



## GSA NEWS & INFORMATION

Monthly Newsletter of  
The Geological Society of America

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## Four Named GSA Honorary Fellows

by Rick R. Nelson

The achievements of four internationally known geoscientists will be recognized at the Centennial Meeting of the Geological Society of America in Denver. GSA Council members, at their meeting last May, voted to confer Honorary Fellowship upon the four, who represent various disciplines and localities around the world. They are Ihsan Ketin of Istanbul, Turkey; Rupert W.R. Rutland of Canberra, Australia; Isabella Premoli-Silva of Milan, Italy; and Rashid A. Khan Tahirkheli of Peshawar, Pakistan.

GSA Honorary Fellowships are awarded to outstanding geologists who have distinguished themselves internationally through their geological work or have rendered special service to the Society. Most Honorary Fellows live outside North America.

### Ihsan Ketin

Ketin is often called the dean of Turkish geology, having taught a large number of Turkey's geologists himself over the past 30 years. He trained in Bonn under Penrose Medalist Hans Cloos and returned to Turkey to study the geology of his native land. With little support from his government, and for years alone in his pursuit, he studied and mapped large parts of the country. He compiled or helped with many of the 21 sheets making up the 1:500,000-scale map of Turkey. In 1948, Ketin recognized the North Anatolian fault as one of the major strike-slip faults in the world and mentioned an earthquake that might mark it as such; a later earthquake in the region confirmed his suggestion. This and other work enabled him to formulate a tectonic synthesis of Turkey, aspects of which were published in 1959 and 1966 by the Turkish Institute for Mineral Resources and Exploration (MTA).

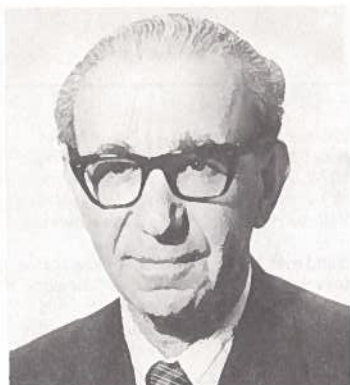
In addition to his considerable contributions to geological knowledge of Turkey and general tectonics, Ketin has been responsible for much of the development of geoscientific education in Turkey. In a country in which no research tradition existed in the natural sciences, he helped to establish a Department of Geophysics at the Istanbul Technical University. In 1983, he was named professor emeritus at the university. To this day, Ketin's personal library is one of the department's most prized resources. He has written four textbooks on structural geology and the geology of Turkey; these remain standard works in Turkish universities. He helped found the Turkish Geological Society and later served as its president. He was the Dean of the Faculty of Mines (twice) and served on the Turkish National Research Council.

Beginning with little more than a compass, a hammer, and his mind, Ketin has brought Turkish geology and geologists into the world geological community through 50 years of research and administrative work.

### Rupert W.R. Rutland

Roye Rutland began his career as a geologist with the Geological Survey of the United Kingdom, and later taught at the University of London. After two years as a structural geologist in Manila, he moved to Australia to head the geology department at the University of Adelaide, South Australia. In 1980, after 14 years at the university, he was appointed Director of Australia's Bureau of Mineral Resources, where he now serves.

Rutland's scientific contributions include clarification of the  
*(continued on p. 274)*



Ihsan Ketin



Rupert W.R. Rutland



Isabella Premoli-Silva



Rashid A.K. Tahirkheli

### Honorary Fellows (continued from p. 273)

structurally complex area around Broken Hill, New South Wales. This area had been studied for a century, but Rutland and his students realized that the section is overturned and explained the extraordinary structures. His contribution to the Phanerozoic tectonics of the northern boundary of the Australian block was an important addition to the first full-scale synthesis and continental map of the basement and basement-cover relations of Australia. Rutland was also convener for the 1976 IGC symposium "Structural Characteristics of Tectonic Zones."

Upon taking over as director of the Bureau of Mineral Resources in Canberra, Rutland moved quickly to restructure the internal workings of the bureau and brought in several outstanding geologists in the process. The result is a dramatic increase in the quantity and quality of work being done there.

Rutland is chairman of the Committee on Exchanges in Precambrian Geology with the USSR and is a member of the National Committee for Solid Earth Sciences of the Australian Academy of Sciences, and the Scientific Committee of the International Geological Correlation Program; he chaired the committee in 1983-1984.

### Isabella Premoli-Silva

Micropaleontologist Premoli-Silva has been affiliated with the University of Milan since her undergraduate days; she is now a professor there. Her research efforts, however, have spanned the globe, making her today one of the most active micropaleontologists in international geology. By applying micropaleontological techniques to the study of foram successions at Gubbio, she and co-workers laid the groundwork for the discovery of the iridium anomaly there. Their work also led to the calibration of Cretaceous magnetostratigraphy. She has also furthered the application of Milankovitch cycle stratigraphy on a global basis through her work on Umbrian Mesozoic stratigraphy.

Premoli-Silva has earned an international reputation for her work on board the *Glomar Challenger*. Participating in five DSDP drilling legs, she has made important contributions to Pacific Basin geology, both in biostratigraphy and in analysis of atoll histories in the Line and Marshall islands. Her work on Late Cretaceous benthic foram distribution from the Caribbean through the Pacific has supported arguments for a Pacific origin of the Venezuelan Basin and the evolution of the Caribbean. She has also served on numerous IPOD and ODP advisory panels and stratigraphic commissions. With her colleagues, Premoli-Silva has developed at the University of Milan an international center for micropaleontological studies.

