSA News & Information*, July 1988).

Ocean Incineration. The EPA has been developing a regulatory program for allowing incineration of hazardous wastes from specially built ships. Although this program began in the 1970s and reached the stage of initial permits in 1983, at the present time rule-making activities have been suspended because of strong opposition by the coastal states. Concerns included the danger of transportation accidents in ports or collision at sea and that plans called for incinerator ships without scrubbers or other pollution control devices. S. 1751 (Sen. Lautenberg, D—N.J.) and H.R. 3595 (Rep. Hughes, D—N.J.) are companion bills that require permits and inspections for incinerator ships.

Waste Reduction (Minimalization). As it has become evident that pollution control methods rarely destroy hazardous wastes completely, there has been greater emphasis on reducing (minimizing) the amount of hazardous materials that are generated. Although there is widespread support for this concept, there has been certain confusion over use of the terminology and its implications. "Waste minimalization" has been interpreted to mean reducing the amount of waste that is land disposed, thus giving equal value to reducing waste before and after it is generated. Thus, recycling waste outside of the process in which it was generated would be a form of waste minimalization. "Waste reduction," however, is taken to mean in-plant practices that reduce, avoid, or eliminate the generation of hazardous wastes. "Source reduction" has been interpreted as reduction in the generation of waste. Thus, more efficient use of materials ("waste reduction") could lead to reduced generation of those materials ("source reduction").

Two waste minimalization bills are S. 1429 (Sen. Lautenberg, D—N.J.) and its companion bill H.R. 2800 (Rep. Wolpe, D—Mich.). Both require annual status reports on the nation's inventory of certain chemicals and on the success of waste reduction efforts. These bills call for an Office of Waste Reduction within EPA, to be a clearinghouse, and a fund to support demonstration projects and match state grants. S. 1331 (Sen. Biden, D—Del.) is similar to these bills.

RCRA Legislation. It is expected that an omnibus RCRA bill will be introduced soon. In the House, it is expected to contain a new subtitle governing aboveground storage tanks; provisions for regulating incinerator ash under subtitle D; new restrictions on landfills; mandatory waste management plans for subtitle D waste; the explicit inclusion of federal facilities in RCRA regulations; provisions for medical wastes; and regulations for international (and possibly interstate) transportation of solid wastes. The Senate bill would address all of these issues but may also include provisions for special waste classes (mining and petroleum wastes); regulations for PCBs; amendments to the injection well program; waste minimalization and recycling goals; and provisions to address "sham recycling" (illegal hazardous waste disposal under the guise of recycling). At this time it is considered unlikely that either the House or Senate will pass a comprehensive RCRA bill this year.

CENTENNIAL CATALOG UPDATE

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FOUNDATION NEWS

by Robert L. Fuchs



What a Party!

GSA's Centennial birthday party was a smash. Those who attended can attest to the plentiful and memorable scientific and historic activities, not to mention the fun and festivities.

If you forgot to send a birthday gift to GSA, there is still time. The Century Challenge continues until the end of this Centennial year. Each Challenge contribution of \$100 is supplemented by an additional \$10 from the Trustees, and the money goes to geologic research. Mail a check to the Foundation today, or send \$25 and pledge the balance over the next three years. You may use the envelope included in this issue for this purpose.

Planned Giving, Part II—The Tools for the Job

In Foundation News last month we introduced the subject of planned or deferred giving, a concept that can provide benefits of long-term importance to donor and donee. The subject has complexities that derive from the necessity of separating the gift into two parts, the life income interest, which is retained by the donor, and the remainder interest, which is given to the GSA Foundation. Special tools have been devised to accomplish this separation and fulfill legal and tax requirements. These tools are the deferred giving trusts—charitable remainder annuity trust and unitrust—and the pooled income fund.

Under an annuity trust arrangement, the donor retains the right to a specified annuity, a fixed amount of dollars each year. This amount is set at the inception of the trust and cannot be less than 5% of the initial fair market value of the trust assets. Income generated by the trust assets will fluctuate from year to year depending on interest rates and economic conditions. The annuity payment is unaffected by these fluctuations, so there will either be a shortfall or surplus of income. The former requires that the payment be filled out by drawing from principal; the latter augments principal.

While generally similar to the annuity trust, the unitrust is significantly different in that the annual payment to the income beneficiary varies. The donor specifies a percentage return that is applied annually to the fair market value of the assets. Thus, as the value changes, the annual payment to the beneficiary will increase or decrease. As in the case of the annuity trust, the difference between trust income and the payment will be added to or subtracted from principal.

The pooled income fund is a commingling of gifts from more than one donor, in order to minimize investment risks and maximize investment opportunities. GSA manages the fund along with other financial assets of the Society and the Foundation. The various contributors to the fund have their respective interest in the income, similar to a mutual fund. Unlike the annuity trust and unitrust, the actual income of the fund determines each year's payout. The pooled income fund is a particularly appropriate planned giving method for contributors of smaller amounts, since deferred gifts of only several thousand dollars can be handled in this manner.

