



## GSA NEWS & INFORMATION

Monthly Newsletter of  
The Geological Society of America

ISSN 0164-5854

VOLUME 10, NUMBER 9, September 1988

### Robinson Named GSA Congressional Science Fellow for 1988-1989

Elizabeth M. Robinson, Stanford University, has been selected as the third GSA Congressional Science Fellow. She will work as a special legislative assistant on the staff of a committee or member of the U.S. Congress from September 1988 through August 1989.

Robinson earned a B.S. degree in physics at Reed College and a Ph.D. in geophysics awarded jointly by the Massachusetts Institute of Technology and the Woods Hole Oceanographic Institution. She has been a National Science Foundation Fellow and has studied at Oxford University and Scripps Institution of Oceanography. Before accepting the GSA Fellowship, she was a postdoctoral fellow at Stanford University, investigating fluid flow in Earth's interior and in hydrogeologic settings. Her research interests include flow in hazardous waste, effects of melting in the uppermost mantle, and the concepts of chaos and nonlinear systems as applied to the mantle.

Her interest in science and public policy led her to participate in the Science, Technology and Policy Program at MIT and a faculty seminar, Values, Technology, Science and Society, at Stanford. "Scientists interested in public policy can make an immediate and beneficial impact on the communication between the scientific community and legislators, and I see myself fulfilling that role as a Congressional Science Fellow," Robinson said in her application for the fellowship.

She hopes to get placement in a congressional office where she can pursue her interests in water and atmosphere policy, waste disposal, and development and regulation of computer and information technology.

#### The Fellowship

The GSA Congressional Science Fellowship is intended as a way to obtain first-hand experience in the public policy process and to educate the earth science community about the need for informed involvement; to demonstrate the value of such science-government interaction; and to make practical contributions to the more effective use of scientific and technical knowledge in government. Requirements for the fellowship include 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.

The fellowship is funded by GSA and by a grant from the U.S. Geological Survey. Guided by the American Association for the Advancement of Science, the program places highly qualified,



Elizabeth Robinson ponders a question during her interview in April with the GSA Congressional Science Fellowship selection committee.

accomplished scientists with the offices of individual members of Congress and committees for a one-year assignment. Fellows perform in much the same way as regular staff members; they have the opportunity to be involved in varied legislative, oversight, and investigative activities. They offer their special knowledge, skills, and competence for the opportunity to acquire experience and the chance to contribute to the formulation of national policy. The GSA Congressional Science Fellow reports periodically to the GSA membership and to the USGS during the one-year period.

#### Selection Committee

On the selection committee for the fellowship this year were Chairman C. Edward Buchwald, Carleton College; William F. Cannon, U.S. Geological Survey; Marcus E. Milling, University of Texas at Austin; Samuel S. Adams, Colorado School of Mines; and ex officio members Jennifer Hess, 1987 GSA Congressional Science Fellow; and F. Michael Wahl, GSA Executive Director.

## Clean Air Legislation

by Jim Evans  
GSA Congressional Science Fellow



### Legislative Overview

Reauthorization and amendment of the Clean Air Act of 1970 remains one of the most important issues facing the 100th Congress. The Clean Air Act was last amended in 1977. The authorization for continued funding expired in 1981, although Congress has continued to provide funds, at a level between \$216 million and \$247 million, since 1981. Congress agreed to extend the December 31, 1987, deadline for cities to be in attainment for carbon monoxide and ozone until August 31, 1988, effectively delaying the controversy over whether economic sanctions should be implemented against nonattainment cities.

The status of clean air legislation is unclear. In the House of Representatives, two bills are being considered. H.R. 2666 is an acid rain bill, and H.R. 3054 is a carbon monoxide and ozone nonattainment bill. Both bills are in the jurisdiction of the Subcommittee on Health and the Environment (Rep. Waxman, D—Calif.), in the Energy and Commerce Committee. Neither bill has advanced, due to strong opposition within the subcommittee and from the chairman of the full committee, Rep. Dingell (D—Mich.). Recently, nine committee Democrats have proposed an alternative legislative package, in hopes of securing Rep. Waxman's and Rep. Dingell's support.

In the Senate, several bills have been packaged into an omnibus measure, S. 1894, which contains provisions for carbon monoxide and ozone nonattainment, acid rain, mobile sources, national ambient air quality standards, and hazardous air pollutants. The Environment and Public Works Committee approved S. 1894 (Senate Report 100-231) on October 22, 1987. Senate action on S. 1894 is unclear, due to the opposition of Senate Majority Leader Byrd (D—W. Va.) and several other key senators. Proponents of S. 1894 argue that urban pollution, toxic substances, and acid rain threaten human health and result in severe environmental damage. Opponents argue that many of the major provisions are costly and unnecessary.

Some of the background of S. 1894 is given here. Because of the complexity and detail of this legislation, it is only possible to outline some of the key provisions.

### Nonattainment Areas (Title I)

The 1977 amendments to the Clean Air Act required each state to prepare an implementation plan about how to attain the

national ambient air quality standards for certain pollutants. These "criteria" pollutants are carbon monoxide (emitted by motor vehicles), ozone (formed from the chemical interaction of volatile hydrocarbons and nitrogen oxides, from industrial sources and motor vehicles), lead (from motor vehicle exhaust and lead smelters), sulfur dioxide (emitted by electric utilities, smelters, petroleum refineries, and industrial boilers), nitrogen oxides (emitted by electric utilities and motor vehicles), and particulates (emitted by industry and motor vehicles). The Environmental Protection Agency (EPA) is required to establish "primary standards" (to protect human health) and "secondary standards" (to protect the environment, crops, buildings, and visibility) without regard to the economic cost of compliance.

Currently, more than 100 major urban areas are in non-compliance for the ozone and carbon monoxide standards. Under the Clean Air Act, these areas could face economic sanctions, such as loss of federal highway funds and sewage-treatment construction funds. The new bill would allow nonattainment areas to escape sanctions if the states submit new implementation plans. The plans must contain certain tougher pollution-control measures and provide for meeting the standards by new deadlines (3, 5, 10, or 15 years, depending on the severity of the current problem).

Three-year extensions would be granted in instances where an area only slightly exceeds the present standards. Areas that exceed present standards by up to 50% would be applicable for a five-year extension. These areas would be required to institute the following programs:

- implement stricter motor vehicle inspection and maintenance programs;
- install gasoline vapor recovery systems at service stations, to prevent hydrocarbon emissions during fueling;
- implement the use of alternative fuels (gasohol, electric vehicles, etc.) for centrally fueled fleets of more than 50 vehicles;

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Vol. 10, no. 9 GSA News & Information September 1988

GSA NEWS & INFORMATION (ISSN 0164-5854) is the monthly newsletter of The Geological Society of America, Inc., P.O. Box 9140, Boulder, Colorado 80301. Second-class postage rates paid at Boulder, Colorado and additional mailing office. GSA, a scholarly society, neither adopts nor supports positions of advocacy. We provide this and other forums for the presentation of diverse opinions and positions by scientists worldwide, regardless of their race, citizenship, gender, religion, or political viewpoint. Opinions presented in these publications do not reflect official positions of the Society. Postmaster: Send address changes to GSA News, Membership Coordinator, P.O. Box 9140, Boulder, CO 80301.

Subscriptions for 1988 calendar year: **Society Members:** GSA News & Information is provided as part of membership dues. Contact the Membership Department at (303) 447-2020 for membership requirements. **Nonmembers:**

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Prepared from contributions from the staff and membership. Executive Director: F. Michael Wahl; Managing Editor: Faith Rogers; Associate Editor: Lee Gladish; Production and Advertising Manager: James R. Clark; Marketing/Advertising Assistant: Ann H. Crawford; Assistant Production Manager: Meredith L. Larson; Production Assistants: Mona T. Gonzales, Joan E. Manly, and Barbara F. Smith.

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## DNAG NEWS

by Allison R. (Pete) Palmer

### DNAG Progress

Three more DNAG items are under control. One of these, *The Seismicity Map of North America*, compiled by Bob Engdahl of the USGS and prepared by Bill Rinehart of NOAA, went to the printer in mid-June and should be published by the time you read this. This is the third map to be published in the seven-map series that will synthesize different classes of geologic or geophysical information for North America and the surrounding oceanic regions at a scale of 1:5,000,000.

In May we received the printed Spanish-language edition of *Geología Económica de México*, prepared under the editorship of G. P. Salas for the DNAG Project. This book, which contains 58 chapters describing mineral deposits and metallogenic provinces throughout Mexico, is now being translated, and the English-language version will be Volume P-3 of *The Geology of North America*.

In mid-June, the editors of *Hydrogeology* (GNA Volume O-2) were in Boulder to go over the galleys for their volume. The plates are already in final form, and this book may just barely be published in time for the GSA Centennial Celebration at the end of October.

Many authors who have not yet completed their commitments have promised their chapters for review, or their revisions in final form, before the end of the summer. Our goal is to have the remaining books in the DNAG set as well as several more of the transects and major maps at least into production by the Centennial Celebration in October. Inasmuch as all books were promised for completion well before this major geological milestone, those authors who have not completed their long-promised contributions by the time they read this, and thus whose books may not even be in *production* by the time of the Centennial Celebration in Denver, may once again be identified so their colleagues can offer them some needed encouragement.

### GSA Centennial T-Shirt

The response to the call for geologically related phrases utilizing the letters G, S, and A that might be among the 100 emblazoned on a GSA Centennial T-Shirt has been substantial. More than 300 suggestions were received, and the final 100 are now being selected. Thanks to all of those creative colleagues who contributed to this challenging exercise.

### Clean Air (continued from p. 242)

- apply reasonably available control technology to all existing sources of hydrocarbons and nitrogen oxides;
- apply the lowest achievable emission rates standards (stricter than reasonably available control technology standards) for all new pollution sources and for all modifications of existing sources.

Areas that exceed existing standards by 50% to 125% would be given 10-year extensions, and areas exceeding by more than 125% would be eligible for 15-year extensions. In addition to all of the requirements above, these areas must

- "offset" any new increases in emissions by reductions of existing pollution sources;
- attain required reductions of pollution (33% by the end of 1991, 50% by 1994, 65% by 1997, and 15% each year subsequently);
- each major stationary source must individually match these area reductions on schedule;
- impose emission fees (at least \$100/ton) for hydrocarbons, nitrogen oxides, and carbon monoxide and emission penalties (at least \$5000/ton) for failures to comply. These funds would be dedicated to air pollution control programs and mass transit programs.

The bill establishes Ozone Transport Regions to the midwest and northeast to combat regional pollution problems. Other significant provisions of the bill include stricter definitions of reasonably available control technology, lowest achievable emission rates, and what constitutes a "major source." Eleven new control technique guidelines are established (for wood furniture coating, auto-body refinishing, metal rolling, synthetic organic chemical distillation, chemical batch processing, bakeries, web offset lithog-

raphy, plastic parts coating, coke oven by-product plants, sewage treatment plants, and hazardous-waste treatment facilities). Finally, the bill prohibits the "bubble rule," which permitted all emissions from one large facility to be treated as a single source; this allows more flexibility for the plant in meeting the standards.

### Acid Deposition Control (Title II)

The bill would combat acid rain by requiring reductions in sulfur dioxide and nitrogen oxides from utilities, industries, and motor vehicles. The new goals are to attain sulfur dioxide reductions of 5 million tons by 1993, 10 million tons by 1998, and 12 million tons by 2000 (a 50% reduction of present emissions). Nitrogen dioxide levels are to be reduced by 4 million tons by 1996.

States must meet the stricter of two requirements: either to reduce sulfur dioxide emissions by a proportion of the national goals (based on 1980 emissions), or to meet a 1998 statewide average emission rate of 0.9 lb SO<sub>2</sub>/MMBTU for all fossil-fuel-fired boilers in operation in 1980. The latter standard is strict enough to require flue-gas desulfurization scrubbers on most plants.

Other key provisions mandate that pre-1981 utility plants cannot exceed sulfur dioxide or nitrogen oxide emission rates unless offset by emission reductions elsewhere. Beginning in 2003, each fossil-fuel plant must comply with new source performance levels when it reaches 40 years of age—this is designed to force construction of newer plants utilizing modern control technologies.

The bill contains a 5-year, \$5 billion clean coal technology demonstration program to implement the recommendations of the 1986 acid rain report of the Special Envoys from the United States

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### **Clean Air** (continued from p. 243)

and Canada. The program is designed to demonstrate technologies more cost effective than current pollution-control equipment (e.g., scrubbers) that could be used without significantly reducing the market for midwestern, high-sulfur coal.

### **Mobile Sources (Title III)**

The bill requires the EPA to issue regulations tightening motor vehicle emission standards. Among the key provisions are a requirement for onboard vapor recovery systems (to capture hydrocarbon emissions during refueling), and a total ban on manufacture of engines using leaded gasoline by 1991. Starting in 1990, auto manufacturers must demonstrate through presale certification that their cars can meet emission standards for 10 years or 100,000 miles, with correspondingly extended warranties.

Other important sections of the bill require reduction of the sulfur content of diesel fuel and of the volatility of gasoline and use of alcohol-based fuels in carbon monoxide nonattainment regions during the winter. New emission standards are required for solvents, paints, pesticides, and metal-coating processes.

Municipal incinerators would be subject to new or modified emission standards for particulates, sulfur dioxide, nitrogen oxides, carbon monoxide, heavy metals, lead, cadmium, halogenated organic compounds, dioxins, and dibenzofurans. In establishing these standards, the EPA must also take into account methods to reduce 19 other types of pollutants in emissions or ash. New facilities could not be built unless the applicant could demonstrate through enforceable contracts that there would be sufficient capacity to treat or dispose of the ash. The bill specifies the number of liners, leachate collection systems, and groundwater monitoring systems the different types of ash must receive for landfill disposal.

### **National Ambient Air Quality Standards (Title IV)**

The bill contains provisions designed to expedite the EPA's efforts to set new air quality standards and revise existing ones. The process is divided into two parts: development of a criteria document (which assembles all available research on health and environmental effects), and a standard-setting review (which assesses whether regulations are adequate for the available knowledge of health and environmental effects). Among significant changes is a new standard for measuring particulate concentrations.