### Rashid A. Khan Tahirkheli

Born in Pakistan and educated in Scotland, Tahirkheli returned in the 1950s to study the geology of his homeland. He ventured into the previously unmapped juncture of the Himalaya, Karakoram, and Hindu Kush Ranges in northern Pakistan, an area previously referred to as the "Great White Spot" in reference to its appearance on the 1964 geologic map of Pakistan. Traveling by Jeep and on foot, and using his knowledge of tribal languages along with tribal connections established during his childhood, he mapped an area never before seen by geologists. From this work, the picture of Himalayan continental collision in Pakistan finally became clear.

Early in his work, Tahirkheli sought help from the West in developing a modern program in geology at the University of Peshawar. Affiliations followed with French and British teams, and he attracted British petrologists and geochemists to work on the alkaline granites of the northern edge of the Peshawar basin. In the 1970s, he began affiliations with Dartmouth College, Columbia University, and the National Science Foundation to study the South Asian mammal stages using magnetostratigraphy and tephrochronology, work that culminated in age calibrating the Kamli stage. Around 1980, Tahirkheli began research in conjunction with Oregon State University, again with NSF support, working toward completing the geochronology of Himalayan granites and metamorphic rocks that is still in progress. His mapping in the Attock-Cherat Range was extended to reveal an imbricate thrust belt that indicates a previously unrecognized major tectonic event at the end of the Cretaceous.

Peshawar is near the border with Afghanistan, and native Pathans intermingle with some 3 million Afghan refugees. Tribal tensions are high, and campus and field work are often accompanied by distant gunfire and explosions. Despite adverse conditions, Tahirkheli and colleagues have established in Peshawar the National Centre of Excellence in Geology, and have attracted young faculty members with degrees earned in the West. With the help of Japanese financing, the Centre has added advanced analysis equipment. At the same time, the annual Bulletin of the Department of Geology published by the University of Peshawar has emerged as the leading earth-science journal in Pakistan; it receives contributions from both Western and Pakistani scientists.

Tahirkheli was awarded the Star of Imtiaz (the equivalent of the National Medal of Science in the United States) by the president of Pakistan. He served a five-year term as the vice-chancellor of the University of Peshawar, ending in 1987, and is now director of the National Centre for Excellence in Geology.

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## DNAG NEWS

by Allison R. (Pete) Palmer

### Hot off the press!

The Decade of North American Geology synthesis volume *Sedimentary Cover of the Craton: U.S.*, edited by L. L. Sloss was printed and distributed to all authors, co-authors, and holders of prepaid, time-pay, and standing orders for DNAG publications in September. This volume covers the Phanerozoic geology of the major sedimentary basins in the conterminous United States—from those in the Rocky Mountain region to the Appalachian and Black Warrior basins. It represents the combined efforts of 60 geologists from academia, industry, and state and federal agencies and is the fourth book completed in the series *The Geology of North America*.

The *Seismicity Map of North America* is also now printed. Both new products can be obtained from GSA Publication Sales.

### What About the Rest?

As of this writing, there is light at the end of the tunnel for five more of the volumes of this series that are being produced by GSA: *Hydrogeology*, *The Eastern Pacific Region*, *The Arctic Ocean Region*, *The Appalachian and Ouachita Regions*, and *The Caribbean Region*. The *Hydrogeology* volume will be at the printer by the time you

receive this. The others should be wrapped up and either printed or at the printer before the end of the year; each one is down to contributions or revisions from one or more of the volume editors!

Of the remaining volumes on *The Geology of North America*, to be produced by GSA, the volumes on the Cordilleran Region that cover the conterminous U.S. and Alaska, *The Gulf of Mexico Basin*, *Surface Water Hydrology*, *Quaternary Nonglacial Geology*, and *Economic Geology: U.S.* are moving slowly along but are not yet close enough to completion (albeit long overdue) for reasonable predictions to be made. Manuscripts are beginning to appear for volume A, a one-volume synthesis of North American geology, which is to be ready for the International Geological Congress, and translation has begun on chapter texts for the volume *Petroleum Geology of Mexico* being prepared by the geologists of PEMEX, and for the volume *Economic Geology of Mexico*, already printed in Spanish.

Several Canadian volumes are finished or nearly finished, but will be delayed by the need for them to be translated into French for simultaneous English and French publication.

## Call for Nominations for 1989 Penrose and Day Medals and Honorary Fellows

Nominations for GSA's two most prestigious awards, the Penrose and Day Medals, and for the esteemed Honorary Fellowships of the Society are due at headquarters by *February 1, 1989*. Members and Fellows of the Society are encouraged to participate in this important process by nominating candidates for these high honors.

### Penrose Medal

The Penrose Medal was established in 1927 by R.A.F. Penrose, Jr., to be awarded in recognition of eminent research in pure geology, for outstanding original contributions or achievements that mark a major advance in the science of geology. The award is made only at the discretion of the Council. Nominees are selected by the Council, may or may not be members of the Society, and may be from any nation. Penrose's sole objective in making the gift was to encourage original work in purely scientific geology.