The tax effect upon the donor as a result of a deferred gift must be analyzed for each situation. Factors to be considered include age and life expectancy of the donor, rate of payout, and the individual's marginal tax bracket.

The creation of a deferred gift is a personal and somewhat complex matter that requires input from professionals in its final

stages. A call or a note to the Foundation office will provide answers to preliminary questions and suggestions as to ways in which to develop a satisfactory deferred gift structure.

Donors to the GSA Foundation, August 1988

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Louis C. Conant
Perry R. and Linda M. Donald
Stuart L. Schoff

Century Challenge

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Preston Cloud
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3300 Penrose Place, P.O. Box 9140
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THE GEOLOGICAL SOCIETY OF AMERICA

Annual research awards program

1989

The Geological Society of America will continue its annual research awards program in 1989. Eligibility is not restricted to GSA members. New application forms for the current year and detailed requirements are available each fall in the geology departments of colleges and universities offering graduate degrees in earth sciences. Forms are mailed annually to GSA Campus Representatives and department secretaries and chairmen in the United States and Canada. They are also available upon request from the Research Grants Administrator, Geological Society of America, P.O. Box 9140, Boulder, Colorado 80301. PLEASE USE ONLY THE 1989 APPLICATION AND APPRAISAL FORMS.

The primary role of the research grant program is to provide partial support of master's and doctoral thesis research for graduate students at universities in the United States, Canada, Mexico, and Central America.

The Geological Society of America awarded \$178,800 in grants in 1988. The awards went to 213 students doing research for advanced degrees. The average amount awarded was \$850. The largest award was \$1,500, but there is no predetermined maximum amount.

Confidential evaluations from two faculty members are required from master's and doctoral candidates and must accompany applications submitted. PLEASE USE THE "APPRAISAL OF APPLICANT" FORMS, WHICH ACCOMPANY THE 1989 APPLICATION FORMS.

Applications will also be accepted for the Harold T. Stearns Fellowship(s). These grants are awarded periodically in support of research on one or more aspects of the geology of Pacific Islands and of the circum-Pacific region. They are distinct from the GSA Penrose research grants and are restricted in their use to the particular region. The awardee(s) will be selected by the Research Grants Committee. Applications must be postmarked by **February 15**. Application forms are the same as those used for the Penrose research grants.

The Committee on Research Grants will meet in April to evaluate applications and award grants. In April, all applicants for grants will be informed of the committee's actions by the Executive Director of the Geological Society of America.

**ALL APPLICATIONS MUST BE SUBMITTED ON THE 1989 FORMS
AND POSTMARKED BY FEBRUARY 15, 1989**

GSA Grants Fund Wide Variety of Research

General Grants

The purpose of the general research grants program is to provide partial support of master's and doctoral thesis research for graduate students at universities in the United States, Canada, Mexico, and Central America. Applicants need not be members of GSA. (Applicants for the Cole Award, however, must be GSA Fellows; see below.)

To apply for one of these grants, you must fill out an application form, available from GSA Campus Representatives, from geology departments in the United States and Canada, or from GSA headquarters (Research Grants Administrator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301). Evaluations from two faculty members are required for master's and doctoral candidates. The deadline for applications for the 1989 research grants program is February 15, 1989. Applications must be submitted on 1989 forms. The GSA Committee on Research Grants evaluates all applications and at its early spring meeting at GSA headquarters chooses those to be funded. Grants are awarded in April.

Specialized Grants

The Robert K. Fahnestock Award is a grant given to the applicant with the best proposal in sediment transport or related aspects of fluvial geomorphology.

The Harold T. Stearns Fellowship Award is earmarked for research on aspects of the geology of the Pacific islands and the circum-Pacific region.

You can indicate on the general research grants application form that you also want to be considered for the Fahnestock or Stearns grants. The application deadline is February 15.

The Gladys W. Cole Memorial Research Award is given for investigation of the geomorphology of semiarid and arid terrains in the United States and Mexico. Applicants must be GSA Fellows between 30 and 65 years old who have published one or more significant papers on geomorphology. The application form for this grant is different from the one for the general grants; it is also available from GSA headquarters (address above).

Section Grants

GSA's Southeastern Section began its student grants program eight years ago. Applicants must be GSA Student Associates and must be attending a college or university within the geographical boundaries of the Southeastern Section. Grants are awarded for both graduate and undergraduate research. Applications for these grants can be obtained from Michael J. Neilson, Department of Geology, University of Alabama, Birmingham, AL 35294. The deadline for 1989 applications is March 1, 1989. The grants will be awarded in late April.

The North-Central Section began awarding student grants in 1985. Applicants must be attending a college or university in the North-Central Section geographic area. Grant recipients are selected from applicants for the general research grants program (applications available from GSA headquarters; see address under General Grants). Deadline for 1989 applications is February 15, 1989.