### **Hazardous Air Pollutants (Title V)**

This part of the bill addresses congressional dissatisfaction with the fact that the EPA has issued standards for only seven hazardous air pollutants since 1970. To speed regulation of toxic air pollutants, the bill requires the EPA to set up emission standards requiring the best available control technology by major sources (e.g., refineries or chemical plants) of 224 pollutants. Smaller sources (e.g., service stations, wood stoves, motor vehicles) are required to reduce emissions of hazardous pollutants by 55% over 10 years.

In instances where technology-based standards are not sufficient to protect health or the environment, the EPA can set health-based standards. By the terms of the bill, these standards must be established without regard to cost or technological feasibility. This list must include the seven or eight hazardous pollutants currently listed by the EPA, but it may include others, at the EPA's discretion. The bill also discusses the procedure of ensuring that adequate research takes place to determine whether any pollutant should be under health-based (stricter) guidelines. It establishes a safety board to monitor chemical spills and accidents and attempt to prevent future accidental releases.

## **36 Students Receive AGI Minority Participation Program Scholarships**

The American Geological Institute has awarded 36 scholarships for the 1988–1989 academic year. Awards given to Black, Hispanic, and Native American geoscience students ranged from \$500 to \$2000 each and totaled \$36,750. Contributions supporting these scholarships came from societies (including the Geological Society of America) and industries in geoscience, and from individuals. Recipients are enrolled in geoscience departments at colleges and universities in 18 states.

Undergraduate awardees are Ruben Covarrubias, San Diego State University; Angela T. Daniels, North Carolina State University; Stanton K. Enomoto, Macalester College; Cindy Gillespie, Texas Christian University; Raymond J. Gomez, Jr., University of Kansas; Jon P. Guerra, Colorado State University; Andrew C. Humphrey, Jr., University of Michigan; Carla M. James, University of Nevada—Reno; Robert Lopez, California State University—Hayward; Tracy A. Love, Miami University; Yolanda H. Moore, Centenary College; Lara Mosby, Cornell University; Ian M. Palao, Florida State University; James M. Shepherd, Florida Institute of Technology; Stephanie A. Williams, Dartmouth College; Sylvester R. Young, Hampton University.

Graduate student awardees are Claudia Alexander, University of Michigan; Jannette Aquilar, University of California—Santa Cruz; George T. Basabilvazo, New Mexico State University; Jerry B. Coleman, University of Maryland; Paul A. Coplen, Tarleton State University; Earle C. Dixon, University of Nevada—

Las Vegas; Giovanni Guglielmo, Jr., University of California—Santa Cruz; Frank R. Hall, University of Rhode Island; Art D. Lombard, University of Michigan; Luis E. Marin, Northern Illinois University; Katherine A. Milla, Florida State University; Isabel P. Montanez, Virginia Polytechnic Institute; David Padgett, University of California—Davis; Aurora Pun, University of New Mexico; Kenneth Ridgway, University of Rochester; Tonia E. Rucker, University of California—Berkeley; Lauret E. Savoy, Syracuse University; Renata G. Sheffey, Virginia State University; Russell E. Stands, Colorado School of Mines.

These scholarships are sponsored by the AGI Minority Participation Program (AGI-MPP) which was formed to increase the participation of under-represented minorities in the geosciences. Since its first award in 1974, the AGI-MPP Scholarships have provided more than \$0.5 million in support for more than 400 individuals. The awards are based upon academic achievement, financial need, and judged potential for future success in the geoscience profession, which includes geoscience education. Scholarship applications for the 1989–1990 academic year must be submitted by February 1, 1989.

For more information on the AGI-MPP Scholarships and related programs, contact the AGI Minority Participation Program, American Geological Institute, 4220 King Street, Alexandria, VA 22302, (703) 379-2480.

# 1988 CENTENNIAL CELEBRATION

DENVER, COLORADO ■ OCTOBER 31 to NOVEMBER 3, 1988  
DENVER CONVENTION COMPLEX

PREREGISTRATION DUE OCTOBER 7

for meeting information (303) 447-2020 or 1-800-GSA-1988

HOUSING FORMS DUE OCTOBER 7

The following program information and special activities are highlighted this month. Full information and registration forms appear in the August issue of *GSA News & Information*.

## AIR TRANSPORTATION

GSA has again designated The Cain Travel Group of Boulder, Colorado, as the official airline reservation agent for the GSA Centennial Celebration. Meeting participants are encouraged to call Cain's toll-free number to take advantage of discounted fares on selected airlines.

United and Delta airlines have been named the official carriers.

Reduced rates are 5% off any available discount fare that generally has restrictions. If you do not meet the requirements for the discount fare, you will be offered 40% off the unrestricted coach fare.

To make a reservation:

- Call 1-800-346-4747 (toll-free outside Colorado) or (303) 443-2246 (inside Colorado or collect from Canada). Hours: Monday through Friday, 8 a.m. to 5:30 p.m., Mountain Time.
- Call early for best availability and identify yourself as a GSA traveler.
- Be sure that you understand the restrictions on the type of ticket you request.
- Tickets can be paid for by check (payable to Cain Travel), major credit card, or invoice to company. The final payment must reach Cain Travel no later than seven days prior to departure to allow for mailing time.
- All tickets will be mailed via certified mail upon receipt of payment unless requested otherwise.
- After tickets are issued, you are protected from fare *increases*; if a fare *decreases*, call Cain Travel for an adjustment.
- Cain Travel will have an on-site Customer Service Desk at the Convention Center.

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## VAIL/ BEAVER CREEK/ LEADVILLE/AVON

Rest and relax following the Celebration. Take a weekend to enjoy Colorado in the Vail/Beaver Creek area and to experience the beauty of Colorado's western slope. Nearby Vail has activities year-round—including golf, tennis, biking, and hiking. There is always a weekend festival, plus the pleasures of pre-ski season shopping.

The GSA special package rate of \$68 per person includes

- two nights double occupancy room accommodations at a newly decorated Comfort Inn in Avon, a town located between Vail and Beaver Creek
- Continental breakfast each morning
- cross-country jeep tour on Saturday to and from historic Leadville, with spectacular views of Colorado's highest peak, Mount Elbert, and its companion peak, Mount Massive. The tour includes a delicious lunch at The Golden Rose, just down the street from Baby Doe's hotel, plus a visit to Leadville's Mining Museum.
- jacuzzi and pool
- transportation between Avon and Vail—daily and evenings both on a regular schedule and on request.

The two nights reserved are Friday and Saturday. Thursday night also may be

reserved for an additional \$30 double occupancy.

Transportation by van to and from Denver will be arranged at no more than \$35 additional per person round trip. This is \$20 below the regular rate and will be a substantial savings if you do not have a car.

RESERVATIONS ARE DUE BY OCTOBER 10. A DEPOSIT WILL BE REQUIRED. CALL DIRECTLY TO THE COMFORT INN, 1-800-423-4374, or (303) 949-5511.

## COLORADO TOURIST INFORMATION

Abundant information and friendly service are available through the following sources:

Colorado Tourism Board  
1625 Broadway, Suite 1700  
Denver, CO 80202  
1-800-433-2656

Denver Metro Convention &  
Visitors Bureau  
225 West Colfax Avenue  
Denver, CO 80202  
(303) 892-1505

## 1988 Centennial Celebration Symposia Highlights

The following is the final in a series highlighting 1988 symposia. Descriptions of other symposia have appeared in the June and July issues of *GSA News & Information*. The full listing appeared in the April and August issues.

### 21. Seismicity, Quaternary Faulting and Earthquake Hazards in the Rocky Mountain Region

*Conveners:* Ivan G. Wong, William P. Rogers

*Speakers:* Ivan G. Wong, William P. Rogers, Mary Lou Zoback, Robert Smith, David Butler, John Nicholl, Chris Wood, Dean Ostenna, F. (Bert) Swan, Michael Stickney, Peter Dickson, Charles Langer

It has been a long-standing belief that the level of seismic hazard in the Rocky Mountain region of the United States (including large parts of Montana, Idaho, Wyoming, and Colorado) is low or even nonexistent. In large part, this has been due to the apparent absence of large and damaging earthquakes during historical times. However, the historical earthquake record is extremely short in duration (only 140 years) and thus represents an inadequate sample of geologic time upon which to assess the frequency of large earthquakes. This is especially critical in that the recurrence intervals of large earthquakes in the Rocky Mountain region appear to be long (maybe several to tens of thousands of years in a given location) when compared to the more seismically active regions in the rest of the western United States. However the relatively recent occurrence of several large earthquakes such as the 1959 M 7 Hebgen Lake, Montana and the 1984 M 5.5 Laramie Mountains, Wyoming earthquakes; the reevaluation of past events such as the 1882 M 6.2 Colorado earthquake; and discoveries in the Quaternary geologic record of past surface faulting events, all attest to a level of seismic hazard that requires addressing. Recognition of such hazard and the need for thorough assessments for critical facilities such as dams has in the past 10 years led to vastly improved seismographic coverage of the region and in-depth Quaternary faulting studies. This symposium will bring together for the first time scientists who have focused their research on the Rocky Mountain region. The opportunity to disseminate new results and share ideas will aid in our effort to inform the public that a moderate level of earthquake risk does exist in this part of the United States and that proper mitigation of earthquake hazards can be achieved through public awareness and appropriate engineering design.

### 22. Thermal Evolution of the Sevier Hinterland

*Conveners:* K. V. Hodges, J. F. Sutter

*Speakers:* Listing unavailable at this time

The Mesozoic Sevier foreland fold and thrust belt of the North American Cordillera is one of the most extensively studied and best known thrust belts in the world. In general, the deep structural levels of "Andean-type" orogens like the Sevier belt are poorly understood. We are fortunate in the North American Cordillera that Cenozoic extension west of the Sevier foreland has led to the exhumation of terrains that were at deep structural levels (as much as 30 km or more) within the orogen. These terrains, the infamous "cordilleran core complexes," have received tremendous attention from the tectonics community in recent years, but the age and physical conditions of Mesozoic compressional and Cenozoic extensional deformation in these tracts are only now coming into focus. The recent GSA Penrose conference on metamorphic core complexes revealed the need for an organized forum for the

## WHERE ARE ALL THE OBOES?

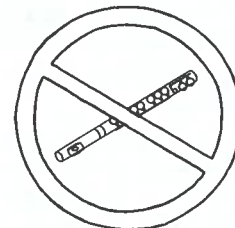


Don't miss the chance to play in

### THE 1988 GSA CENTENNIAL ORCHESTRA

The 1988 Centennial Orchestra is still seeking musically active geologists and their spouses interested in participating in this musical event to take place at the 1988 GSA Centennial Celebration. An overwhelming response has produced a balanced orchestra of more than 80 Friends of the Earth, but there is still room for additional musicians, especially upper strings and oboes. Please indicate your interest by providing (1) your name, address, and telephone number and (2) the instrument you play and current level of ability. When the 100th musician joins the orchestra, there will be a drawing for free meeting registration for one musical geologist.

**Please send to**  
Holly Stein, organizer  
U.S. Geological Survey  
M.S. 905, Federal Center  
Denver, CO 80225  
(303) 236-5592  
(303) 985-2797



presentation of available quantitative constraints on the pressure-temperature-time (P-T-t) evolution of the Sevier hinterland and discussion of the tectonic implications of these data.

### 23. Historical Perspectives and Future Directions in Mineral Deposit and Major Metals Utilization

Sponsored by the Society of Economic Geologists

*Conveners:* R. W. Hutchinson, R. I. Grauch

*Speakers:* A. J. Naldrett, T. Parak, G. B. Morey, R. L. Stanton, M. J. Russell, E. C. Jowett, J. E. Tilton, R. W. Boyle, D. A. Pretorius, S. S. Adams, J. Hunt, S. R. Wallace, B. Berger, P. D. Fells

The focus of this full-day symposium is to provide a historical perspective on the evolution of geologic understanding and concepts concerning the origin of ore deposits. Speakers on twelve major types of deposits will review the changes and progress of genetic concepts for each of these types over recent decades, and also offer a forecast of the directions in which major advances may occur over the next two decades. Two additional speakers will similarly review the changing economics of supply-demand-price for the base metals and for gold over recent decades and offer forecasts for future utilization of these metals.

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#### 24. EEZ-SCAN: Results of the U.S. Geological Survey's GLORIA Program

Conveners: Mark L. Holmes, Gary W. Hill, Herman A. Karl, David Twichell

Speakers: M. Holmes, R. Holcomb, D. O'Leary, J. Schlee, J. Robb, P. Popenoe, W. Dillon, D. Twichell, E. Schmuck, K. Scanlon, P. Valentine, N. Edgar, B. McGregor, R. Mattick, M. Field, J. Gardner, H. Karl, M. Hampton, D. Cacchione, D. Drake, J. Moore, D. Clague, R. Mark, W. Normark, M. Marlow, A. Cooper, S. Dadisman, P. Carlson, A. Stevenson, B. Edwards, T. Vallier, D. Scholl, R. Bohannon, T. Bruns, M. Fisher, H. Lee, R. Kayen, P. Lipman, Q. Hugget, L. Parson, C. Jacobs, D. Masson, N. Kenyon, G. Rothwell, J. Wilson, R. Searle

The purpose of the symposium is to present the latest scientific results from the U.S. Geological Survey's mapping and research program in the Exclusive Economic Zone. The program has utilized the GLORIA (Geological Long-Range Inclined Asdic) side scan sonar systems, developed at the Institute of Oceanographic Sciences, to obtain digital backscatter imagery from the offshore areas of the eastern United States, Gulf of Mexico, Puerto Rico, western United States, Alaska, and Hawaii. The images cover the areas from the 300 m isobath out to the 200 km EEZ limit. During the GLORIA expeditions, gravity, magnetics, 10 kHz and 3.5 kHz bathymetry, and two-channel (digital) seismic reflection data are obtained synoptically with the acoustic imagery. The combination of areal imagery maps and conventional trackline geophysical data has provided new, and in some cases revolutionary, insights into the basic processes that are modifying the continental margins, generating new ocean crust, and forming (and destroying) the Hawaiian Islands. The poster papers in the symposium cover a wide range of subjects from intra-plate tectonics to neo-volcanism on the Hawaiian arch to deep-sea fan and submarine canyon formation.