### Day Medal

The Day Medal was established in 1948 by Arthur L. Day to be awarded annually, or less frequently, at the discretion of the Council, for outstanding distinction in contributing to geologic knowledge through the application of physics and chemistry to the solution of geologic problems. Day's intent was to recognize outstanding achievement and inspire further effort, rather than reward a distinguished career.

### Honorary Fellows

Honorary Fellows of the Society are generally selected from geologists throughout the world who have distinguished themselves as geological investigators or who have rendered special service to the Society. The candidates are usually residents outside North America.

### How To Nominate

To ensure thorough consideration by the respective committees, please submit for each candidate a brief biographical sketch, such as used in *American Men and Women of Science* and *Who's Who in America*, a summary of the candidate's scientific contributions to geology, and a selected bibliography of no more than 20 titles. In choosing candidates for the Penrose and Day Medals, scientific achievements should be considered rather than contributions in administration and service.

A nomination for any one of these three awards **MUST BE SUPPORTED** by signed letters from each of five (5) GSA Fellows or Members. The letters may be attached to the nomination form or may be sent to the Executive Director separately.

For the Penrose and Day Medals, the names of unsuccessful candidates proposed to the Council will remain for consideration by the respective committees for three years.

(Continued on p. 276)



**Call for Nominations** (continued from p. 275)

For Honorary Fellowships, the names of unsuccessful candidates proposed to the Council require a letter of renomination each year.

The deadline for the receipt of nominations at the office of the Executive Director is **FEBRUARY 1, 1989**.

The form for submitting the name of a candidate for any one of the awards is on pages 277-278.

Recipients of the awards to date are listed below.

**R.A.F. Penrose, Jr., Medalists**

1927	Thomas Chrowder Chamberlin	1947	Arthur Louis Day	1969	Francis Birch
1928	Jakob Johannes Sederholm	1948	Hans Cloos	1970	Ralph Alger Bagnold
1929	No award given	1949	Wendell P. Woodring	1971	Marshall Kay
1930	François Alfred Antoine Lacroix	1950	Morley Evans Wilson	1972	Wilmot H. Bradley
1931	William Morris Davis	1951	Pentti Eskola	1973	M. King Hubbert
1932	Edward Oscar Ulrich	1952	George Gaylord Simpson	1974	William Maurice Ewing
1933	Waldemar Lindgren	1953	Esper S. Larsen, Jr.	1975	Francis J. Pettijohn
1934	Charles Schuchert	1954	Arthur Francis Buddington	1976	Preston Cloud
1935	Reginald Aldworth Daly	1955	Maurice Gignoux	1977	Robert P. Sharp
1936	Arthur Philemon Coleman	1956	Arthur Holmes	1978	Robert M. Garrels
1937	No award given	1957	Bruno Sander	1979	J Harlen Bretz
1938	Andrew Cowper Lawson	1958	James Gilluly	1980	Hollis D. Hedberg
1939	William Berryman Scott	1959	Adolph Knopf	1981	John Rodgers
1940	Nelson Horatio Darton	1960	Walter Herman Bucher	1982	Aaron C. Waters
1941	Norman Levi Bowen	1961	Philip Henry Kuenen	1983	G. Arthur Cooper
1942	Charles Kenneth Leith	1962	Alfred Sherwood Romer	1984	Donald E. White
1943	No award given	1963	William Walden Rubey	1985	Rudolf Trümpy
1944	Bailey Willis	1964	Donnel Foster Hewett	1986	Laurence L. Sloss
1945	Felix Andries Vening-Meinesz	1965	Philip Burke King	1987	Marland P. Billings
1946	T. Wayland Vaughan	1966	Harry H. Hess	1988	Robert S. Dietz
		1967	Herbert Harold Read		
		1968	J. Tuzo Wilson		

**Arthur L. Day Medalists**

1948	George W. Morey	1961	Willard F. Libby	1976	Hans Ramberg
1949	William Maurice Ewing	1962	Hatten Schuyler Yoder	1977	Akiho Miyashiro
1950	Francis Birch	1963	Keith Edward Bullen	1978	Samuel Epstein
1951	Martin J. Buerger	1964	James Burleigh Thompson, Jr.	1979	Walter M. Elsasser
1952	Sterling Hendricks	1965	Walter H. Munk	1980	Henry G. Thode
1953	John F. Schairer	1966	Robert M. Garrels	1981	Donald L. Turcotte
1954	Marion King Hubbert	1967	O. Frank Tuttle	1982	Eugene M. Shoemaker
1955	Earl Ingerson	1968	Frederick J. Vine	1983	Harmon Craig
1956	Alfred O.C. Nier	1969	Harold C. Urey	1984	Wallace S. Broecker
1957	Hugo Benioff	1970	Gerald J. Wasserburg	1985	Freeman Gilbert
1958	John Verhoogen	1971	Hans P. Eugster	1986	E-an Zen
1959	Sir Edward C. Bullard	1972	Frank Press	1987	Don L. Anderson
1960	Konrad B. Krauskopf	1973	David T. Griggs	1988	Claude J. Allègre
		1974	A. E. Ringwood		
		1975	Allan Cox		