The South-Central Section began awarding student grants in 1988. Applicants must be attending a college or university in the South-Central Section geographic area. Graduate student recipients are selected from applicants for the general research grants program (applications available from GSA headquarters; see address under General Grants). Deadline for 1989 applications is February 15, 1989. Undergraduate student recipients are selected by the Management Board of the South-Central Section. Applications for undergraduate student grants can be obtained from Page C. Twiss, Department of Geology, Thompson Hall, Kansas State University, Manhattan, KS 66506. The deadline for 1989 undergraduate student applications is October 15; the grants will be awarded in late December.

Division Grants

The Coal Geology Division of GSA and the Symposium on the Geology of Rocky Mountain Coal jointly sponsor scholarships for research on coal in the Rocky Mountain and northern Great Plains

(continued on p. 314)

To the members of the North-Central Section:

Because Richard A. Hoppin has accepted the position of science editor for GSA books beginning January 1, 1989, he has resigned as secretary-treasurer of the North-Central Section, effective right after the Section meeting in April 1989. The Management Board appointed George A. Hallberg to fill the last two years of the unexpired term beginning April 22, 1989.

Because of the impending change, a misunderstanding resulted in an incomplete slate of officers presented on the ballot mailed to you in June. The Member-at-Large position was inadvertently left off the ballot. The Nominating Committee submitted the name of Annabelle Foes for Member-at-Large effective following the Notre Dame meeting. Biographical data for Annabelle Foes is included below for your information.

To avoid the cost of another ballot mailing, an election by voice vote will be held during the North-Central Section's business meeting next April. Please plan to attend. We hope to end up with a set of properly elected officers for 1989-1990.

FOOS, ANNABELLE M., b. Rochester, NY, May 13, 55; Geochem., Clay mineralogy. Educ.: SUNY Potsdam, BA, 78; Univ. New Hampshire, postgrad., 79; Univ. TX, Dallas, Ph.D. (Geol./Geochem.), 84. Prof. Exp.: Geochemist, Sedimentary Petrographer, Mobil Explor. & Prod. Serv., 81-84; Assistant Prof., Univ. Akron, 84-. Mem.: Geol. Soc. Am.; Soc. Econ. Paleon. & Mineral.; Clay Minerals Soc.; North Ohio Geol. Soc.; Sigma Xi. Res.: Paleosols and modern soils in carbonate environments, Phanerozoic sedimentary iron ores. Mailing add.: Dept. Geol., Univ. Akron, Akron, OH 44325.

GSA Grants (continued from p. 313)

coal provinces. Applicants must be master's or doctoral candidates doing research on coal in Arizona, Alberta, British Columbia, Colorado, Idaho, Montana, New Mexico, North Dakota, Utah, Saskatchewan, South Dakota, or Wyoming. However, the college or university where applicants are doing the work need not be in those states or provinces. Applications for Rocky Mountain Coal Scholarships can be obtained from GSA (address under General Grants) or from Gary B. Glass, c/o Geological Survey of Wyoming, Box 3008, University Station, Laramie, WY 82071. The deadline for 1989 applications is February 1, 1989.

The Coal Geology Division awarded its first Antoinette Lierman Medlin Scholarship Award in 1988. This newly established grant is awarded annually to the applicant who submits the best proposal of a research project by a full-time graduate or undergraduate student in the field of coal geology. Detailed guidelines are available from the chairman of the Coal Geology Division Awards Committee: Robert B. Finkelman, U.S. Geological Survey, 956 National Center, Reston, VA 22092. The deadline for 1989 applications is February 15, 1989.

The Geophysics Division awarded its first Allan V. Cox Student Research Award for outstanding student research in 1988. This grant is awarded annually to an applicant for the general GSA research grants who is working in the field of geophysics. Applicants must be master's or doctoral candidates. Applications for this grant are available from GSA headquarters (address under General Grants) and for 1989 must be submitted by February 15, 1989.

GSA's Quaternary Geology and Geomorphology Division established its J. Hoover Mackin Research Grants in 1974 to support graduate student research on Quaternary geology or geomorphology. Applications for this grant are available from the secretary of the division, John E. Costa, U.S. Geological Survey, Cascades Volcano Observatory, 5400 MacArthur Blvd., Vancouver, WA 98661. The deadline for applications for 1989 is February 15, 1989. Grant awardees are announced in April.

The Sedimentary Geology Division awarded its first grant for outstanding student research in 1987. This grant is awarded annually to an applicant for the general GSA research grants who is working in the field of sedimentary geology and stratigraphy. Applicants must be master's or doctoral candidates. Applications for this grant are available from GSA headquarters (address under General Grants) and for 1989 must be submitted by February 15, 1989.

Reminder

Call for Nominations for 1989

Nominations for GSA's two most prestigious awards, the Penrose and Day Medals, and for the esteemed Honorary Fellowships of the Society are due at headquarters by **FEBRUARY 1, 1989**.

Nominations for service as officers and councilors of the Society are due at headquarters by **FEBRUARY 15, 1989**.

For procedures and additional information, please refer to the October 1988 issue of *GSA News & Information*, or call headquarters at (303) 447-2020.