#### 25. The Dynamics of Climate Change

Conveners: David K. Rea, Margaret Leinen

Speakers: Stephen H. Schneider, Nicklas G. Piasis, Michael A. Arthur, John E. Kutzbach, Thomas J. Crowley

The atmosphere, ocean, cryosphere, land surface, and biosphere all respond to climate change and leave their imprint on the geologic record. Understanding the full complexity of the links and feedbacks among these climatic subsystems requires the cooperation of earth scientists who study the response of the earth to modern climate, often using mathematical models, and those who observe and interpret the history of those processes in the geologic record. Models, while the only tool for prediction of climate change, are merely sophisticated hypotheses and as such can be tested with data. It is this interaction between those who model past climates and climate change and geologists who provide the tests for those models that is at the forefront of today's science. There has been a growing recognition of the importance of global climate change to the future well-being of humanity. In particular, the climatic response to human alterations of the earth's surface and atmosphere has led to concern over the agricultural, hydrological, ecological, and societal impacts of such potential global changes. The symposium will focus on the effort of earth scientists to understand past climates and climate changes in order to make better predictions of future conditions.

#### 27. Late Proterozoic Evolution of Western North America: A Re-evaluation

Conveners: Gerald M. Ross, Nicholas Christie-Blick

Speakers: Gerard C. Bond, Julia Miller, Nicholas Christie-Blick, Don Elston, J. D. Aitkin, Gerald M. Ross

Sedimentary rocks of Late Proterozoic age (ca. 750-570 Ma) are widespread in the North American Cordillera between Alaska and Sonora, Mexico. Fifteen years have passed since Stewart (1972) first suggested that these rocks record the rifting and break-up of the North American continent during formation of the proto-Pacific Ocean. Quantitative analysis of tectonic subsidence in the Paleozoic miogeocline of both the Canadian Cordillera and the Great Basin now indicate that thermally driven subsidence of the passive margin did not begin until between 600 and 545 Ma. The rifting event that immediately preceded continental break-up must postdate Late Proterozoic volcanic activity (ca. 750 Ma) which occurred 100-200 m.y. before break-up, too early to be directly related to subsidence of the lower Paleozoic miogeocline. In light of these developments and the accumulation of substantial new data in the wake of Stewart's hypothesis, a reevaluation of the tectonic setting of western North America during the Late Proterozoic seems warranted.

#### 28. Mineral Resources of Solution-Collapse Breccias and Filled Sinkholes

Conveners: Karen J. Wenrich, Harry A. Tourtelot

Speakers: Listing unavailable at this time

Mineral resources of solution-collapse breccias and filled sinkholes are important sources of metals and industrial minerals throughout the world. More and more ore deposits that were once believed to have formed by other means are currently recognized as karst-formed breccias. Deposition of ore minerals requires open space, and one means of acquiring open space is through solution-collapse breccias, most of which occur in carbonate terranes. In many of the midcontinent base-metal deposits and occurrences the breccias are diffuse in form, but pipelike masses are also present. Pipe like bodies are conspicuous in northwestern Arizona and in the Missouri diaspore district. The pipe like orebodies are of exceptional interest because the mechanism of their formation, that is the fluid movement through the pipes, the source of the mineralizing fluids, and the regional hydrology are not well understood. Circular bodies on the order of several hundred feet in diameter can penetrate from several hundred to several thousand feet of strata. Such occurrences are known in the Redwall Limestone of northwestern Arizona, the Ordovician of Missouri, the Leadville Formation in Colorado, the Madison Limestone in Montana, the Guadalupe Mountains in New Mexico, and, of course, the Tsumeb breccia pipe in Namibia; papers on these areas and other less well known areas are encouraged. Invited papers will cover hydrology and carbonate dissolution as well as the mechanism of brecciation that forms such circular bodies with such a relatively limited size range. This symposium will focus on pipelike bodies filled with breccia and mineral resources.

#### 29. Fractals in Geology

Conveners: Christopher C. Barton, Geoffrey C.P. King

Speakers: Benoit B. Mandelbrot, Christopher H. Scholz, Donald L. Turcotte, William L. Power, Stephen L. Brown, Geoffrey C. P. King, Arthur H. Thompson, Charles G. Sammis, Christopher C. Barton, Neville G. W. Cook

Fractal geometry is the mathematics of chaos. Over the past few years, fractal geometry has been applied to study features and

(continued on p. 248)

**Symposia Highlights** (continued from p. 247)

systems in nature that could not be dealt with by standard mathematics. Fractal geometry finds order in what previously was thought to be completely chaotic. The order is repetition of patterns over large ranges of size and scale. A small part of a fractal object or system looks identical to the whole object or system. Geologists are now using fractal geometry to analyze shapes, patterns, and systems in the earth, with startling success. This symposium brings together the foremost experts on applying fractal geometry to geologic phenomena. Topics of the symposium include earthquake prediction, rock fractures, the flow of water, petroleum, and toxic and nuclear waste in the earth, and the surface of Earth and other planets. The first speaker will be the mathematician Benoit B. Mandelbrot, the "father of fractal geometry."

**30. Paleomagnetism and North American Apparent Polar Wander Paths: Cenozoic to Precambrian**

*Conveners:* John W. Geissman, Robert F. Butler

*Speakers:* Rob Van der Voo, Edward Irving, John W. Hillhouse, Dennis V. Kent, Richard G. Gordon, Myrl E. Beck, Jr., David J. Dunlop, F. Butler, John W. Geissman

Over the past three decades, paleomagnetic methodology, instrumentation, and the resulting data base have significantly improved and dramatically expanded. As well, applications of paleomagnetic methods in geologic problems have greatly broadened in scope. Collaborative research among paleomagnetists and other geoscientists is becoming commonplace. Paleomagnetic research, rigorously begun in the 1950s, has impacted the geosciences considerably. Early, first-order contributions proving past motions

of the continents are well recognized by the public in general. Today, paleomagnetic studies are integral elements of a wide range of geologic endeavors; the prominence in GSA publications of contributions in paleomagnetic research readily attests to this. Critical to the interpretation of paleomagnetic investigations and evaluation of data in terms of geologic processes are temporally and statistically well-defined apparent polar wander paths for individual cratons. The purpose of this symposium is to provide an appropriate, rigorous review of (1) paleomagnetic methodology, particularly the analysis of remanent magnetization components in rocks and how such analysis relates to first principles of rock magnetism, and (2) the paleomagnetic data base for North America, particularly as it relates to the formation and evaluation of apparent polar wander paths from Precambrian to Cenozoic time.

*Harvard Hosts Science Teaching Bicentennial*

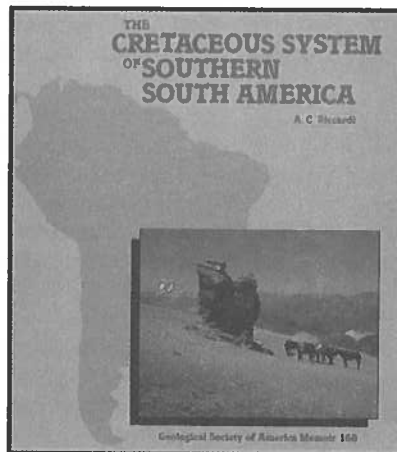
On September 9-11, 1988, the Department of Earth & Planetary Sciences of Harvard University will celebrate the bicentennial of the first teaching of earth science in North America by Benjamin Waterhouse at Harvard College in 1788. The department will hold a convocation including a series of invited lectures on currently interesting topics covering major aspects of all of the earth sciences, to be given by alumni, faculty, and others who have been closely associated with Harvard. In addition to alumni and others connected with Harvard, all are invited to attend this convocation. Contact R. Siever, Department of Earth & Planetary Sciences, 20 Oxford St., Cambridge, MA 02138.

**NEW!**

**THE CRETACEOUS SYSTEM OF SOUTHERN SOUTH AMERICA**

*by A. C. Riccardi, 1988*

This synthesis of the existing knowledge of the Cretaceous System of southern South America gives a general account of the stratigraphy, magmatism, tectonism, paleontology, and paleogeography of Argentina, Bolivia, southern Brazil, Chile, Paraguay, and Uruguay. In the first part is a description of the Cretaceous rocks on the basis of generalized sections of the most important areas or basins; in the second part is a summary of



**MWR168**, 168p., 1 pocket-plate, indexed, ISBN 0-8137-1168-1, \$32.00

THE GEOLOGICAL SOCIETY OF AMERICA  
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patterns of plutonism, volcanism, tectonism, paleontology, transgressive-regressive history, and paleogeographic evolution. Includes more than 1,100 bibliographic references, a general correlation chart for the entire area, and 16 tables listing the stratigraphic and geographic distribution of all described and figured fossils. Tithonian to Maastrichtian ammonites are figured in 18 plates.



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- Horseshoes
- Cow Chip Toss
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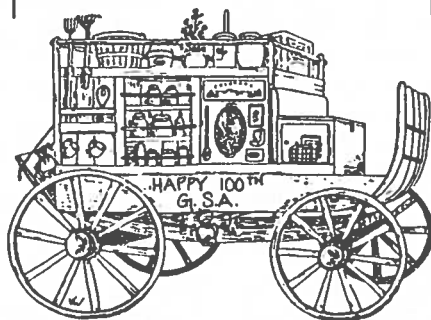
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Preliminary Announcement and Call for Papers  
**SOUTH-CENTRAL SECTION, GSA, 23rd Annual Meeting**  
Arlington, Texas  
March 12–14, 1989

The South-Central Section of the Geological Society of America will meet in the Arlington Rodeway Inn Conference Center, Arlington, Texas. The meeting is sponsored by the Department of Geology of the University of Texas at Arlington, and will be held jointly with the Texas Section of the National Association of Geology Teachers.

### CALL FOR PAPERS

Papers are invited for oral presentation at technical sessions and symposia, or in poster sessions. The format for technical sessions will be fifteen minutes for presentation and five minutes for discussion. Poster sessions will be available for viewing for one-half day or a full day. Papers of regional interest to geologists in the south-central United States, as well as those of general geological or educational interest, will be considered for the program.

### STUDENT PAPERS

To encourage student participation, *cash awards* for travel to the convention and for outstanding papers will be presented. Special student accommodation rates have also been arranged. Judging for travel awards will be based upon evaluation of abstracts for quality of research and writing. Outstanding paper awards will be judged upon both quality of research and effectiveness of presentation. To be eligible, only students may be listed as authors on the paper, and it must be designated on the abstract form as a student paper.

### REGISTRATION

Preregistration will be by mail. Forms will accompany the Final Announcement in the December issue of *GSA News & Information*. On-site registration will take place on Sunday, March 12, 1989, from 3 to 8 p.m. at the Conference Desk of the Arlington Rodeway Inn and will continue there daily from 7:45 a.m. to 5 p.m. for the duration of the meeting. For lower registration fees and to assist the local committee in planning **PREREGISTER BY FEBRUARY 9, 1989!**

### SYMPOSIA

The following symposia have been organized or are planned. Authors of papers to be considered for inclusion in a symposium should send abstracts directly to the convener. Contact the convener(s) as well for further information.

1. **Intraplate and Alkaline Magmatism.** John A. Wolff, Dept. Geology, University of Texas, Arlington, TX 76019.

Intraplate magmas, especially those erupted onto or emplaced within continental crust, are fascinating because of the number and complexity of potential contributing mantle and crustal source materials. Alkaline magmas of various types, with enriched trace-element and isotopic signatures at many places, are common in the intraplate environment, and their extreme nature may harbor clues to the nature of sources and processes involved in magmagenesis and subsequent evolution. The symposium will provide an opportunity for participants to review and exchange results of current research in this field. Contributions emphasizing the physical behavior of these magmas during generation, evolution, and eruption are especially welcome.

2. **The Caribbean–North American Plate Boundary: Terranes and Tectonics.** T. W. Donnelly, Dept. Geological Sciences, SUNY Binghamton, Binghamton, NY 13901;

B. Burkart, Dept. Geology, University of Texas, Arlington, TX 76019.

The symposium will focus on identification and origin of terranes of southern Mexico, northern Central America, Cuba, and Hispaniola and their relations to the northern Caribbean and southern North American plate boundary. Whereas exotic terranes form a major—perhaps central—focus for the geology of the western quarter of North America, such terranes are not at present widely recognized in southern Mexico and the northern Caribbean. Bits of Paleozoic and older terranes in Mexico and Guatemala may represent a history of movement analogous to the terranes of the North American Cordillera; however, the analysis of these terranes is in its infancy. Cuba and Hispaniola have juxtaposed Mesozoic terranes with widely contrasting geologic characteristics, representing, perhaps, the tectonic mingling of terranes from widely different locations, such as the Chortis block, oceanic crust of the early Caribbean, or the Florida-Bahamas block. Identification of some of these seems certain, but a coherent synthesis has not yet appeared. Substantial participation of speakers from outside the United States is anticipated.

3. **Secondary Magnetic Minerals and Their Implications for Exploration and Paleomagnetism.** R. Douglas Elmore, School of Geology and Geophysics, University of Oklahoma, Norman, OK 73019; Chad McCabe, Dept. Geology, Louisiana State University, Baton Rouge, LA 70803.

Recent paleomagnetic research on the phenomenon of widespread remagnetization has led to new findings on magnetic mineral diagenesis. The results have profound implications for the interpretation of paleomagnetic data and also may have applications to other fields, principally sediment diagenesis and petroleum geology. This symposium will focus on the origin and significance of diagenetic magnetic minerals in sedimentary rocks. Possible topics include (1) the relation of hydrocarbons to the authigenic development of magnetic minerals, (2) the origin of magnetic anomalies over oil fields, (3) paleomagnetism and reservoir histories, (4) the origin of chemical remagnetization, and (5) remagnetization and orogeny.