**Honorary Fellows**

Neil Armstrong	Dorothy Hill	Alexander B. Ronov
Jean A. Aubouin	Kenneth J. Hsü	Rupert W.R. Rutland
Ralph A. Bagnold	Jiqing Huang	Hitoshi Sakai
V. V. Beloussov	Emilie Jager	Mircea Sandulescu
Krzysztof Ludwik Birkenmajer	Harold Jeffreys	Harrison Hagan Schmitt
Roland Brinkmann	Ihsan Ketin	Eugen Seibold
S. Warren Carey	Teiichi Kobayashi	Ahti J. Simonen
Maria Bianca Cita	Dmitri S. Korzhinskii	Boris Sergeevich Sokolov
Michael Collins	Henno Martin	John Sutton
William Compston	Michael W. McElhinny	Rashid A. Khan Tahirkheli
Douglas Saxon Coombs	Mervyn Silas Paterson	Bernard P. Tissot
Kingsley C. Dunham	Leo Y. Picard	Livio Trevisan
Stanislaw Dzulynski	Wallace S. Pitcher	Rudolf Trümpy
William S. Fyfe	Jean Piveteau	Guangzhi Tu
Augusto Gansser	Isabella Premoli-Silva	Harry B. Whittington
Martin F. Glaessner	Desmond A. Pretorius	Alwyn Williams
David Headley Green	Hans Ramberg	Quido Zaruba
	John G. Ramsay	
	Alfred Rittmann	

THE GEOLOGICAL SOCIETY OF AMERICA

**Nomination for Penrose Medal, Day Medal, or Honorary Fellowship  
(please circle one)**

DEADLINE: Please return this form to headquarters by **February 1**.

NAME OF CANDIDATE:

ADDRESS:

BIOGRAPHICAL INFORMATION: (suggested sources)

American Men and Women of Science

Who's Who in America

GSA Service Record (obtainable from headquarters)

Other

SUMMARY OF SCIENTIFIC CONTRIBUTIONS TO GEOLOGY:  
(not more than 200 words)

**SELECTED BIBLIOGRAPHY:**  
(no more than 20 titles)

A nomination for any one of these three awards **MUST BE SUPPORTED** by signed letters from each of five (5) GSA Fellows or Members. The letters may be attached to this nomination form or may be sent to the Executive Director separately.

Name of person making the nomination: \_\_\_\_\_

Address: \_\_\_\_\_

Date: \_\_\_\_\_ Signature: \_\_\_\_\_

**LETTERS OF SUPPORT WILL BE SUBMITTED BY:**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

**RETURN TO:** Executive Director  
The Geological Society of America  
P.O. Box 9140  
Boulder, CO 80301  
(303) 447-2020

**DEADLINE:** Please return this form to headquarters by February 1.



# FOUNDATION NEWS

by Robert L. Fuchs

## Century Challenge—The Countdown Begins

1988 is the year of the Centennial—and the Century Challenge. Only three months remain for you to join the Century Challenge program and make a birthday gift to GSA. Remember that for every \$10 contributed or pledged to the Century Challenge, the Foundation Trustees will add \$1.

Those who contribute at or prior to the Centennial Celebration (October 31–November 3, 1988) will receive special recognition at the meeting. Visit the Foundation's booth in the exhibit area, #331, and receive a gift of appreciation.

Century Challenge contributors will also be eligible to win free airfare for two anywhere in the U.S. lower 48 states. The winner will be chosen at the close of the Centennial meeting, so make sure that we receive your contribution well in advance either by mail or in person at the Foundation's booth.

## Planned Giving, Part I—The Best of Both Worlds

Charitable giving can be broadly classified into two categories: present gifts and deferred gifts. Present gifts are as one would expect from the term—the donor transfers possession and use of the gift to the donee at the time the gift is made. In the case of deferred giving, the donor also makes a current gift, but it is a gift of a future interest. Understandably, such a gift brings with it certain complexities. However, the benefits can be of long-term importance to both the donor and the donee.

Planned or deferred gifts provide opportunities to design a long-term estate or financial plan from a variety of structuring options. In addition to an immediate tax deduction such gifts can provide life income, continued use of the gift property, and the avoidance of capital gains taxes. While clearly a more sophisticated charitable contribution technique than the immediate outright gift, deferred giving is a sort of charitable alchemy, allowing the giver to enjoy the best of both worlds.

A geologist plans to retire in the near future. During the course of her career she has invested wisely and accumulated a portfolio of high-grade stocks and bonds, the current value of which is approaching \$750,000. Her final year of full-time employment is proving to be a year of high income, and consequently she could benefit from a larger than normal tax deduction. A contribution of securities to the GSA Foundation valued at \$35,000 would achieve the desired tax deduction, but with retirement coming on, she feels she can ill afford to give up the income that these securities would generate in future years.

The solution to this scientist's dilemma is a deferred giving trust that allows her to make a significant lifetime gift without sacrificing needed income. This is done by dividing the gift property into two parts. Through the mechanism of this trust, she retains the first part—the life income interest. She gives the GSA Foundation the second part—the remainder interest. At the time of her death the Foundation gains full possession and use of the total property.