Send your nominations and required backup and supporting materials **TODAY** to

Administrative Department
Geological Society of America
P.O. Box 9140
Boulder, CO 80301

The Structural Geology and Tectonics Division awarded its first grant for outstanding student research in 1986. This grant is awarded annually to an applicant for the general GSA research grants who is working on structural geology or tectonics. Applicants must be master's or doctoral candidates. Applications for this grant are available from GSA headquarters (address under General Grants) and for 1989 must be submitted by February 15, 1989.

More GSA divisions will probably award student grants in the future. Watch for announcements in your division newsletter.

Smithsonian Research Fellowships Include Earth Science

The Smithsonian Institution announces its research fellowships for 1989-1990 in the fields of History of Science and Technology, Social and Cultural History, History of Art, Anthropology, Biological Sciences, Earth Sciences, and Materials Analysis.

Smithsonian Fellowships are awarded to support independent research in residence at the Smithsonian in association with the research staff and using the Institution's resources. Predoctoral and postdoctoral fellowship appointments for six to twelve months and graduate student appointments for ten weeks are awarded. Areas of interest to GSA members are the following:

History of Science and Technology: History of computers, communication, and society; history of agriculture; air and space; electrical technology; engineering; industrial archaeology; mathematics; medicine and pharmacy; natural history; physical sciences; social dimensions of science and technology; transportation.

Anthropology: Archaeology; cultural anthropology; folklore; linguistics; physical anthropology.

Biological Sciences: Animal behavior and pathology; ecology; environmental studies; evolutionary biology; marine biology; natural history; paleobiology; systematics; tropical biology.

Earth Sciences: Meteoritics; mineralogy; paleobiology; petrology; planetary geology; sedimentology; volcanology.

Applications are due **January 15, 1989**. Stipends supporting these awards are \$25,000 per year plus allowances for senior postdoctoral fellows; \$20,000 per year plus allowances for postdoctoral fellows; \$12,500 per year plus allowances for predoctoral fellows; and \$3,000 for graduate students for the ten-week tenure period. The first three stipends are prorated on a monthly basis for periods less than one year.

Awards are based on merit. Smithsonian fellowships are open to all qualified individuals without reference to race, color, religion, sex, national origin, age, or condition of handicap of any applicant. For more information and application forms, write to Smithsonian Institution, Office of Fellowships and Grants, 7300 L'Enfant Plaza, Washington, DC 20560. Indicate the particular area in which you propose to conduct research and give the dates of degrees received or expected.

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Cervantes Convention Center

FRONTIERS IN GEOSCIENCE—1989 THEME

In order to establish a new focus to GSA meetings, the 1989 Local Committee wishes to expand the concept of theme sessions. Accordingly, the technical program, field trips, and short courses for the 1989 Annual Meeting will be organized around the central theme *Frontiers in Geoscience*.

As a logical sequel to the 1988 Centennial Celebration in Denver, which will review the accomplishments in the geosciences over the past 100 years, the main thrust of the St. Louis meeting will be the frontiers of the next 100 years.

The expectation for theme sessions is that they will serve to integrate information along the following lines: to review the current knowledge in several important areas; to establish what the significant unanswered questions are in those areas; and to map out new approaches and strategies toward resolving those questions in the future.

A Theme Session is a topically focused session which has an official advocate who poses the theme. The papers for the session are entirely volunteered submissions. Although some of the papers may be solicited by the advocate, no paper is guaranteed acceptance. All of the papers will be reviewed by three independent reviewers appointed by the Joint Technical Program Committee (JTPC). The advocate may serve as the fourth reviewer.

An organization may elect to have its JTPC representative select and schedule its theme papers from among the reviewed and accepted abstracts during the JTPC meeting on August 17 and 18, or if necessary, may name a special representative. This special representative, who may be the theme advocate, is particularly necessary when a multi-disciplinary theme session is involved.

Divisions and Associated Societies have been invited to participate in selection of themes. Individuals are encouraged to participate also. The deadline for submissions is January 2, 1989. Please contact either of the co-chairmen if you are interested.

The following ideas have been compiled by the 1989 Local Committee. They are by no means comprehensive or exclusive, nor are they necessarily the ones that will emerge as the final titles of theme sessions to which abstracts will be submitted. The committee hopes that the long lead time will allow everyone to give strong consideration to organizing both symposia and theme sessions around the *Frontiers of Geoscience* theme.