4. **Archaeological Geology of the Southern Midcontinent.** C. Reid Ferring, Inst. Applied Sciences, University of North Texas, Denton, TX 76203; Brooks B. Ellwood, Dept. Geology, University of Texas, Arlington, TX 76019.

Current research as well as syntheses of regional investigations will be emphasized in this symposium on archaeological geology of the southern midcontinent. Field Trip 4 is planned in conjunction with this symposium. The symposium will consist of two sessions: (1) methods of investigation, and (2) syntheses of research. Papers for the methods of investigation section should focus on application of techniques from the earth sciences to archaeological problems. Potential topics include geologic

(Continued on p. 251)

### South-Central Section (Continued from p. 250)

approaches to site discovery and excavation, paleoenvironmental and subsistence studies, artifact analysis and provenance determination, and geochronology. Critical appraisal of methods and discussion of new methods is encouraged. Papers for the synthesis of research session should focus on the synthesis of research at local and regional scales. Potential topics include synthesis of intensive, interdisciplinary studies at important single sites or projects; syntheses of regional paleoenvironments; syntheses of late Quaternary geologic records as these relate to archaeological investigations; subsistence patterns on regional or temporal scales; and syntheses of paleodemography or settlement patterns.

5. **Stratigraphy, Sedimentology, and Paleontology of Upper Cretaceous and Lower Tertiary (Paleogene) Rocks in Trans-Pecos Texas.** Arthur B. Busbey, Dept. Geology, Texas Christian University, Fort Worth, TX 76129; Thomas M. Lehman, Dept. Geosciences, Texas Tech University, Lubbock, TX 79409.

In the past two decades, an increased research effort has significantly improved understanding of the largely clastic Upper Cretaceous and lower Tertiary rocks in Trans-Pecos Texas. Most of these units crop out in and around Big Bend National Park in Texas, but additional exposures are found in counties to the west and in northern Mexico. These constitute the southernmost exposures of "terrestrial" units that span the Cretaceous/Tertiary boundary in the United States. A much clearer picture is emerging of the geologic, biological, ecological, and climatological events that took place from the Campanian through the Chattian in Trans-Pecos Texas, yet major disagreement about the mappability and validity of the major lithostratigraphic units has major implications for the biostratigraphy and chronostratigraphy of these rocks. In addition, much of the latest work is unpublished, and there have been no recent symposia on the topic. This symposium has two primary purposes: (1) to provide a summary of current research in the topics mentioned for those involved in similar research north of Texas, and (2) to permit those involved in active research in the Trans-Pecos region to have constructive dialogue aimed at solving current controversy.

6. **Midcontinent Middle and Upper Pennsylvanian Chronostratigraphy, Biostratigraphy, and Paleocology.** Merlynd K. Nestell, Dept. Geology, University of Texas, Arlington, TX 76019; leaders of field trip on middle and late Pennsylvanian.

This one-day symposium will focus on topics related to the paleontology, stratigraphy, and paleocology of middle and upper Pennsylvanian units in the midcontinent region. Emphasis will be on faunal and floral distributions across potential or established chronostratigraphic boundary horizons; interaction of allocyclic and autocyclic events and their effects on lithostratigraphy and biostratigraphy; and correlation of chronostratigraphic boundaries within the midcontinent region and into other areas. This symposium is planned in conjunction with Field Trip 2.

### FIELD TRIPS

1. **Stratigraphic and Structural Overview of Upper Cretaceous Rocks Exposed in the Waxahachie Vicinity, Northeast Texas.** A one-day visit to classic Dallas-area Upper Cretaceous exposures of the Eagle Ford Shale, Austin Chalk, and Taylor Marl near and at the proposed Dallas-Fort Worth site of the superconducting supercollider. Donald F. Reaser, Dept. Geology, University of Texas, Arlington, TX 76019.

2. **Middle and Late Pennsylvanian Chronostratigraphic Boundaries in North-Central Texas: Glacial Eustatic Events, Biostratigraphy, and Paleocology.** A two-day field trip in the Mineral Wells-Jacksboro-Graham area to examine classic middle and upper Pennsylvanian exposures related to chronostratigraphic boundaries. Planned in conjunction with Symposium 6. Darwin R. Boardman, James E. Barrick, Dept. Geology, Texas Tech University, Lubbock, TX 79409; Jim Coker, Dept. Geology, Southwest Missouri State University, Warrensburg, MO 65804; Merlynd K. Nestell, Dept. Geology, University of Texas, Arlington, TX 76019.
3. **Clastic-Carbonate Shoreline Depositional Environments of the Glen Rose Formation (Lower Cretaceous) in North-Central Texas.** A one-day trip to visit classic exposures and dinosaur tracks in the Glen Rose Formation in the Glen Rose area. Gail R. Bergen, Reservoir Inc., Houston, TX 77043; Jeffrey G. Pittman, Wann Langston, Jr., Vertebrate Paleontology Lab., Balcones Research Center, University of Texas, Austin, TX 78712; Bob F. Perkins, Graduate School, University of Texas, Arlington, TX 76019.
4. **Archaeological Geology in the Upper Trinity Basin.** Planned in conjunction with Symposium 4. A one-day field trip will provide participants with the opportunity to visit localities in the Trinity River Basin with excellent exposures of upper Quaternary alluvium, soils, and archaeological horizons. The trip will focus on local alluvial history, paleoenvironments, and records of site formation processes. C. Reid Ferring, Inst. Applied Sciences, University of North Texas, Denton, TX 76203; Duane Peter, Geomarine, Fort Worth, TX 76102; Brooks Ellwood, Dept. Geology, University of Texas, Arlington, TX 76019.

### ABSTRACTS

Abstracts are limited to about 250 words and must be submitted camera-ready on the official 1989 GSA abstract form, available from

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P.O. Box 9140  
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Department of Geology  
University of Texas  
P.O. Box 19049  
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Send one original and five copies of abstracts to be considered for technical sessions, carefully marked for type of session (oral or poster) and category of interest, to the Technical Program Chairman,

William L. Balsam  
Dept. Geology  
University of Texas  
P.O. Box 19049  
Arlington, TX 76019  
(817) 273-2987

Send one original and five copies of abstracts for symposia directly to the convener (first name following symposium topic or title). Acceptance or rejection of all abstracts will be based upon technical review. Abstracts will be judged on the basis of scientific merit, informative content, readability, and significant problems. You may submit as many abstracts as you wish, but no more than two bearing an individual's name as first author will be accepted for

(continued on p. 252)

### South-Central Section (Continued from p. 251)

the program. No author may give more than one oral presentation. Authors will be notified of acceptance or rejection during December 1988.

### ABSTRACTS ARE DUE OCTOBER 24, 1988

### PROJECTION EQUIPMENT

All slides must be 2" x 2" and fit in a standard carousel tray. Two projectors and two screens will be provided in each technical session. Please bring your own loaded carousel trays. A speaker ready room equipped with projectors will be available for review and practice. Overhead projectors will not be available.

### EXHIBITS

Exhibits will be adjacent to the technical session rooms. The cost of booths for educational and nonprofit institutions will be reduced. For further information contact

C. I. Smith  
Dept. Geology  
University of Texas  
P.O. Box 19049  
Arlington, TX 76019  
(817) 273-2987

### SPECIAL EVENTS

A welcoming party will be held on Sunday evening, March 12. The annual banquet is scheduled for Monday evening, March 13, and will feature a distinguished geologist as speaker. Shopping tours and visits to area museums and tourist attractions will be provided for guests.

### DETAILED INFORMATION

Information concerning registration, accommodations, and activities will appear in the December 1988 issue of *GSA News & Information* and in *Abstracts with Programs* for 1989. Requests for additional information or suggestions should be addressed to the General Chairman,

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### MAPS & CHARTS

**Geologic Map and Measured Stratigraphic Section for the Rockerville Quadrangle, Pennington County, South Dakota.** Compiled by Perry H. Rahn, 1988. Two sheets, each 20"X30": one two-color, the other one-color. Includes a profusely illustrated 16-page text and comes in an illustrated file envelope. Map base is the 7-1/2-minute Rockerville Quadrangle. MCH062, Rolled \$19.00, Folded \$17.00

**Geologic Map and Descriptions of Stratigraphy and Structure of the West-Central Grant Range, Nye County, Nevada.** Compiled by J. E. Fryxell, 1988. Two sheets, black & white, 29"X25" and 20"X40". Includes an illustrated 16-page text and an illustrated file envelope. Scale: 1:24,000. MCH064, Rolled \$18.00, Folded \$16.00

**A Free-Air Gravity Map of the Hawaiian Islands and Adjacent Areas of the Pacific Ocean.** Compiled by Dennis A. Lindwall, 1988. Four sheets in color, 22"X32". Includes a 6-page text and an illustrated file envelope. Scale: 1:2,055,480. MCH065, Rolled \$32.00, Folded \$30.00

**Geology of the Mount Barcroft-Blanco Mountain Area, Eastern California.** Compiled by W. G. Ernst and C. A. Hall, 1988. One sheet, in color, 60"X42", in an illustrated file envelope. Scale 1:25,000. MCH066, Rolled \$14.50, Folded \$12.50

### MICROFORM PUBLICATIONS

**Geology of the Grand Canyon: An Annotated Bibliography, along with an Annotated Catalogue of Grand Canyon Type Fossils, Volume 3.** By Earle E. Spamer, 1988. The Grand Canyon has always been a source of lessons and enigmas for the geologist and paleontologist to ponder. This new work

by Spamer expands his earlier work in volumes 1 and 2 and provides new and important information. More than 150 new annotations are provided, and citations include some references published as late as September 1987, although the bibliography and lists of new fossil taxa are not comprehensive to that date. Features a new part, "An annotated Bibliography of the World Literature on the Grand Canyon Type Fossil *Chuarina circularis* Walcott, 1899, an Index Fossil for the Late Proterozoic," and a master index to all three volumes, which distinguishes between principal authors, coauthors, and editors and the authors of discussions and replies to published papers. This index has both alphabetical and chronological listings for all references. MIC017, 378 p., 5 cards, \$10.00

**Bibliography and Index of Paleozoic Crinoids and Coronate Echinoderms, 1981-1985.** By G. D. Webster, 1988. Webster continues and updates three earlier GSA works: Memoir 137 (1942-1968), MIC008 (Microform Publication No. 8), (1969-1973), and MIC016 (1974-1980). In addition to papers published from 1981-1985, five papers are indexed that were overlooked or unavailable to the author earlier. The bibliography is in two parts: the first part lists 214 papers, articles, and monographs of which 178 are indexed (thirty-six non-indexed papers are included for completeness); the second part lists abstracts which indicate the diversity of research conducted on crinoids during the 1981-1985 period. The volume is presented in three parts: Part I contains both identified and unidentified cups, crowns, and non-columnal parts of the Crinoidea; Part II covers the same for the Coronate Echinoderms, which were removed from the Crinoidea by Brett, *et al.*, (1983); Part III lists identified and unidentified columnals. MIC018, 242 p., 3 cards, ISBN 0-8137-6018-8, \$10.00

**Preliminary Announcement and Call for Papers**  
**NORTHEASTERN SECTION, GSA, 24th Annual Meeting**  
**New Brunswick, New Jersey**  
**March 23-25, 1989**

Rutgers University at New Brunswick, together with Rider College, Rutgers University at Newark, and Princeton University, will host the Northeastern Section of the Geological Society of America meeting at the Hyatt Regency in New Brunswick. The Eastern Section of the Society of Economic Paleontologists and Mineralogists (ES-SEPM), the Northeastern Section of the Paleontological Society (NE-PS), and the Eastern Section of the National Association of Geology Teachers (ES-NAGT) will be meeting with GSA's Northeastern Section.

The meeting will run from Thursday noon, March 23, through Saturday, March 25. Field trips will be Sunday, March 26.

#### **DETAILED INFORMATION**

Information concerning registration, accommodations, and activities will appear in a future issue of *GSA News & Information* and as part of *Abstracts with Programs* for 1989. Requests for additional information or suggestions should be addressed to the General Chairman,

Gail M. Ashley  
Dept. Geological Sciences  
Rutgers University  
New Brunswick, NJ 08903

#### **CALL FOR PAPERS**

Papers are invited for presentation at oral and poster sessions as well as symposia. Fifteen minutes for presentation and five minutes for discussion will be the format for the technical sessions. Papers of regional interest to geologists in northeastern North America as well as those of general geological interest will be considered for the program. Poster papers are encouraged. Every attempt will be made to assure that oral and poster sessions will not conflict with related technical sessions.

#### **SYMPOSIA**

The following symposia will be presented at the New Brunswick meeting. Those wishing to contribute to a symposium should contact the conveners directly. General information regarding symposia may be obtained by contacting Warren Manspeizer, Dept. Geological Sciences, Rutgers University, Newark, NJ 07102

1. **Origin, Duration, and Extent of Early Mesozoic Igneous Activity.** John H. Puffer, Dept. Geological Sciences, Rutgers University, Newark, NJ 07102; Jonathan Husch, Dept. Geosciences, Rider College, Lawrenceville, NJ 08648.
2. **Structural and Stratigraphic Development of Eastern North America Early Mesozoic Rift Basins.** Warren Manspeizer, Dept. Geological Sciences, Rutgers University, Newark, NJ 07102; Paul E. Olsen, Dept. Geological Sciences, Columbia University, Palisades, NY 10964.
3. **The Acadian Orogen: Its Driving Force, Its Products, and Environment.** James W. Skehan, S.J., and David C. Roy, Dept. Geology and Geophysics, Boston College, Chestnut Hill, MA 02167.
4. **Geology and Geophysics of Appalachian Sutures.** Lynn Glover III, Dept. Geological Sciences, Virginia Polytechnic Inst. and State University, Blacksburg, VA 24061; Robert E. Sheridan, Dept. Geological Sciences, Rutgers University, New Brunswick, NJ 08903.
5. **Long Island Sound: Post-Glacial Evolution and Sea Level Changes: A Symposium in Honor of Walter S. Newman.** Henry J. Bokuniewicz, Marine Sciences Research Center, Stony

Brook, NY 11794; Paul T. Gayes, University of South Carolina, Coastal Carolina College, Conway, SC 29526; Ralph S. Lewis, Connecticut Geological Survey, University of Connecticut, Groton Point, CT 06340.