One of the reasons to make this gift was to receive a tax deduction in the current year. While this deferred giving trust yields a tax deduction, the actual amount of the deduction depends on the present worth of the projected future value of the remainder interest that passes to the Foundation. This present worth is calculated by taking into account factors such as the life expectancy of the donor

based on actuarial tables and the rate of payout to the income beneficiary during her lifetime. Thus, her contribution to a deferred trust would have to be greater than \$35,000 in order to achieve a tax deduction in that amount.

Planned Giving, Part II, in the next issue of *GSA News & Information* will discuss several types of trusts that can be used to accomplish a deferred gift—annuity trust, unitrust, and pooled income trust. If you can't wait until next month to learn more, mail us the coupon or call, and we'll be pleased to send you two booklets about these trusts.

## Donors to the GSA Foundation, July 1988

*Centennial/DNAG*  
Chevron, U.S.A., Inc.

Malcolm P. Weiss  
Virgil Winkler  
Lynn A. Yehle  
Shizuo Yoshida



*Century Challenge*  
Timothy Bowers  
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3300 Penrose Place, P.O. Box 9140  
Boulder, CO 80301

*Supporting The Advancement of Research*

To help me in my financial planning, please send me the deferred giving booklets *The Remarkable Unitrust* and *The Charitable Gift Annuity*.

Please print:

Name \_\_\_\_\_

Address \_\_\_\_\_

City/State \_\_\_\_\_

Phone \_\_\_\_\_

## Review of Activities

by Jim Evans  
GSA Congressional Science Fellow



I have been asked to provide a short summary of the types of activities one is involved in as a Congressional Fellow, and a brief description of current and future legislative issues. My Fellowship started on September 9, 1987. The first two weeks were spent in a series of meetings arranged by the American Association for the Advancement of Science for all of the Congressional Fellows. The orientation process featured speakers from the Congressional Research Service (Library of Congress), Office of Technology Assessment, General Accounting Office, Congressional Budget Office, Office of Management and Budget, Department of State, Department of Defense, and Congressional staffers. The orientation process was invaluable toward understanding the legislative process and providing insight about upcoming issues.

I chose a position with Congressman Mike Lowry (D-Wash.), who is chairman of the Subcommittee on Oceanography in the House Committee of Merchant Marine and Fisheries. I arranged to work on Lowry's personal staff, but also to be involved with selected subcommittee issues, especially the Arctic National Wildlife Refuge, contaminated sediments, and ocean dumping. As part of my role on Lowry's personal staff, I have dealt with issues related to nuclear waste disposal, hazardous wastes, wild and scenic river protection, wilderness issues, endangered species protection, U.S. Forest Service issues, and the Clean Air Act.

Here is a partial list of specific activities I have been involved in as your Congressional Fellow:

1. Attended Field Hearing in Detroit on the effects of water-level changes on coastal erosion in the Great Lakes (October 16, 1987).
2. Participated in GSA's Geology and Public Policy Congressional Fellow Forum, Phoenix, Arizona (October 26-30, 1987).
3. Was liaison to USGS/NOAA Symposium on the Exclusive Economic Zone (November 17-18, 1987).
4. Was liaison to National Research Council's Marine Board Committee on Contaminated Sediments (November 19-20, 1987) and field hearings (May 31-June 2, 1988).
5. Prepared a major speech for Congressman Lowry on nuclear waste management for the Symposium on National Defense Waste Issues, Whitman College, Walla Walla, Washington (January 15-16, 1988).
6. Initiated a study by the General Accounting Office, sponsored by Congressman Lowry and Congressman Gerry Studds (D-Mass.). The GAO study will investigate the assumptions used by the U.S. Forest Service in setting the timber harvest yields in the Pacific Northwest region. The study will also evaluate whether the "indicator species" concept used by federal agencies is successful in its goal of protection of critical habitat for species of special concern. Finally, the study will also investigate the recent decision by the U.S. Fish and Wildlife Service not to list the Northern Spotted Owl as an endangered or threatened species. The status of the spotted owl affects timber sales on federal lands valued in hundreds of millions of dollars, and there is evidence that a political, rather than scientific, decision was made regarding its protection level.
7. Initiated a study by the Office of Technology Assessment (OTA), sponsored by Congressmen Lowry, Studds, Walter Jones (D-N.C.), and Morris Udall (D-Ariz.), which will focus on the

problem of defense wastes at the Hanford Nuclear Facility in central Washington State. OTA is to evaluate the magnitude of the current health threat from radionuclides in ground water, contamination of the Columbia River by seepage, and distribution of radionuclides by dust (from dumping in surface soil pits). OTA is to prioritize clean-up efforts and calculate probable cost estimates. Finally, the major assignment for OTA is to analyze the needs for advances in clean-up technology at this and other sites that are heavily contaminated with radioactivity.

8. Helped to prepare H.R. 1260, Lowry's National Seabed Hard Minerals Act, and contacted members of the earth science community for expert advice and comments on the legislation.

9. Helped to prepare H.R. 4343, Lowry's Arctic National Wildlife Refuge Energy Plan Act. Lowry's bill would have prohibited drilling in the Arctic National Wildlife Refuge (ANWR) pending completion of a national energy plan that must fully consider the potential contributions of energy conservation and alternative energy sources. This bill was offered as an amendment on H.R. 3601, Jones's ANWR bill, but was defeated in committee. If H.R. 3601 reaches the House floor, Lowry's bill may be offered again as an amendment.