Co-Chairmen, 1989 Technical Program Committee

Robert F. Dymek
Dept. of Earth & Planetary Science
Washington University, Box 1169
St. Louis, MO 63130
(314) 889-5610

Kevin L. Shelton
Dept. of Geology
University of Missouri
Columbia, MO 65211
(314) 658-3131

1989 Candidate Themes

1. Global Geoscience: Climate modeling; seismic tomography
2. Crustal Properties and Processes—Examples from the Mid-continent: Cratonic basins; seismic and tectonic activity not associated with plate boundaries
3. Emerging Technologies: Geologic mapping; uses of satellite remote sensing data; ultra-high-pressure experimental apparatus
4. Societal Needs and the Geosciences: Ground-water pollution; coastal land management; toxic wastes; resources
5. Communicating Earth Science in the 21st Century: Teaching innovations; data retrieval; information dissemination
6. Geobiology: Interdisciplinary approaches—Geochemical evolution of fossils; Precambrian fossil record

CALL FOR SHORT COURSE PROPOSALS

Have you thought about giving a short course? The GSA Committee on Short Courses invites those members interested in proposing a GSA-sponsored short course to contact GSA headquarters for proposal guidelines.

Short courses may be conducted in conjunction with all GSA annual or section meetings, but we are particularly interested in identifying short courses to be offered during the 1989 Annual Meeting in St. Louis.

Proposals for the St. Louis meeting must be received by December 15, 1988. Selection of courses will be made by February 1, 1989, leaving 8 months for preparing course manuals and making arrangements.

For proposal guidelines or further information, contact Edna A. Collis, Short Course Coordinator, GSA Headquarters, (303) 447-2020.

FUTURE GSA ANNUAL MEETING SITES

St. Louis	November 6-9	1989
Dallas	October 29-November 1	1990
San Diego	October 21-24	1991
Cincinnati	October 26-29	1992
Boston	October 25-28	1993

AGI Completes Survey of North American Geoscientists

The American Geological Institute has completed a two-phase study of employment patterns and opportunities for geoscientists in North America. The survey is the first of its kind to specifically target the geoscience community.

The first phase of the study, titled *North American Survey of Geoscientists*, completed in 1987, provides a comprehensive demographic index of geoscientists in the United States and Canada. It includes a vast amount of information on current employment statistics, annual income levels, occupational experience and objectives, educational background and training, membership in geoscientific organizations, work location, racial/ethnic origin, age, and gender.

The report includes all survey raw data and cross-tabulations of variables by occupational specialty practiced (e.g., geology, geophysics, hydrogeology, etc.) and employer category (academia, government, petroleum industry, etc.).

On the basis of the survey, there are approximately 120,000 geoscientists and closely related petroleum and mining engineers in the United States. Of these, 33% are geologists, geochemists, and other solid-earth scientists; 26% are petroleum engineers; 24% are geophysicists; 8% are mining engineers; 5% are engineering geologists; and 4% are hydrologists or hydrogeologists. Approximately 50% work in the petroleum industry; 12% for federal or state governments; 9% in mining and minerals; 8% in academia; 7% in geoscientific and engineering consulting; 3% for research employers; and 3% for other employers with geoscientific requirements.

The second phase of the study was completed in the spring of 1988 with the publication of *Geoscientific Employment and Hiring Survey—1988* by AGI. The study was developed in part from data

contained in the earlier comprehensive first-phase survey. This second study focuses especially on 1988 employment trends and opportunities. The study summarizes sample and projected statistics for current geoscience employment and anticipated hiring levels in 1988 for geologists, geophysicists, hydrologists/hydrogeologists, engineering geologists, and related professional scientists. It covers employment in the domestic oil and gas industry, mining and minerals industry, federal and state government agencies, DOE-funded national laboratories, geoscientific consulting firms, and academia. The study also includes approximate starting salaries for new graduates by degree level.

Both reports may be obtained for \$10 each from Customer Service Department, American Geological Institute, 4220 King Street, Alexandria, VA 22302-1507. AGI's Manpower Advisory Committee is planning a 1989 geoscience employment survey. For further information regarding geoscience survey plans and summaries, contact Nick Claudy at the address above.

U.S. Embassy Promoting Science and Technology Ties with Malaysia

To encourage scientific research and development activities in Malaysia, the U.S. Embassy in Kuala Lumpur offers possibilities for interaction between scientists, engineers, and technical experts in Malaysia and the United States. If you plan to travel in Malaysia, the embassy, given adequate advance notice, can arrange appointments with Malaysian counterparts. The embassy can also help to set up correspondence between U.S. and Malaysian scientists. Many scientists and engineers in Malaysia hold advanced degrees from English-speaking countries. There are five universities and several research institutes in the country. For more information, write to Jeffrey A. Beller, Science Officer, U.S. Embassy, P.O. Box 10035, 50700 Kuala Lumpur, Malaysia.

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You can receive a free copy of the U.S. Government Books Catalog of hundreds of useful books published by the Government. The catalog lists Government books on research, census information, business, medicine, law and regulations, statistics, foreign trade, manufacturing, science, and other subjects. These books are the results of Government research and statistical analysis and are available for sale by the Government.

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FROM THE GSA BOOKSHELF

Special Papers

LATE QUATERNARY CLIMATE, TECTONISM, AND SEDIMENTATION IN CLEAR LAKE, NORTHERN CALIFORNIA COAST RANGES
edited by John D. Sims
(SPE214, \$34.00)

PROCESSES IN CONTINENTAL LITHOSPHERIC DEFORMATION
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MEETINGS

(Asterisk indicates new or changed information)

1988

2nd Symposium on the Geology and Mineral Deposits of Sonora, November 6-8, 1988, Hermosillo, Sonora, Mexico. Information: Cesar Jacques Ayala, Instituto de Geología, UNAM, Apartado Postal 1039, Hermosillo, Sonora, Mexico; phone (621)-31720 or (621)-31753.