6. **Barrier Islands: Their Origin and Development in Light of the Coastal Compartment Model: A Symposium in Honor of John J. Fisher.** Susan D. Halsey, NJDEP—Division of Coastal Resources, CN 401, Trenton, NJ 08625.
7. **Recent Investigations and Developments in Groundwater Quality and Quantity, Northeastern United States.** Wayne Hutchinson, Haig F. Kasabach, New Jersey Geological Survey, CN-029, Trenton, NJ 08625. Parts I and II will consist of oral presentations by invited speakers. Part III will consist of poster papers.
8. **Geologic Controls on Radon.** Alexander E. Gates, Dept. Geological Sciences, Rutgers University, Newark, NJ 07102; Linda Gundersen, U.S. Geological Survey, Reston, VA 22092.
9. **Neotectonics, Seismogenesis, and Earthquake Hazards in the Northeastern United States.** Randall D. Forsythe, Dept. Geological Sciences, Rutgers University, New Brunswick, NJ 08903; Leonardo Seeber, Lamont-Doherty Geological Observatory, Palisades, NY 10964.
10. **Paleosols.** Sponsored by the SEPM Eastern Section. David E. Fastovsky, Dept. Geology, University of Rhode Island, Kingston, RI 02881.
11. **Depositional Sequences on the Middle Atlantic Continental Margin.** Kenneth G. Miller, Dept. Geological Sciences, Rutgers University, New Brunswick, NJ 08903; C. Wylie Poag, U.S. Geological Survey, Woods Hole, MA 02543.
12. **Paleontological Event Horizons: Stratigraphic, Ecological, and Evolutionary Implications.** Sponsored by the PS Northeastern Section. Carlton E. Brett, Dept. Geological Sciences, University of Rochester, Rochester, NY 14627; Gordon Baird, Dept. Geoscience, SUNY College of Fredonia, Fredonia, NY 14063.

#### **POSTER SESSIONS**

Poster booths (8' x 8') will be framed by pipe and drape and have three 4' x 8' Homosite tack boards. For general information regarding poster sessions, contact Joseph E. Nadeau, Dept. Geosciences, Rider College, Lawrenceville, NJ 08648.

#### **Technical Poster Sessions**

The option of using a computer or video for presentation of research results will be available as an alternative to poster board displays. Authors must write "technical poster" as the session category choice on the official abstract form. For general information

(Continued on p. 254)

### Northeastern Section (continued from p. 253)

regarding technical posters, contact Michael Carr, Dept. Geological Sciences, Rutgers University, New Brunswick, NJ 08903.

### Special Poster Session

*Classic Field Sites for Teaching Geology in the Northeast.* Sponsored by the NAGT Eastern Section. Send abstracts by October 15 to Loretta Molitor, Dept. Physics/Geology, Towson State University, Towson, MD 21204.

Those wishing to contribute to this special poster session should contact Loretta Molitor.

### ABSTRACTS

Abstracts are limited to 250 words and must be submitted camera-ready on the official 1989 GSA abstract form, available from

Abstracts Coordinator Geological Society of America P.O. Box 9140 Boulder, CO 80301 (303) 447-2020	or	Richard K. Olsson Dept. Geological Sciences Rutgers University New Brunswick, NJ 08903
--	----	---

Send one original and five copies of abstracts to be considered for technical sessions and poster sessions to Technical Program Chairman Richard K. Olsson, Dept. Geological Sciences, Rutgers University, New Brunswick, NJ 08903. Symposia and Special Poster Session abstracts (one original and five copies) are to be sent directly to the convener whose name follows the symposium title (above).

Acceptance or rejection of abstracts (other than symposia) will be based on review by the Technical Program Committee. Abstracts will be judged on the basis of scientific merit, information content, readability, and relevance to geologic problems of northeastern North America. There is no limit to the number of abstracts that may be submitted, but no more than two abstracts bearing an individual's name as first author will be accepted for the program. No author may give more than one oral presentation. Authors will be notified of acceptance or rejection during November 1988.

### ABSTRACTS ARE DUE NOVEMBER 3, 1988

### STUDENT PAPERS

Students are encouraged to submit abstracts. Awards will be made for outstanding student papers presented in the technical sessions. To be eligible and judged, an abstract must be written exclusively by a student and must be designated on the abstract form as a student paper.

### PROJECTION EQUIPMENT

All slides must fit in a standard 35-mm carousel tray. Two projectors and two screens will be provided in each of the technical sessions. If possible, bring your own loaded tray labeled with name, session, and time of paper.

### EMPLOYMENT SERVICE

An employment service will be provided for meeting registrants. The service will be free to those seeking a job. Recruiters will be charged a small fee. For general information regarding the employment program, contact Claude Herzberg, Dept. Geological Sciences, Rutgers University, New Brunswick, NJ 08903.

### EXHIBITS

Exhibits of geological research equipment and educational

material will be on display in the EXPO Hall, adjacent to the poster sessions, the employment service area, and refreshments. Booths (8' x 8') will be framed with pipe and drape and contain table and chairs. Special rates are available for nonprofit and educational organizations. For additional information, contact John H. Puffer, Dept. Geological Sciences, Rutgers University, Newark, NJ 07102.

### SPECIAL EVENTS

Thursday, March 23—Association for Women Geoscientists panel discussion, "Two-career Relationships," 5-7 p.m. Welcoming Party, Hyatt Regency, 8-11 p.m.

Friday, March 24—Alumnae-Alumni Reception, 6:30-7:30 p.m. Annual Banquet, 7:30-10 p.m.

### SHORT COURSE

**Microtextures in Deformed Rocks.** Carol Simpson, Dept. Earth and Planetary Sciences, Johns Hopkins University, Baltimore, MD 21218.

### FIELD TRIPS

1. **Jurassic Igneous Rocks of the Northern Newark Basin.** John H. Puffer, Dept. Geological Sciences, Rutgers University, Newark, NJ 07102; Jonathan Husch, Dept. Geosciences, Rider College, Lawrenceville, NJ 08648.

2. **A Geological Transect through the Uraniferous Provinces of New Jersey and Their Associated Radon Hazards.** Karl Muessig, Hugh Houghton, M. Kaeding, Richard Volkert, New Jersey Geological Survey, CN-029, Trenton, NJ 08625.

3. **Structure and Paleozoic Tectonics of the Great Valley of Northern New Jersey.** Gregory Herman, Don Monteverde, New Jersey Geological Survey, CN-029, Trenton, NJ 08625.

4. **Stratigraphy and Paleontology across the Cretaceous/Tertiary Boundary of the New Jersey Coastal Plain.** William Gallagher, New Jersey State Museum, CN-530, Trenton, NJ 08625.

5. **New Jersey's Northern Coast: Recent Coastal Processes and Coastal Zone Management.** Stewart Farrell, Marine Science Program, Stockton State College, Pomona, NJ 08240.

For information on costs and registration for short course and field trips, please contact the identified leaders.

### In Memoriam

Antonio Almela  
Madrid, Spain  
December 1987

Randolph W. Chapman  
Wylie, Texas

F. Thomas Connolly  
Houston, Texas  
April 27, 1988

Keith L. Katzer  
Tucson, Arizona  
July 8, 1988

Clayton H. Johnson, Jr.  
Columbia, Missouri  
April 9, 1988

Walter K. Link  
LaPorte, Indiana

Joseph Neely  
San Diego, California  
November 1987

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

W. Armstrong Price  
Austin, Texas  
November 1, 1987

Clark C. Stephenson  
Sandersville, Mississippi  
May 7, 1988

# 1989 Annual Meeting

November 6-9  
Cervantes Convention Center



## Meet Us in St. Louis—Gateway to the Next 100 Years 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.

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. An expanded list of these themes will appear in the October issue of *GSA News & Information*.

The Technical Program chairmen welcome your reaction to the overall concept of the theme-oriented GSA meeting, as well as your suggestions as to how the list of theme topics could be improved.

### 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 anyone 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.

## CALL FOR FIELD TRIP PROPOSALS

The committee would like to structure field trips to complement the Frontiers in Geoscience theme and to coincide with topics of major symposia or theme sessions. Field trips that have this focus will be particularly welcomed.

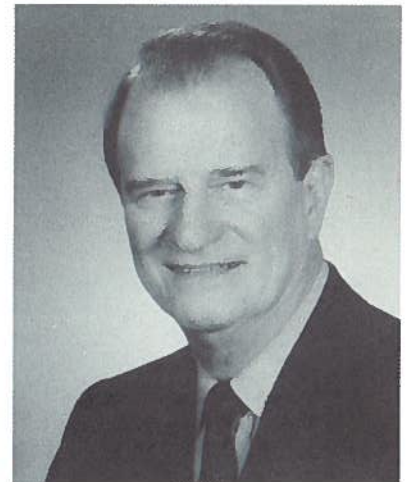
To submit your proposal or for further information, contact 1989 Field Trip Chairman Jerry D. Vineyard, Dept. of Natural Resources, Div. of Geology and Land Survey, P.O. Box 250, Rolla, MO 65401, (314) 364-1752.

# FOUNDATION NEWS

by Robert L. Fuchs



Fred Donath



Roy Huffington

## Foundation Board Appoints Two Trustees

The Board of Trustees of the GSA Foundation has appointed Fred A. Donath and Roy M. Huffington to five-year terms ending in 1993. They fill the positions of Chairman Harry Jamison and Trustee Larry Funkhouser, whose terms have expired.

Fred Donath received a B.A. degree in geology and geophysics from the University of Minnesota in 1954. Subsequently he received M.S. and Ph.D. degrees from Stanford University. Donath was on the faculty at Columbia University from 1958 until 1967 as professor of geology. He was head of the department of geology at the University of Illinois from 1967 until 1980. After three years as president of CGS, Inc., he was appointed corporate vice president for research and development of the Earth Technology Corporation in Long Beach, California. Donath is internationally recognized for his contributions to the understanding of geologic deformation, and his work is noted for its integration of field, experimental, and theoretical approaches. He is a member of numerous scientific organizations including AAAS, AAPG, and AGU. He has served on expert panels and provided expert testimony to such groups as the U.S. Senate, NAS, and NRC. His work at Earth Technology emphasizes radioactive waste management. Donath was chosen a member of Phi Beta Kappa and Sigma Xi, and he was the recipient of Rice University's Semicentennial Medallion in 1962.

Roy Huffington received a B.S. degree in geology from Southern Methodist University in 1938 and obtained his M.A. and Ph.D. degrees from Harvard University. He also attended Harvard University's Advanced Management Program in 1976. After military service with the U.S. Navy, during which he was awarded the Bronze Star, Huffington worked for Humble Oil in various geological positions for ten years. In 1956, he formed Roy M. Huffington, Inc., and he has served as chairman of the board ever since. Through this company, Huffington is best known for his oil and gas discoveries in the United States and abroad, most particularly the giant Badak Field in East Kalimantan, Indonesia. His reputation as one of the best known independent geologists and wildcatters in the United States has been long established. Huffington is a participant and leader in many local, national, and international professional and civic organizations, including the Houston Geological Society, Houston Ballet Foundation (trustee), Southern Methodist Uni-

versity (trustee), Baylor College of Medicine (trustee), American Petroleum Institute (director), Brookings Institution (trustee), Committee for Economic Development (trustee), and Council on Foreign Relations. He has been a leader in expanding the United States' interface with the Far East, serving as chairman of the Asia Society. Huffington has received numerous awards, including distinguished alumnus awards from SMU and Harvard and the Gold Medallion Oil Pioneer Award from the Indonesian government.

Trustee Chairman Phil LaMoreaux expressed the feelings of the entire board when he stated that the appointment of Fred Donath and Roy Huffington to the Board "is an event of singular importance to the Foundation and the Society. These are men of extensive accomplishments, both professionally and personally. We are honored that they have chosen to give us their time and effort."

## Geophysics Division Establishes Research Award

The Geophysics Division of GSA has set up the Allan V. Cox Student Research Award to support student research in geophysics. The award has been initially funded with \$5000 from the Division.

The award funds are managed by the Foundation, and the award itself is administered by the Research Grants Committee. Further information about this award may be obtained from Francis S. Birch, Secretary/Treasurer of the Geophysics Division or June R. Forstrom, Research Grants Administrator, at GSA headquarters. Contributions to the Allan V. Cox Student Research Award fund may be sent directly to the Foundation.

## Century Challenge—Time Is Growing Short

At the end of June there were 515 gifts and pledges to the Century Challenge, totaling \$68,638. Challenge Partners, those giving \$250 or more, now total 37.

1988 is GSA's Centennial year, and the annual meeting from October 31 to November 3 is the birthday celebration. Don't miss out on your chance to send a birthday gift to GSA in time for the celebration. Mail your check today.





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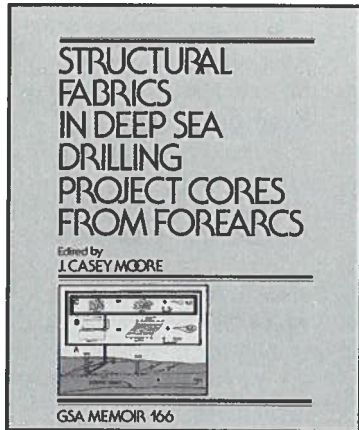
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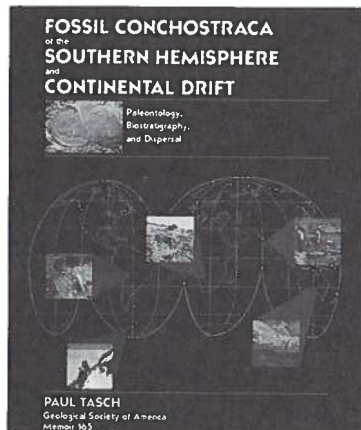


## Structural Fabrics in Deep Sea Drilling Project Cores from Forearcs

edited by J. Casey Moore, 1987

DSDP cores from forearcs have a known tectonic setting and catch deformational and diagenetic-metamorphic processes while they are occurring. Analysis of the fabrics from these cores has great potential for furthering understanding of initial structural processes in accretionary wedges and for providing new insight into the evolution of ancient subduction complexes. Although studies of these cores, conducted in the context of each drilling leg, have elucidated the structural development of forearcs, those studies have lacked consistency between legs in terminology, approach, and detail. To bring this critical information to a broad geological audience in a uniform and condensed format, a group of geologists from several disciplines undertook the extensive structural study of all cores collected from forearcs during the DSDP. These ten papers summarize that work; each paper could stand alone as an important contribution.