10. Attended the American Association for the Advancement of Science 1988 Research and Development Colloquium (April 14-15, 1988).

11. Prepared testimony before the Appropriations Committee to increase funding for the Land & Water Conservation Funds, to reallocate funds from the Forest Service road building budget to fish and wildlife and recreation programs, and to defer timber sales in certain tracts of old-growth forest.

12. Prepared testimony before the Appropriations Committee to obtain \$4.5 million for the Federal Centers For Disease Control to conduct a three-year study on the health effects of radioactive iodine releases from the Hanford Nuclear Facility. Uncontrolled iodine-131 releases from this facility during the late 1940s have been correlated with high local incidence of thyroid cancer.

13. Worked with other Congressional offices to secure \$2 million in Department of Labor discretionary funds to help in worker retraining and relocation after closing of the N-reactor and Basalt Waste Isolation Project (geologic repository) at Hanford.

### Current and Future Legislative Issues

*Clean Air Act reauthorization* (carbon monoxide and ozone nonattainment, acid-rain legislation). In the Senate, an omnibus clean air bill (S.1894) was reported out of committee October 22, 1987, and has not yet been scheduled for floor action. In the House, H.R. 2666 (acid rain) and H.R. 3054 (nonattainment) are facing

(Continued on p. 281)



### Report from Washington (continued from p. 280)

action in the Energy and Commerce Committee. A major conflict between Subcommittee Chairman Waxman and Chairman Dingell has stalled these bills. Recently, nine committee Democrats have proposed compromise legislation, but this bill is far from successful passage.

**Indoor Air Pollution** (radon and hazardous substances). In the Senate, a radon protection bill (S.744) passed full committee markup on June 17, 1987, and was passed by the Senate July 8, 1987. An indoor air quality bill (S.1629) is expected to be marked up soon. In the House, a radon protection bill (H.R. 2837), similar to S.744, has been reported to the full committee (Energy and Commerce). A bill to require EPA to set safe radon standards (H.R. 3110) may be added to H.R. 2837 in markup. A companion bill to S.1629 (H.R. 3809) was recently introduced, and faces hearings.

**Arctic National Wildlife Refuge (ANWR)**. In the Senate, the Energy Committee completed full markup of the pro-leasing bill (S.1217, now called S.2114). It is ready for floor action. An attempted amendment requiring completion of a national energy plan prior to leasing ANWR failed in committee, but may be attempted again on the floor. Hearings are being held on the ANWR wilderness bill (S.1804). In the House, hearings continue on H.R. 39 (ANWR wilderness), H.R. 1082 (pro-leasing), and H.R. 3601 (phased-leasing bill). H.R. 3601 has cleared the House Merchant Marine Committee and has been referred to the House Interior Committee. A new bill (H.R. 4343), requiring a national energy plan prior to leasing, was offered as an amendment to H.R. 3601, but was defeated.

**Ground Water**. The House passed a USGS ground-water research bill (H.R. 791) on December 2, 1987. A comprehensive ground-water protection bill (H.R. 963) has been introduced, and faces more hearings. In the Senate, S.20 is the companion of H.R. 963, and S.1105 is the companion of H.R. 791. In addition, S.2091 is a ground-water contaminants bill. All of these bills face additional hearings.

**Nuclear Waste**. The language of the 1987 Budget Reconciliation Act (P.L. 100-203) authorizes studies to determine if Yucca Mountain, Nevada, is suitable for a high-level waste repository and starts a new search for an MRS site in the east.

**Oil Spills**. In the House, H.R. 1632, a comprehensive oil spill liability and compensation bill, passed the full committee (Merchant Marine and Fisheries). This legislation was added to the Budget Reconciliation bill (H.R. 3545) but was dropped in conference committee after the Senate agreed to work on oil spill legislation in 1988.

**Pesticides**. In the Senate, markup is expected on two bills (S.1516 and S.2035) to revise the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). In the House, markup of the FIFRA bill (H.R. 2463) has not been scheduled. Significant issues on these bills

include fees for reregistering pesticides, pesticide residues in food, ground-water pollution, and monitoring.

**Resource Conservation and Recovery Act (RCRA) Reauthorization**. Efforts this year focus on Subtitle D, solid-waste management provisions. There are many bills that will probably be combined at a later time. H.R. 3515 concerns disposal of medical wastes. H.R. 3516 regards interstate transport of solid wastes. H.R. 3478 bans dumping of medical wastes in navigable waters. Five bills regard management of hazardous and radioactive wastes at federal facilities (H.R. 3781, 3782, 3783, 3784, 3785). Three bills deal with reduction of hazardous wastes (H.R. 2599, 2800, 3094). H.R. 2517 concerns disposal of incinerator ash. H.R. 3595 concerns marine transport of hazardous wastes. In the Senate, S.1331 concerns waste reduction, S.1566 concerns incinerator ash, and S.1751 concerns marine transport of wastes. Hearings continue on all of these.

**Appropriations**. Subcommittee hearings continue on the FY89 federal budget. See my article in the June 1988 issue of *GSA News & Information* about the budget process.