Second International Gold Mining Conference, November 7-9, 1988, Vancouver, British Columbia. Information: C. O. Brawner, P.O. Box 91651, West Vancouver, B.C. V7V 3P3, Canada; (604) 922-3717.

Symposium: Prediction of Hydrocarbon Reservoir Potential from Paleotemperature and Petrographic Data, November 9, 1988, Houston, Texas. Information: John A. Clendening, P.O. Box 3092, Houston, TX 77253; (713) 556-3549.

American Association of Stratigraphic Palynologists Annual Meeting, November 10-12, 1988, Houston, Texas. Information: John A. Clendening, Amoco Production Company, P.O. Box 3092, Houston, TX 77253; (713) 556-3549.

Carolina Geological Society Meeting, Geology of the Western Sauratown Mountains Window, November 11-13, 1988. Information: Robert D. Hatcher, Jr., Dept. of Geological Sciences, University of Tennessee, Knoxville, TN 37996-1410.

Lunar and Planetary Institute Workshop, Moon in Transition: Apollo 14, KREEP, and Evolved Lunar Rocks, November 14-16, 1988, Houston, Texas. Information: Pam Jones, LPI, 3303 NASA Road 1, Houston, TX 77058; (713) 486-2150.

Advances in Ground-Water Hydrology, November 16-18, 1988, Tampa, Florida. Information: American Institute of Hydrology, 3416 University Ave. S.E., Suite 200, Minneapolis, MN 55414; (612) 379-1030.

Symposium on Hot Spots in the South Pacific, November 21, 1988, Paris, France. Information: Société Géologique de France, 77 rue Claude Bernard, 75005 Paris, France; phone 331-43-31-77-35.

Third Symposium on Regional Geology of Mexico, November 28-30, 1988, Mexico City. Information: L. M. Mitre-Salazar, Instituto de Geología, UNAM, Aptdo. Postal 70-296, Ciudad Universitaria, Coyoacán, 04510 México D. F., México; phone (905) 548-0772.

1988 Eastern Oil Shale Symposium, November 30-December 2, 1988, Lexington, Kentucky. Information: Connie S. Willingham, UK/IMMR, 201 Porter Bldg., Lexington, KY 40506-0205; (606) 257-2841.

Geochemistry of Gulf Coast Oils and Gases, December 4-7, 1988, New Orleans, Louisiana. Information: Dietmar Schumacher, Pennzoil Co., P.O. Box 2967, Houston, TX 77252, (713) 546-4028, or Mahlon C. Kennicutt, Geochemical and Environmental Research Group, Texas A&M University, Ten South Graham Rd., College Station, TX 77840; (409) 690-0095.

American Geophysical Union Fall Meeting, December 5-9, 1988, San Francisco, California. Information: Ann E. Singer, American Geophysical Union, 2000 Florida Ave., N.W., Washington, DC 20009; (202) 462-6903.

ECORS Program: Deep Seismic Line across the Western Alps, joint meeting of French, Swiss, and Italian geological societies, December 12-13, 1988, Paris, France. Information: François Roure,

Inst. Français du Pétrole, 1-4 ave. du Bois Préau, 92506 Rueil-Malmaison, France.

1989

Fourth International Conference on Mars, January 10-13, 1989, Tucson, Arizona. Information: Hugh H. Kieffer, U.S. Geological Survey, 2255 N. Gemini Drive, Flagstaff, AZ 86002; (602) 527-7015.

Australasian Tectonics, February 6-10, 1989, Kangaroo Island, Australia. Information: A. Grady, c/o Dept. of Earth Science, Flinders University, Bedford Park, SA 5042, Australia.

Geophysics of the Rocky Mountains, Front Range, and High Plains, February 13-14, 1989, Golden, Colorado. Information: Front Range AGU Service Center, P.O. Box 18-P, Denver, CO 80218; 1-800-525-6338 (303-831-6338 in Colorado).

Society of Mining Engineers Annual Meeting, February 27-March 2, 1989, Las Vegas, Nevada. Information: Society of Mining Engineers, Meetings Dept., P.O. Box 625002, Littleton, CO 80162-5002; (303) 973-9550; Telex 881988; Fax (303) 973-3845.

***International Symposium on Natural Catastrophes and Their Impact**, March 1989, Ankara, Turkey. Information: Tevfik Erkal, Türkiye Jeomorfoloğlar Derneği, P.K. 652 Kızılay, 06425 Ankara, Turkey. (Abstract deadline: December 1, 1988.)

Prospectors and Developers Association of Canada 57th Annual Convention, March 5-8, 1989, Toronto, Ontario, Canada. Information: Cary McLeod, PDAC, 74 Victoria St., Suite 1002, Toronto, Ontario M5C 2A5, Canada; (416) 362-1969.