MWR166, 168 p., 2 pocket plates, ISBN 0-8137-1166-5, hardbound, \$18.00



## Fossil Conchostraca of the Southern Hemisphere and Continental Drift: Paleontology, Biostratigraphy, and Dispersal

by Paul Tasch, 1987

Does the record of fossil conchostracan of the southern continents contain credible evidence of nonmarine dispersal between them during portions of Paleozoic and Mesozoic? The author presents results of field studies and biostratigraphic collections of fossil conchostracans in pursuit of this question. His own fossil collections extended to Africa, Australia, Antarctica, India, and South America, and he supplemented his own with fossils from collections of colleagues and museums. The data, he claims, indicate a need for reexamination of pre-Drift placement of India and Africa. He describes several new taxa, and provides 49 outstanding plates, six appendices, and his personally prepared index. MWR165, 304 p., indexed, ISBN 0-8137-1165-7, \$55.00



## Geology of the Henry Mountains, Utah, As Recorded in the Notebooks of G. K. Gilbert, 1875-76

edited by Charles B. Hunt

Go back in time with this volume and experience the thrill of discovering brand new geologic concepts. Travel alongside one of America's greatest geologists, Grove Karl Gilbert, whose early discoveries and theories have now become fundamental principles of our science. These day-by-day field notes of Gilbert's trip into Utah's Henry Mountains in 1875-1876 are an exciting, firsthand record of new discoveries and new ideas. They became the guide for Charles Hunt's many seasons of work in the same area. Now he shares Gilbert's original entries and maps with us, adding asides and clarifications of his own to create a fascinating combination of geologic history and frontier Americana. An enjoyable book, and one you can use to aid your own exploration of this scenic section of the great American West.

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The Cretaceous System of Southern South America

by A.C. Riccardi

Geology and Paleontology of Seymour Island, Antarctic Peninsula

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## THE GEOLOGICAL SOCIETY OF AMERICA

## GSA Division and Section Awards for 1988

The **Geophysics Division** presented its first annual Allan V. Cox Student Research Award in 1988 for an outstanding student research proposal, submitted to the GSA Research Grants Program, to Gary Acton, a Ph.D. candidate at Northwestern University, Evanston, Illinois. The award was for his research project titled "Cretaceous Paleomagnetism of the North American and Pacific Plates: Implications for Apparent Polar Wander, True Polar Wander, and Hotspot Motion."

The **Quaternary Geology and Geomorphology Division** awarded Mackin grants to three students in 1988: master's degree candidate Eric A. Oches, University of Massachusetts, for "Late Quaternary Paleotemperature Estimates of the Northern Mississippi and Illinois River Valleys, USA," and Ph.D. candidates Jay Stratton Noller, University of Colorado, for "History of El Niño in Soil Chronosequences of the Peruvian Desert" and Donald Templeton Rodbell, University of Colorado, for "Late Quaternary Glacial and Climatic History of the Northern Peruvian Andes Based on Glacial Geology, Glacial-Lacustrine Sedimentology, and Soils."

The first Mackin grant was awarded by the Division in 1974; 27 awards have been presented.

The **Sedimentary Geology Division** presented its second annual award for an outstanding student research proposal, submitted to the GSA Research Grants Program, to Cary Hauptman Gaunt, a master's candidate at the University of Maryland, for "Historical Response (and Causative Mechanisms) of Selected Virginia Barrier Islands to Sea Level Rise—Landward Migration or In-Place Drowning?"

The third student research award to be presented by the **Structural Geology and Tectonics Division** went to Cameron Davidson, Princeton University, for "Tectonic and Metamorphic History of the Maclaren Metamorphic Belt, Alaska."

The **North-Central Section** of GSA awarded two research grants to students in the section this year. Each award is for \$500 and is awarded to qualified students to support field work leading to completion of a thesis or dissertation. To be eligible for an award, a student must be attending a college or university in the North-Central Section geographic area. Recipients are selected from students who have submitted applications to the GSA Research Grants Program. This is the fourth year that the North-Central Section has awarded student grants; it has presented 18 awards.

The recipients and the titles of their research projects are Thomas Albert Stemann, University of Iowa, for "Evolutionary Patterns in the Scleractinian Coral Family Agariciidae from the Caribbean Neogene and Quaternary" and Gregory C. Wilson, University of Wisconsin—Madison, for "Structure, Petrology and Shear Zone Fabrics in the Huron Mountains, Marquette and Baraga Counties, Upper Michigan."

The **South-Central Section** of GSA presented its first annual research awards to qualified students in the section this year. Recipients are students who attend a college or university in the South-Central Section geographic area and have submitted applications to the GSA Research Grants Program. The two awards presented this year went to Clinton Lum, Rice University, for "Evaluation of Mantle Heterogeneities across the Northern Great Basin: Northern Nevada" and David C. Roberts, University of Texas, El Paso, for "Structure and Stratigraphy of the Cerro Panales Area, East-Central Chihuahua, Mexico."

GSA's **Southeastern Section** awarded \$4000 in research grants to 13 qualified students within the section.

Ph.D. students: Timothy L. Davis, University of Tennessee, for "Stratigraphy, Structure and Metamorphism of Part of the Western

Inner Piedmont, North and South Carolina"; Thomas L. Seal, Florida State University, for "Geochemistry and Geochronology of Granitoids of the Western Georgia Inner Piedmont: Implications for the Late Precambrian and Paleozoic Tectonic Evolution of the Southern Inner Piedmont"; D. Mark Steinhaufl, University of Tennessee, for "Integrated Petrographic and Geochemical Approach to Fluid-flow Timing and Pathway Prediction in Carbonate Cement Sequences, Middle Ordovician of East Tennessee"; Tammy D. Suter, West Virginia University, for "Origin of Polymictic Diamictites at the Devonian-Mississippian Boundary in the Central Appalachian Basin"; James D. Walker, University of Tennessee, for "The Tectonic Significance of the Stratigraphy and Sedimentology of the Chilhowee Group (Latest Precambrian to Earliest Cambrian) of East Tennessee: Implications for the Paleodynamics of the Iapetus-North American Continental Margin."

M.S. students: Mark P. Fischer, University of Tennessee, for "Stratigraphic Controls on the Structural Geometry of the Rocky Valley Thrust Sheet near New Market, Tennessee"; Sarah L. Hanson, University of New Orleans, for "Mineralogy, Petrology, and Geochemistry of the Trout Creek Pass Pegmatite District"; William D. Keefer, Auburn University, for "Structural Development of the Towaliga Shear Zone and the Towaliga Fault in Northeastern Lee County, Alabama: Fabric Analysis and Kinematic Reconstruction"; Joseph A. McReynolds, University of Tennessee, for "Paleoenvironments and Facies Relations of the Lower Cambrian Rome Formation on the Department of Energy Reservation in Roane and Anderson Counties, Tennessee"; Clifton R. Naylor, Jr., University of North Carolina, Chapel Hill, for "Paleotectonics and Depositional Environments in the Latest Precambrian Wilhite Formation"; Dorothy A. Satterfield, Georgia State University, for "Depositional Environments, Stratigraphy, Age, and Distribution of Tertiary Volcanics in Sweetwater Pass, Montana"; Charles H. Trupe, University of North Carolina, Chapel Hill, for "Kinematic Analysis and Petrology of Ductile Shear Zones Northwest of the Grandfather Mountain Window, Western North Carolina."

Undergraduate student: Christopher M. Bailey, College of William and Mary, for "The Depositional and Deformational History of the Blue Ridge Anticlinorium West of Charlottesville, Virginia."

### GEOLOGY AND PALEONTOLOGY OF SEYMOUR ISLAND, ANTARCTIC PENINSULA

Edited by Rodney M. Feldmann and Michael O. Woodburne

Seymour Island is a unique locality in Antarctica and ranks as one of the more important localities in the Southern Hemisphere for the study of Upper Cretaceous and Paleogene strata.

This volume is the outgrowth of several field seasons of work on Seymour Island. The 22 chapters discuss paleontological and geologic research that has been conducted in the area since the early years of this century. Publication of these contributions in a single volume has a number of advantages, perhaps the most important of which is that access to a diverse range of studies will be simplified for future workers. Also, collective publication reflects the major importance of Seymour Island as a research site for the interpretation of the geologic history of the Antarctic Peninsula.

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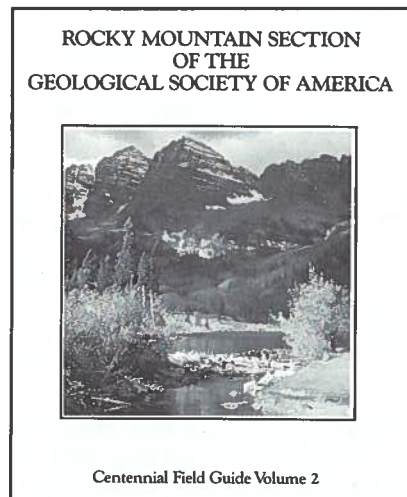
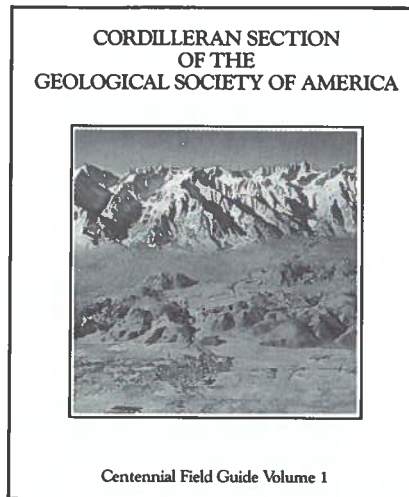
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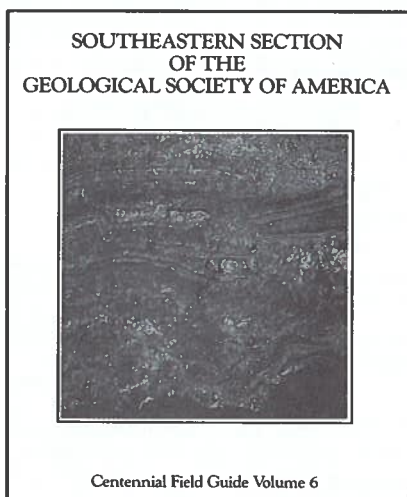
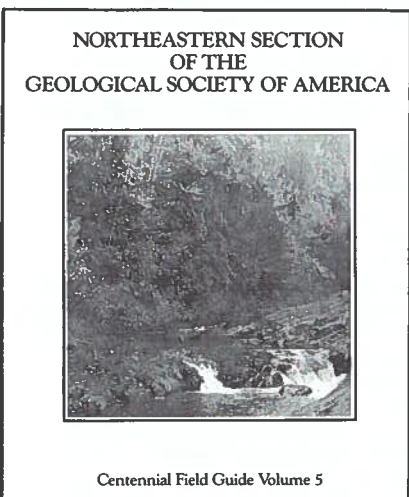
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# GSA Research Grants Awarded for 1988-1989

by June Forstrom

Research Grants Administrator

The GSA Committee on Research Grants allotted its \$178,800 budget for 1988 to 213 proposals, 35% of the proposals received. The committee—Chairman Thomas H. Anderson, members John A. Breyer, Patricia H. Cashman, Elaine R. Padovani, Richard H. Groshong, Jr., Mitchell W. Lyle, and National Science Foundation conferee Ian D. MacGregor—met in Boulder, Colorado in April. The committee evaluated 603 proposals, 16 more than in 1987.

The committee's 1988 budget, \$2600 more than the 1987 budget, included \$150,000 from the Penrose Endowment, \$3300 income from the Harold T. Stearns Fund, and \$3000 income from the Arthur L. Day Fund. Funding also included \$20,500 from the GSA Foundation as follows: \$2959 from the Century Challenge Fund, \$500 from the Geostar Unrestricted Fund and \$17,041 from the Foundation Research Fund (which includes \$6500 from oil companies).

Of the 213 proposals recommended for support, 62 were master's proposals, 150 were doctoral proposals, and one was a postdoctoral proposal. The size of the average award decreased slightly, from \$885 in 1987 to \$850 this year. Proposal requests totaled \$631,025.

## AWARDS

*Gladys W. Cole Memorial Research Award.* This memorial award of \$3000 goes to Richard A. Young, State University of New York at Geneseo, to support continuing field studies of the Late Cretaceous-Eocene fluvial geomorphology of the southwest Colorado Plateau in Arizona. The objective is to better constrain the interval of Laramide erosion and the Eocene(?) extended weathering episode that shaped the Tertiary landscape of the western Grand Canyon region.

*Robert K. Fahnestock Award.* This grant is awarded to the applicant with the best proposal in sediment transport or related aspects of fluvial geomorphology. The 1988 recipient is Jim E. O'Connor, University of Arizona, Tucson, for "Hydraulics and Sediment Transport of Pleistocene Lake Bonneville Flooding and the Snake River, Idaho."

*Harold T. Stearns Fellowship Award.* The three recipients of this award, for research on aspects of the geology of the Pacific Islands and the circum-Pacific region, are Jeffrey Delon Corrigan, University of Texas, Austin, for "Structure and Tectonics of the Gulf of Chiriqui, Panama Pacific Margin"; Jay L. Jackson, University of Arizona, Tucson, for "Tectonic Analysis of the Northern Cache Creek Terrane, Northwestern British Columbia and Southern Yukon"; and Suzanne A. McEnroe, University of Massachusetts, Amherst, for "Comparison of Magnetic Susceptibility Anisotropy with Shape and Crystal Orientation Indicators of Strain in Slates of the Kitikami Mountains and Other Metamorphic Rocks in Japan."