### Procedures for Contacting Your Legislators

The best procedure is to contact directly the staff of the relevant subcommittee or committee. The Congressional Fellow can provide valuable assistance in helping you identify the correct subcommittee or committee for each issue. After discussing concerns about a particular piece of legislation, the geologist may be asked to provide written or verbal testimony at a hearing or to provide some other input (such as a critique of a bill). The situation depends quite heavily on the status of the bill.

As a general policy, it may be wise for interested earth scientists to make general contacts with the staff of committees that have jurisdiction over areas of particular interest. These general contacts might include visiting and talking to staff members on the Hill, sending them briefing papers or background information, or other activities. The goal of these activities is to make the necessary contacts so that when important issues arise, the appropriate earth scientists are consulted.

### Meet the GSA Congressional Science Fellow

An open forum has been scheduled by the GSA Geology and Public Policy Committee during the 1988 Annual Meeting in Denver. Jim Evans will be available at the informal lunch-hour session on Tuesday, November 1, from 12:15 to 1:15 p.m., in the Denver Convention Complex, Room 2AF.

### November 30 Is 1989 Dues Deadline

Last year, most GSA members remitted their annual dues payment before the November 30 deadline. As a result, they received their GSA publications without delay. This year, the timing is again critical because all section meeting *Abstracts with Programs* will be mailed to members early in 1989. If we do not receive your dues payment before the November 30 deadline, you may not receive that much-needed *Abstracts with Programs* in time for the section meeting that you plan to attend. Remember, back orders take 6 to 8 weeks to reach you! Please use the 1989 dues and publications selection form mailed to you earlier. Dues for 1989 are \$70 for Members and Fellows and \$32 for Students.

If you have any questions, please call or write the GSA Membership Department, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020.

Preliminary Announcement and Call for Papers

**SOUTHEASTERN SECTION, GSA, 38th Annual Meeting**

**Atlanta, Georgia  
April 6-7, 1989**

The Southeastern Section of the Geological Society of America will meet at the Radisson Hotel in Atlanta. The meeting is sponsored by the Georgia Geological Survey with the cooperation of Columbus College, Georgia State University, University of Georgia, Georgia Institute of Technology, Atlanta Testing and Engineering Co., Golder Associates, and New Riverside Ochre Co.

**CALL FOR PAPERS AND SYMPOSIA**

Papers are invited for presentation at technical and poster sessions and symposia. A maximum of 15 minutes for presentation and 5 minutes for discussion will be allowed in the technical sessions. Papers of regional interest to geologists in the southeastern United States as well as those of general geological interest will be considered for the program. Abstracts not accepted for symposia may be considered for regular technical sessions. The co-chairmen for the technical program also solicit suggestions for additional symposia.

**SYMPOSIA**

- 1. Geologic Mapping in the Southeastern United States.** Michael W. Higgins, U.S. Geological Survey, 6481 Peachtree Industrial Blvd., Doraville, GA 30630; Thomas J. Crawford, Dept. Geology, West Georgia College, Carrollton, GA 30117.
- 2. Metallic Ore Deposits in the Southeastern United States.** Robert B. Cook, Dept. Geology, Auburn University, Auburn, AL 36830.
- 3. Industrial Minerals in the Southeastern United States.** Samuel M. Pickering, Georgia Kaolin Company, Deepstep Office, P.O. Box 1301, Sandersville, GA 31082.
- 4. Hydrogeology in the Southeastern United States.** Ram Arora, Dept. Geology, Georgia State University, Atlanta, GA 30303.
- 5. Tectonic and Thermal Evolution of the Southern Appalachians.** James A. Whitney, Dept. Geology, University of Georgia, Athens, GA 30602.
- 6. Tectonics and Sedimentation of the Southern Appalachians.** Elizabeth A. Gordon, Dept. Geology, University of Georgia, Athens, GA 30602.
- 7. Chronostratigraphic Boundaries in the Southeastern United States.** Thomas W. Broadhead, Dept. Geological Sciences, University of Tennessee, Knoxville, TN 37916; Johnny A. Waters, Dept. Geology, West Georgia College, Carrollton, GA 30117.
- 8. Stratigraphy and Sedimentology of the Murphy Belt.** Timothy E. LaTour, William J. Fritz, Dept. Geology, Georgia State University, Atlanta, GA 30303.

**ABSTRACTS**

Abstracts are limited to 250 words and must be submitted camera-ready on official 1989 GSA abstract forms, available from Abstracts Coordinator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301, (303) 447-8850.

Abstracts for the symposia, oral technical sessions, and poster sessions should be sent to either William J. Fritz, Dept. Geology, Georgia State University, Atlanta, GA 30303, or James A. Whitney, Dept. Geology, University of Georgia, Athens, GA 30602. One original and five copies must be submitted.