Symposium on Energy and Mineral Potential of the Central America-Caribbean Region, March 5-9, 1989, San Jose, Costa Rica. Information: Mary Stewart, Circum-Pacific Council for Energy and Mineral Resources, 5100 Westheimer Road, Houston, TX 77056.

***Symposium on the Afro-Arabian Rift System**, March 6-8, 1989, Karlsruhe, Federal Republic of Germany. Information: U. Achauer, Geophysical Institute, Karlsruhe University, Herzstr. 16, 7500 Karlsruhe 21, Federal Republic of Germany; phone 0049-721-6084545; Telex 7825740 GEOK D; Fax 0049/721/71173.

***Workshop on Drilling the Oceanic Lower Crust and Upper Mantle**, March 7-9, 1989, Woods Hole, Massachusetts. Information: Janet Johnson, Dept. Geology and Geophysics, Woods Hole Oceanographic Institution, Woods Hole, MA 02543; (508) 548-1400, ext. 2623.

***Second Symposium on the Application of Geophysics to Engineering and Environmental Problems**, March 13-16, 1989, Golden, Colorado. Information: Ron Bell, SEMEG, c/o BellWest Geoservices, P.O. Box 10845, Edgemont Branch, Golden, CO 80401. (Abstracts deadline: November 15, 1988.)

European Geophysical Society XIV General Assembly, March 13-17, 1989, Barcelona, Spain. Information: EGS Office, c/o MPI für Aeronomie, D-3411 Katlenburg-Lindau, Federal Republic of Germany. (Abstracts deadline: December 15, 1988.)

Engineering Geology and Geotechnical Engineering 25th Anniversary Symposium, March 20-23, 1989, Reno, Nevada. Information: Engineering Symposium, Division of Continuing

(continued on p. 318)

Meetings (continued on p. 317)

Education, University of Nevada, Reno, NV 89557-0024; (702) 784-4046.

International Symposium on the Silurian System (Murchison Symposium), March 28-April 9, 1989, Keele, England. Information: M. G. Bassett, Dept. of Geology, National Museum of Wales, Cardiff CF1 3NP, Wales; phone 02222-397951.

Economic Geology and Geotechnics of Active Tectonic Regions, April 3-7, 1989, London, England. Information: Conference Manager, Economic Geology and Geotechnics Conference, Dept. of Geological Sciences, University College, Gower St., London WC1E 6BT, England.

Shallow Gas and Leaky Reservoirs, April 10-11, 1989, Stavanger, Norway. Information: Norwegian Petroleum Society, P.O. Box 1897 - Vika, 0124 Oslo 1, Norway; phone 47-2-207025; Telex 77 322 nopet n.

National Fossil Exposition XI, April 14-16, 1989, Macomb, Illinois. Information: Karl A. Stuekerjuergen, Rte. 1, Box 28A, West Point, IA 52656; (319) 837-6690.

American Association of Petroleum Geologists Annual Meeting, April 23-26, 1989, San Antonio, Texas. Information: AAPG, P.O. Box 979, Tulsa, OK 74101; (918) 584-2555.

Third Annual Conference on Undergraduate Research, April 27-29, 1989, Trinity University, San Antonio, Texas. Information: Ann Knoebel, EUREKA, Trinity University, Holt Center, 106 Oakmont, San Antonio, TX 78212.

The Earth: Planet in Transition, University of Michigan Department of Geological Sciences Sesquicentennial Symposium, May 4-5, 1989, Ann Arbor, Michigan. Information: J.C.G. Walker, Dept. Geological Sciences, 1006 C. C. Little Building, University of Michigan, Ann Arbor, MI 48109-1063; (313) 764-2466; Telex 258 869 JCGW UR; GTE mail: JWALKER/KOSMOS/EDUNET.

American Geophysical Union Spring Meeting, May 8-12, 1989, Baltimore, Maryland. Information: AGU, Convention Director, 2000 Florida Ave., N.W., Washington, DC 20009; (202) 462-6903.

Pacific Sections of American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, Society of Exploration Geophysicists, and Society of Professional Well Log Analysts Annual Meeting, May 10-12, 1989, Palm Springs, California. Information: 1989 AAPG/SEPM/SED/SPWLA Pacific Sections, AAPG Convention Dept., P.O. Box 979, Tulsa, OK 74101-0979.

Geological Association of Canada-Mineralogical Association of Canada Joint Annual Meeting, May 14-17, 1989, Montreal, Quebec, Canada. Information: Colin Stearn, Rm. 238, 3450 University St., Montreal, Quebec H3A 2A7, Canada; (514) 398-4082.

40th Annual Highway Geology Symposium, May 17-19, 1989, Birmingham, Alabama. Information: Kathy Keller, Alabama Highway Department, Bureau of Materials and Tests, 1409 Coliseum Blvd., Montgomery, AL 36130; (205) 261-5788.