*Industrial Donations and Awards.* Donations from Conoco, Inc. (\$2000), Marathon Oil Foundation (\$2500), and Mobil Oil Corporation (\$2000) are funding grants to the following applicants:

Stephen K. Boss, University of Michigan, for "Long-term Diagenesis of Aragonitic Deposits: An Example from the Middle Cambrian of Utah and Wyoming"; Randall Carlson, University of Kansas, for "Diagenesis of the Lisburne Group, Northern Alaska"; Sheraz Khan, University of California, Santa Cruz, for "Paleomagnetism Applied to the Miocene Monterey Formation of California"; Tad M. Smith, Texas A&M University, for "Dolomitization and Burial Diagenesis of the Mississippian Mission Canyon

Formation: Central and Southwestern Montana"; Mark D. Sonnenfeld, Colorado School of Mines, for "Anatomy of Offlap: Upper San Andres Sequence (Permian, Guadalupian), Last Chance Canyon, Guadalupe Mountains, New Mexico"; Douglas M. Yates, Washington State University, for "Mineralogy and Chemistry of Synthetic Illites: A TEM/AEM Study"; Lyndon Anderson Yose, Johns Hopkins University, for "Controls over Sequence Development in Carbonate Depositional Systems: Triassic (Carnian) of the Dolomites, Northern Italy."

*Outstanding Mention.* The Committee on Research Grants specially recognized 22 of the proposals as being of exceptionally high merit in conception and presentation:

Gary Acton, Northwestern University, for "Cretaceous Paleomagnetism of the North American and Pacific Plates: Implications for Apparent Polar Wander, True Polar Wander, and Hotspot Motion"; Diane Bellis, New Mexico Institute of Mining and Technology, for "The Analysis and Significance of Fluid Inclusions in Fossil Resins"; David Edward Blake, Washington State University, for "Structural Analysis of the Seven Devils Terrane-Cratonic Margin Suture Zone in the Riggins Region, West-Central Idaho"; Jeffrey Delon Corrigan, University of Texas, Austin, for "Structure and Tectonics of the Gulf of Chiriqui, Panama Pacific Margin"; Cameron Davidson, Princeton University, for "Tectonic and Metamorphic History of the Maclaren Metamorphic Belt, Alaska"; Gregory M. Dipple, Johns Hopkins University, for "Fluid-Rock Interaction and Deformation in Lower Crustal Shear Zones: The Scourie Shear Zones Revisited"; Lisa L. Ely, University of Arizona, for "Paleoflood Records of El Niño/Southern Oscillation (ENSO) Events in Coastal Peru"; Cary Hauptman Gaunt, University of Maryland, for "Historical Response (and Causative Mechanisms) of Selected Virginia Barrier Islands to Sea Level Rise—Landward Migration or In-Place Drowning?"; Peter Craig Gibson, University of Nevada, for "Comprehensive Study of the Calera Vein, A Complex, Multistage Epithermal Au-Ag System, Orcopampa District, Southern Peru"; Daniel Goldman, SUNY, Buffalo, for "Systematics, Biostratigraphy, and Evolution of the *Orthograptus quadrimucronatus* (Graptolithina) Species Group"; Matthew M. Huston, University of Massachusetts, for "Quaternary Marine and Glacial Stratigraphy, Paleoenvironments and Glaciotectonics, Baldwin Peninsula, Northwest Alaska"; Jay L. Jackson, University of Arizona, for "Tectonic Analysis of the Northern Cache Creek Terrane, Northwestern British Columbia and Southern Yukon"; Kirk Richard Johnson, Yale University, for "Floristic and Vegetational Change Across the Cretaceous-Tertiary Boundary in the Northern Rocky Mountains and Great Plains"; Keith Katzer, University of Arizona, for "Patterns of Alluvial Deposition During the Pleistocene-Holocene Transition in Grass Valley, Central Great Basin"; Jack Kohler, University of Minnesota, Minneapolis, for "Glacial Hydrology at Storglaciären, Sweden"; Stephen M. McDuffie, Johns Hopkins University, for "Internal Ordering within Sheet-Like Igneous Bodies"; Suzanne A. McEnroe, University of Massachusetts, for "Comparison of Magnetic Susceptibility Anisotropy with Shape and Crystal Orientation Indicators of Strain in Slates of the Kitikami Mountains and Other Metamorphic Rocks in Japan"; Jerry R. Miller, Southern Illinois University, for "Fluvial Geomorphic Controls on Karst Evolution in the Crawford Upland and Mitchell Plain, South-Central Indiana"; Jim E. O'Connor, University of

(continued on p. 262)

**Research Grants** (continued from p. 261)

Arizona, for "Hydraulics and Sediment Transport of Pleistocene Lake Bonneville Flooding and the Snake River, Idaho"; Peter D. Rude, SUNY, Stony Brook, for "Fluorine Diagenesis in Recent Carbonate Sediments and Its Possible Use as an Indicator of Carbonate Dissolution and/or Recrystallization"; James Stewart Scoates, SUNY, Stony Brook, for "Crystallization and Layering of the Laramie Anorthosite, Laramie Anorthosite Complex (LAC), Southeastern Wyoming"; Debra A. Willard, University of Illinois, for "Integration of Palynology and Coal-Ball Peats: Paleoecological Implications in the Springfield (No. 5) Coal of the Illinois Basin."

**Other Successful Applicants.** Other applicants recommended for funding are the following: Achim Albrecht, Arlene V. Anderson, Laurie C. Anderson, Gerilyn Sue Andrews, Phillip Arthur Armstrong, William H. Babcock, David G. Bailey, Mark Jay Bamberger, Istvan Barany, Jr., Charles Tucker Barrie, George T. Basabilvazo, Randy D. Bauer, Raymond E. Beiersdorfer, Edward Erik Bender, Erick A. Bestland, Lori A. Bettison, Kailash P. Bhatt, Scott William Bie, Anne L. Bloomfield, Ann E. Blythe, Susan Q. Boundy-Sanders, John A. Brooks, Frank Robert Brunton, Jonathan R. Bryan, Roland Burgmann, Richard T. Burtell, Nicholas J. Butterfield, Mary E. Caress, Paul Scott Carpenter, Sharon D. Carr, Louis J. Caruso, Steven R. Chambers, Robert William Clayton, William S. Clendenen, Roger D. Congdon, William Marc Connolly, Dennie Martin Conrad, Alan H. Cutler, Russell K. Davies, Ralph L. Dawes, David Stephen Diamond, David William Dilkes, Steven R. Dively-White, Paul K. Doss, Betsy J. Dransfield, Daniel Patrick Dugas, W. James Dunlap, Maya Elrick, Aley El-Din El-Shazley, Yigal Erel, Brent H. Everett, Benjamin Root Farrell, Todd C. Feeley,

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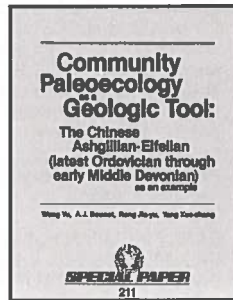
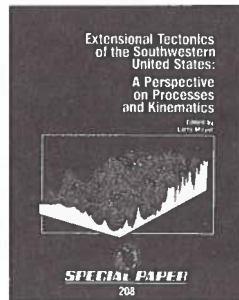
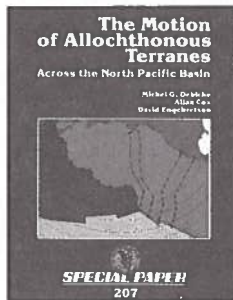
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Webster continues and updates three earlier GSA works: Memoir 137 (1942-1968), MIC008 (Microform Publication No. 8), (1969-1973), and MIC016 (1974-1980). In addition to papers published from 1981-1985, five papers are indexed that had been overlooked or unavailable to the author before. The bibliography is in two parts: the first part lists 214 papers, articles, and monographs (178 are indexed and thirty-six are non-indexed papers included for completeness); the second part lists abstracts that describe the diversity of research conducted on crinoids from 1981 to 1985. The volume is presented in three parts: Part I contains both identified and unidentified cups, crowns, and non-columnal parts of the Crinoidea; Part II covers the same for the Coronate Echinoderms, which were removed from the Crinoidea by Brett et al (1983); Part III lists identified and unidentified columnals.  
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# MEETINGS

(Asterisk indicates new or changed information)

1988

**6th International Fission Track Dating Workshop**, September 5-9, 1988, Besançon, France. Information: J.-L. Janier-Dubry, Lab. de Microanalyses Nucléaires, U.F.R. des Sciences et Techniques, 16 Route de Gray, 25030 Besançon cedex, France; phone 81-53-81-22.

**International Symposium on Geochemistry and Mineralization of Proterozoic Mobile Belts**, September 6-10, 1988, Beijing, China. Information: Proterozoic Geochemistry Symposium, c/o Prof. Sun Dazhong, Tianjin Inst. Geology and Mineral Resources, CAGS No. 4, 8th Rd., Dazhigu, Tianjin 300170, People's Republic of China.

**Wyoming Geological Association Annual Field Conference and Symposium: Eastern Powder River Basin-Black Hills**, September 9-11, 1988, Casper, Wyoming. Information: Janet de Vries, Dwight's Hotline, P.O. Box 2934, Casper, WY 82602; (307) 237-1004.

**International Symposium on Rock Mechanics and Power Plants**, September 12-16, 1988, Madrid, Spain. Information: ISRM Symposium, Sociedad Española de Mecánica de las Rocas, Paseo Bajo de la Virgen del Puerto, 3, 28005 Madrid, Spain.

**Clay Minerals Society Annual Meeting**, September 18-21, 1988, Grand Rapids, Michigan. Information: T. J. Pinnavaia, Dept. of Chemistry, Michigan State University, East Lansing, MI 48824; (517) 353-4511.

**ECORS Program: International Meeting on a Deep Seismic Line with Field Trip across the Pyrenees**, September 19-22, 1988, Toulouse, France, to Balaguer, Spain. Information: Société Géologique de France, 77 rue Claude Bernard, 75005 Paris, France; phone 331-43-31-77-35.

**International Symposium on Engineering Geology: Study, Preservation and Protection of Ancient Works, Monuments and Historical Sites**, September 19-23, 1988, Athens, Greece. Information: Paul G. Marinos, Greek Committee of Engineering Geology, 1988 Symposium Secretariat, P.O. Box 19140, GR-117 10 Athens, Greece; Telex 45 4312 POLX.

**International Conference on Disposal of Radioactive Waste in Seabed Sediments**, September 20-21, 1988, Oxford, England. Information: Society for Underwater Technology, 1 Birdcage Walk, London SW1H 9JJ, England; phone 01-222 8658; Telex 917944.

**Fourth International Tectonostratigraphic Terrane Conference**, September 23-October 7, 1988, Nanjing University, Nanjing, People's Republic of China. Information: Tom Wiley, U.S. Geological Survey, MS 999, 345 Middlefield Road, Menlo Park, CA 94025; (415) 354-3067.

**Mediterranean Basins Conference**, September 25-28, 1988, Nice, France. Information: AAPG Convention Dept., P.O. Box 979, Tulsa, OK 74101-0979; (918) 584-2555.

**Geographic Information Symposium**, September 26-30, 1988, Denver, Colorado. Information: Thomas Usselman, GIS Symposium, National Academy of Sciences, 2101 Constitution Ave., Washington, DC 20418.

**Environments and Physiology of Fossil Organisms Symposium**, September 28-30, 1988, Edinburgh, Scotland. Information:

Meetings Secretary, Royal Society of Edinburgh, 22, 24 George St., Edinburgh EH2 2PQ, Scotland.

**Denver GeoTech '88: Tools for Geocomputing**, October 1-4, 1988, Lakewood, Colorado. Information: Chuck Bierley, CB & Associates, 122 Zang Court, Lakewood, CO 80228; (303) 989-2989.

**19th Annual Underwater Mining Institute**, October 2-5, 1988, Woods Hole, Massachusetts. Information: Allen J. Miller, University of Wisconsin Sea Grant Institute, 1800 University Ave., Madison, WI 53705; (608) 262-0645.

**Nobel Conference XXIV, The Restless Earth**, October 4-5, 1988, Saint Peter, Minnesota. Information: Nobel Conference XXIV, Gustavus Adolphus College, Saint Peter, MN 56082.

**Mars: Evolution of Volcanism, Tectonism and Volatiles**, October 5-7, 1988, Washington, D.C. Information: Projects Office, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX 77058-4399; (713) 486-2150.

**53rd Annual Field Conference of Pennsylvania Geologists**, October 6-8, 1988, Hazleton, Pennsylvania. Information: Donald M. Hoskins, Pennsylvania Geological Survey, P.O. Box 2357, Harrisburg, PA 17120; (717) 787-2169.

**\*Conference of the Society for Literature & Science**, October 6-9, 1988, Albany, New York. Information: David Porush, SLS Conference '88, Dept. of Language, Literature & Communication, Rensselaer Polytechnic Institute, Troy, NY 12181-3590.

**Ter-Qua '88**, symposium and field conference on global climate and the future of the High Plains aquifers, October 6-9, 1988, Lincoln and North Platte, Nebraska. Information: Institute for Tertiary-Quaternary Studies, 2739 Centenary, Houston, TX 77005; (713) 661-4038.

**Geochautauqua '88: Computers for the Analysis of Geochemical and Hydrogeochemical Data**, October 7-8, 1988, Tucson, Arizona. Information: Donald E. Myers, Dept. of Mathematics, University of Arizona, Tucson, AZ 85721; (602) 621-6859.

**Geological Association of New Jersey Annual Meeting**, October 7-9, 1988, Lawrenceville, New Jersey. Information: Jonathan Husch, Dept. of Geosciences, Rider College, 2083 Lawrenceville Rd., Lawrenceville, NJ 08648; (609) 896-5330.

**New York State Geological Association Annual Field Trip Meeting**, October 7-9, 1988, Plattsburgh, New York. Information: Tom Wolosz, Center for Earth and Environmental Science, SUNY College, Plattsburgh, NY 12901; (518) 564-4031.