Engineering Geology in Tropical Terrains, June 26-29, 1989, Selangor Darul Ehsan, Malaysia. Information: Organising Secretary, Conference on Engineering Geology in Tropical Terrains, Dept. of Geology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor Darul Ehsan, Malaysia.

28th International Geological Congress, July 9-19, 1989, Washington, D.C. Information: 28th International Geological Con-

gress, P.O. Box 1001, Herndon, VA 22070-1001; (703) 648-6053; Telex 248418.

6th International Symposium on Water-Rock Interaction, August 3-8, 1989, Malvern, England. Information: W. M. Edmunds, Hydrogeology Research Group, British Geological Survey, Wallingford, Oxon OX10 8BB, England; phone (0) 491-38800, ext. 2293; Telex 849365 HYDROL G; Fax (0) 491-32256.

12th Caribbean Geological Conference, August 7-11, 1989, Christiansted, St. Croix, Virgin Islands. Information: Frederick Nagle, 12th Caribbean Geological Conference, c/o Dept. of Geological Sciences, P.O. Box 249176, University of Miami, Coral Gables, FL 33124.

Dunes '89: Geomorphology and Ecology of Desert and Coastal Sand Dunes, August 14-17, 1989, Swakopmund, Namibia. Information: Dunes '89, c/o J. D. Ward, P.O. Box 2168, Windhoek 9000, Namibia.

14th International Cartographic Conference, August 17-24, 1989, Budapest, Hungary. Information: Conference Secretary, Institute of Geodesy, Cartography and Remote Sensing, POB 546, H-1373 Budapest, Hungary.

Second International Research Symposium on Clastic Tidal Deposits, August 22-25, 1989, Calgary, Alberta. Information: Ray Rahmani, Canadian Hunter Exploration Ltd., 435-4th Ave., S.W., Calgary, Alberta T2P 3A8, Canada; (403) 260-1818.

9th International Clay Conference, August 28-September 2, 1989, Strasbourg, France. Information: Hélène Paquet, Inst. de Géologie, 1, rue Blessig, 67084 Strasbourg, France.

3rd International Conference on Palaeoceanography, September 10-16, 1989, Cambridge, England. Information: I. N. McCave or N. J. Shackleton, Dept. of Earth Sciences, University of Cambridge, Downing St., Cambridge CB2 3EQ, England; phone 223-333422/334876.

***SIAM Conference on Mathematics of Geophysical Sciences**, September 18-21, 1989, Houston, Texas. Information: SIAM Conference Coordinator, 1400 Architects Bldg., 117 S. 17th St., Philadelphia, PA 19103-5052; (215) 564-2929.

14th International Conference of Organic Geochemistry, September 18-22, 1989, Paris, France. Information: Yolande Rondot, Institut Français du Pétrole, BP 311, 92506 Rueil-Malmaison cedex, France; phone 33(1) 47.49.02.14; Telex A 203050 F.

20th Annual Geomorphology Symposium: Geomorphic Evolution of the Appalachians, September 29-October 1, 1989, Dickinson College, Carlisle, Pennsylvania. Information: W. D. Sevon, Pennsylvania Geological Survey, P.O. Box 2357, Harrisburg, PA 17120; (717) 787-6029.

XIII International Geochemical Exploration Symposium and II Brazilian Geochemical Congress, October 1-6, 1989, Rio de Janeiro, Brazil. Information: RIO '89 (XIII IGES-II CBGq), A/C CPRM-LAMIN, Av. Pasteur, 404 - Urca, CEP 22292 - Rio de Janeiro, RJ, Brazil; phone (55-21) 295-5297; Telex (55-21) 22685.

Seventh Thematic Conference on Remote Sensing for Exploration Geology, October 2-6, 1989, Calgary, Alberta, Canada. Information: Robert H. Rogers, ERIM, P.O. Box 8618, Ann Arbor, MI 48107-8618; (313) 994-1200, ext. 3382.

Structural and Tectonic Modelling and Its Application to Petroleum Geology, October 18-20, 1989, Stavanger, Norway.

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Meetings (continued from p. 318)

Information: Norwegian Petroleum Society, P.O. Box 1897 - Vika, 0124 Oslo 1, Norway; phone 47-2-207025; Telex 77 322 nopet n.

Supercomputing World conference and exposition, October 18-20, 1989, San Francisco, California. Information: Carol Y. Hurley,

Meeting Brokers International, Inc., 5 Science Park, New Haven, CT 06511; (203) 786-5132.

***World Gold '89**, November 5-8, 1989, Reno, Nevada. Information: Meetings Dept., World Gold '89, Society of Mining Engineers, P.O. Box 625002, Littleton, CO 80162; (303) 973-9550; Telex 881988.

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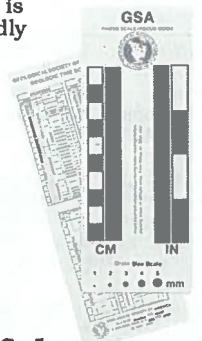
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