**Geothermal Resources Council Annual Meeting**, October 9-12, 1988, San Diego, California. Information: Geothermal Resources Council, P.O. Box 1350, Davis, CA 95617-1350; (916) 758-2360; Fax (916) 758-2839.

**West Texas Geological Society Fall Field Seminar, Guadalupe Mountains**, October 13-16, 1988. Information: West Texas Geological Society, Inc. Office, P.O. Box 1595, Midland, TX 79702; (915) 683-1573.

**Association of Engineering Geologists 31st Annual Meeting**, October 16-21, 1988, Kansas City, Missouri. Information: William  
(Continued on p. 266)

**MEETINGS** (Continued from p. 265)

Bryson, Kansas Corporation Commission, 4th Floor, State Office Bldg., Topeka, KS 66612; (913) 296-5113.

**\*Gulf Coast Association of Geological Societies 38th Annual Convention**, October 19-21, 1988, New Orleans, Louisiana. Information: GCAGS Convention 1988, P.O. Box 52792, New Orleans, LA 70152.

**Global Catastrophes in Earth History: An Interdisciplinary Conference on Impacts, Volcanism and Mass Mortality**, October 20-23, 1988, Snowbird, Utah. Information: Global Catastrophes Conference, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX 77058-4399; (713) 486-2150.

**International Symposium on Remote Sensing of Environment**, October 20-26, 1988, Abidjan, Ivory Coast. Information: Alan K. Parker, P.O. Box 8618, Ann Arbor, MI 48107-8618; (313) 994-1200, ext. 3886.

**American Society of Civil Engineers Convention**, October 23-27, 1988, St. Louis, Missouri. Information: ASCE Conventions and Exhibits Dept., 345 East 47th St., New York, NY 10017; (212) 705-7543.

**IGCP Project 254, Metalliferous Black Shales and Related Ore Deposits, Annual Meeting**, October 29, 1988, Denver, Colorado. Information: Richard I. Grauch, U.S. Geological Survey, M.S. 973, Federal Center, Denver, CO 80225; (303) 236-5551.

**Geological Society of America 100th Annual Meeting**, October 31-November 3, 1988, Denver, Colorado. Information: Meetings Department, GSA, P.O. Box 9140, Boulder, CO 80301; (303) 447-2020.

**\*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.

**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.

(Continued on p. 267)

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SPE225, 160 p., hardbound, ISBN 0-8137-2225-X, list price \$37.50

**MEETINGS** (Continued from p. 266)

**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.

**GSA 1988**

**Centennial Celebration**, October 31-November 3, Denver, Colorado

**PENROSE CONFERENCE**

**Criteria for Establishing the Relative Timing of Pluton Emplacement and Regional Deformations**, September 10-15, 1988, California. Information: Scott R. Paterson, Earth Science Board, University of California, Santa Cruz, CA 95064; (408) 429-3251.

**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). (Abstracts deadline: October 14, 1988.)

**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.

**\*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.

(Continued on p. 268)

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**MEETINGS** (Continued from p. 267)

**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.

**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.

**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 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.

**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.

**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.

**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, Wash-

ington, D.C. Information: 28th International Geological Congress, 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.

**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.

**\*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.

**\*Structural and Tectonic Modelling and Its Application to Petroleum Geology**, October 18-20, 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.

**World Gold '89**, October 22-25, 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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**Memorial Preprints**

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

*James Boyd*, by G. Frank Joklik

*Charles W. Carlston*, by Philip E. LaMoreaux

*James R. Huff*, by William R. Fuller

*Victor C. Miller*, by Mary E. Westerback

*Raymond M. Thompson*, by Rick Nelson

*Walter Henry Voskuil*, by Jack A. Simon

## People

GSA Fellow **James D. Aitken**, Geological Survey of Canada, Calgary, has been awarded the 1988 R.J.W. Douglas Medal by the Canadian Society of Petroleum Geologists in recognition of outstanding contributions to the study of petroleum geology, regional tectonics, and structural geology.

Fellow and 1987 Day Medalist **Don L. Anderson**, California Institute of Technology, became president of the American Geophysical Union on July 1, 1988. Fellow **G. Brent Dalrymple**, U.S. Geological Survey, Menlo Park, became president-elect of AGU, and Fellow **Robert M. Hamilton**, U.S. Geological Survey, Reston, was elected president of the AGU Seismology Section.

Fellow **Donald L. Baars** has joined the staff of the Kansas Geological Survey at the University of Kansas, Lawrence, as a petroleum geologist.

Member **Jeanne E. Harris**, Equity Oil Company, Denver, is the new president of the Association for Women Geoscientists Foundation. Member **Fred Spilhaus**, American Geophysical Union, Washington, D.C., is a new director of the Foundation. Member **Kathleen M. Johnson**, U.S. Geological Survey, Denver, recently received one of three AWG Distinguished Service Awards.

Fellow and former GSA president **John C. Maxwell**, University of Texas, Austin, was awarded an honorary Doctor of Science degree by DePauw University, his alma mater, at its May 1988 commencement ceremonies.

Fellow **John B. Patton**, Bloomington, Indiana, has been named a 1988 recipient of the ASTM Award of Merit for his service on the ASTM committee for advancing the development of test methods and for the clarity that marks the standards on which he worked.

## CSCPRC Announces 1989-1990 China Programs

The Committee on Scholarly Communication with the People's Republic of China (CSCPRC) announces its 1989-1990 National Program of Scholarly Exchanges with China. The Visiting Scholar Exchange Program supports 1-3-month visits for American and Chinese scholars in all disciplines between September 1989 and August 1990. For Americans in natural sciences and engineering, the program supports scholars to initiate and conduct research. Priority will be given to projects in disciplines to which research in China can make a unique contribution and to those that are of mutual benefit to American and Chinese scientists. The program also supports the nomination of Chinese scholars in all disciplines

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by American scholars. Priority will be given to Chinese who have not visited the United States recently and to those whose visits will contribute to future academic exchanges. For both American and Chinese components, women, minorities, scholars beginning their careers, and scholars based at or visiting provincial institutions in China are especially encouraged. The deadline for application to the Visiting Scholar Exchange Program is **November 15, 1988**.

For application information on the program, write the Committee on Scholarly Communication with the People's Republic of China, National Academy of Sciences, 2101 Constitution Avenue, Washington, DC 20418.

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Annual Meeting details—GSA Meetings Department & August issue *News & Information*

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## Positions Open

The Department of Geology and Geography at Mount Holyoke College invites applications for a full-time, tenure-track position at the Assistant Professor level in a four-person geology program, beginning September 1989. Applicants must have completed all requirements for the Ph.D. before the appointment can be finalized. Some teaching experience is preferred, and a sincere commitment to high-quality teaching of excellent undergraduate students (both geology majors and non-majors) in a liberal-arts setting is essential. Applicants must also be willing to interact (both in teaching and in research) with faculty and graduate student colleagues in our local Five-College consortium. We solicit applications primarily from individuals with teaching/research competence in mineralogy, metamorphic petrology, and geophysics. Strong field orientation is important. Please send curriculum vitae, two-page statement of immediate teaching and research goals, and the names of three references to: Mark McMenamin, Dept. of Geology and Geography, Mt. Holyoke College, South Hadley, MA 01075, before December 15, 1988. Mount Holyoke College is an Affirmative Action/Equal Opportunity Employer.

### HYDROGEOLOGIST/WATER QUALITY

The Maryland Geological Survey, an agency of the Maryland Department of Natural Resources, invites applicants for a full-time contractual position in Hydrogeology with future potential for conversion to civil service status. The successful applicant will work as a project leader to establish and operate a State-wide ground-water quality monitoring network and to prepare reports based on data collection and analysis. A MS degree in hydrogeology or a related field is required minimally. Preference will be given to candidates with academic training and/or job experience in aqueous chemistry (or low-temperature geochemistry), well hydraulics, and subsurface fluid flow.

Depending on qualifications, the starting salary range is \$25,833 to \$30,061.

Send resume, transcripts, and references to: Personnel Officer (Code .002), Maryland Geological Survey, 2300 St. Paul Street, Baltimore, Maryland 21218.

The Maryland Geological Survey is an equal opportunity/affirmative action employer.

### LIMNOLOGICAL RESEARCH CENTER DIRECTOR UNIVERSITY OF MINNESOTA

The Limnological Research Center, the School of Earth Sciences of the University of Minnesota, an interdisciplinary center engaged in the study of lakes and lacustrine deposits worldwide, is searching for a new Director. Research in the center encompasses the full range of lake studies. We seek a new director who can maintain and expand a highly successful program based upon external funding, as well as cooperate with one or more of our active groups in geohydrology, geochemistry, sedimentology, ecology, and glacial geology. The Director will be a full time faculty member at the Professorial rank in the Department of Geology and Geophysics with appropriate responsibilities for direction of graduate students and teaching. Minimum qualifications are Ph.D. and 5 years of experience beyond the Ph.D. Send vita and names of five referees to K.L. Kleinspehn, LRC Search Committee Chair, Department of Geology and Geophysics, University of Minnesota, 310 Pillsbury Drive S.E., Minneapolis, MN 55455. Deadline for applications

is October 10, 1988. The University of Minnesota is an equal opportunity educator and employer and specifically invites and encourages applications from women and minorities.

### TECHNICIAN

#### University of Maryland

The Department of Geology invites applicants for a full-time, permanent technician position. Candidates should have technical experience in a laboratory of geology or other physical sciences which provided knowledge and skills in setting up, operating, and maintaining scientific or engineering instruments. Position effective in the Fall, 1988. Salary dependent upon qualifications and experience. Applicants should submit a summary of background and relevant work experience and names and addresses of 3 persons as references to Professor Luke L.Y. Chang, Chairman, Department of Geology, University of Maryland, College Park, Maryland 20742. The University of Maryland is an equal-opportunity/affirmative action employer.

### UNIVERSITY OF MARYLAND AT COLLEGE PARK PETROLOGIST

The Department of Geology invites applicants for a tenure-track position in petrology at the assistant professor level beginning spring or fall, 1989. We are seeking candidates who have clearly demonstrated the potential to be outstanding in research and in teaching both undergraduate and graduate courses. A vita, list of

## RESEARCH STRUCTURAL GEOLOGISTS

Amoco Production Company's Tulsa Research Center is seeking candidates for research positions in structural geology. The emphasis of research in our structural geology program is on the mechanics and seismic expression of macroscale structures and on the effects of deformation on reservoir quality. A strong application is made of geometric and finite element modeling as well as detailed field and core description.

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publications and the names of three references should be sent by December 1, 1988 to Chairman, Faculty Search Committee, Department of Geology, University of Maryland, College Park, Maryland 20742. The University of Maryland is an equal-opportunity/affirmative action employer.

### Consultants

**DR. J.W. SCHROEDER**, Geologist, since 1939, 2, Rue des Granges, GENEVA, Switzerland.

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## Clastic Sedimentary Geologist (Plano, Texas)

The Stratigraphic Exploration Research Group of the Research and Technical Services Organization of ARCO Oil and Gas Company has an immediate opening for a clastic sedimentary geologist. Your primary responsibility will involve the interpretation and quantification of sedimentary environments from cores, well logs, and outcrops, and integration with seismic sequence analysis. You will contribute to an ongoing research program to accurately predict the geologic occurrence of stratigraphic traps. You will also interact closely with operations personnel on exploration problems and participate actively in the Company's internal training program.

The position requires a PhD degree or equivalent, as well as demonstrated experience in clastic sedimentary geology. Experience in seismic sequence analysis is highly desirable.

Please send resume, college transcripts, salary history, and the names of three references to: Mr. Ronald L. Milam (CSG), ARCO Oil and Gas Company, P.O. Box 2819, PRC E-1709, Dallas, Texas 75221.

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### 1988 GeoRef Serials List and KWOC Index Available

The new edition of the *GeoRef Serials List and KWOC Index* includes more than 10,000 earth-science serials that have been cited in the GeoRef database since 1967. The Serials List is arranged alphabetically by title and provides the complete title, abbreviated title, CODEN or ISSN (or both), and country of publication for each entry. Many entries include notes on variant titles, CODENs, or ISSN. (CODENs and ISSN are standardized codes for serials, and both may be searched online.)

The KWOC (key words out of context) Index enables a user to identify a serial quickly by any significant word in the title. In this index, each significant word in the serial titles is listed alphabetically to the left of the title in which it occurs. For example, Finland has 22 entries, exploration 69, mineral 334, and soil 124. Each KWOC index entry consists of the entry word from the title, the title as it appears in the Serials List, its CODEN or ISSN (or both), and country code.

Serials account for about 75% of the 1.3 million references in the GeoRef database. Approximately 4000 different serials are scanned each year for inclusion in GeoRef. Listing of a serial in the GeoRef Serials List does not necessarily mean that it has been covered each year from 1967 to 1988. Questions on which issues of a particular serial have been included in GeoRef should be addressed to the AGI library.

The *GeoRef Serials List and KWOC Index* is available in hard

copy and microfiche from the Customer Service Department, American Geological Institute, 4220 King Street, Alexandria, VA 22302, (703) 379-2480 or (800) 336-4764. Paper copy (\$95) consists of 2185 unbound, prepunched, 8½" x 11" pages. A set of microfiche (\$35) includes 45 fiche (24x reduction).

### Association for Women Geoscientists Foundation Creates National Speakers Bureau

The Association for Women Geoscientists Foundation (AWGF) has created a national Speakers Bureau to serve as a clearinghouse for organizations and speakers on a wide-ranging variety of subjects. Topics include technical and nontechnical geoscience as well as women's issues.

Organizations and speakers may tap into this network by contacting Betsy Campen, P.O. Box 2393, Billings, MT 59103, (406) 652-1760. Basic information such as speaker's name, address, phone number, and title of her talk will be provided. Additional information regarding fees, transportation needs, and audio/visual requirements will be available. Further contact would be directly between the interested organization and the potential speaker.

For general information about the Speakers Bureau or other AWGF programs, contact Vicki Cowart, 21250 East 31st Circle, Aurora, CO 80011.

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**CENTENNIAL MEETING & EXHIBIT**

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