**Abstracts must be received by November 18, 1988**

**FIELD TRIPS**

- 1. Stratigraphy and Structural Geology of the Western Blue Ridge between Eastern Alabama and Southern North Carolina and Tennessee.** John Costello, James Tull, Mark Groszcos, Stephen Kish.
- 2. Stone Mountain Granite and Mount Arabia Migmatite.** William B. Size.
- 3. The Pennsylvanian System in Georgia; Stratigraphy, Structure, Paleontology, and Coal Resources.** Thomas J. Crawford, William H. Gillespie, Johnny A. Waters.
- 4. The Late Eocene and Early Oligocene Carbonate Environments of Central and Southwestern Georgia.** Burchard D. Carter, John P. Manker.
- 5. Structure, Tectonics, and Ore Potential along a Transect across the Inner Piedmont, Charlotte Belt, Slate Belt, and Kiokee Belt of Eastern Georgia.** Gilles Allard, James A. Whitney.
- 6. A New Look at the "Murphy Structure" and a New Interpretation of the Geologic Framework of Northern Georgia and Southern North Carolina.** Michael W. Higgins, Ralph F. Crawford, Thomas J. Crawford, Charles W. Cressler.
- 7. Hydrogeology of Crystalline Rocks.** Douglas Gouzie, N. Peters.
- 8. Hydrogeology of Saprolite and Hard Rock Aquifers in the Blue Ridge and Piedmont of Northeastern Georgia and Northwestern South Carolina.** Tom Schmitt, James Ligon, Robert Atkins, Thomas J. Crawford, Richard White.
- 9. Structure, Stratigraphy, and Economic Geology of a Tertiary Kaolin Deposit in the Eastern Piedmont of Georgia.** Sam M. Pickering.
- 10. Structural and Stratigraphic Comparisons between Thrust Sheets in Portions of the Valley and Ridge Provinces of Georgia and Alabama.** Timothy M. Chowms, W. Edward Osborne.

**PROJECTION EQUIPMENT**

Equipment will be provided for standard 2" x 2" slides, which must fit a 35-mm carousel tray. Please bring your own loaded carousel trays, if possible. Only a single projector will routinely be provided at each session. Overhead projectors will normally not be provided. Requests for special projection needs must be made well in advance.

**EXHIBITS**

Exhibits representing education, research, and industry will be on display at the meeting site. For further information, contact L. T. Gregg, Atlanta Testing & Engineering, 11420 Johns Creek Parkway, Duluth, GA 30136, (404) 476-3555 or Kevin Beck, School  
*(continued on p. 283)*

**Southeastern Section** (continued from p. 282)  
of Geophysical Sciences, Georgia Institute of Technology, Atlanta,  
GA 30332, (404) 894-2857.

Inquiries, additional information, requests, or suggestions  
should be addressed to:

Earl A. Shapiro  
Georgia Geological Survey  
Room 400, 19 MLK, Jr., Dr., SW  
Atlanta, GA 30334  
(404) 656-3214

#### 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.

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### Preliminary Announcement and Call for Papers

## NORTH-CENTRAL SECTION, GSA, 23rd Annual Meeting

Notre Dame, Indiana  
April 20-21, 1989

The North-Central Section of the Geological Society of America will meet at the Center for Continuing Education, University of Notre Dame. The meeting will be hosted by the Department of Earth Sciences, University of Notre Dame, in cooperation with the Indiana Geological Survey, the Department of Geology, Indiana University (Bloomington), and the Department of Earth and Atmospheric Sciences, Purdue University. The North-Central Section of GSA will meet jointly with the North-Central Section of the Paleontological Society, the Great Lakes Section of the Society of Economic Paleontologists and Mineralogists, the Pander Society, and the East-Central Section of the National Association of Geology Teachers.

#### CALL FOR PAPERS

Technical sessions will include all topics listed on the GSA abstract form. Papers, poster sessions, and symposia on these and other subject areas are solicited. Special sessions focused on specific themes or subjects will be arranged by the local program committee after review of the abstracts. The time allotted for the oral presentations will be 15 minutes, followed by 5 minutes for discussion.

#### REGISTRATION

Preregistration will be by mail. On-site registration will take place on Wednesday, April 19, from 4 to 5 p.m. at the Center for Continuing Education and will continue there daily from 7:30 a.m. to 5 p.m. for the duration of the meeting. Preregistration fees will be \$35 for professional GSA members or members of societies jointly meeting with GSA and \$10 for GSA Student Associates. For those not affiliated with GSA, preregistration fees will be \$45 for professionals and \$15 for students. On-site registration will be \$10 additional for professionals; \$5 additional for students. *Please take advantage of the lower preregistration fees.*

PREREGISTER BY MARCH 31, 1989.

#### SYMPOSIA

- Structure and Tectonics of the Midcontinent.** Lawrence W. Braile, William J. Hinze, Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Indiana.
- Ground-water Supplies and Associated Problems in the Midcontinent.** Konrad J. Banaszak, U.S. Geological Survey, Indianapolis; William Steen, Ground Water Section, Indiana Department of Natural Resources, Indianapolis.
- Industrial Minerals and the Environment.** Donald D. Carr, Indiana Geological Survey, Bloomington; Haydn H. Murray, Department of Geology, Indiana University, Bloomington.

- Shoreline Behavior in Response to Lake-level Variations, Modern and Ancient** (Society of Economic Paleontologists and Mineralogists Symposium). Todd Thompson, Indiana Geological Survey, Bloomington; William Wood, Department of Civil Engineering, Purdue University, West Lafayette, Indiana.

- Applied Quaternary Geology and Geophysics.** Ned K. Bleuer, Gordon S. Fraser, Indiana Geological Survey, Bloomington.

- Biological Extinction in the Geologic Record.** J. Jack Sepkoski, Department of Geological Sciences, University of Chicago.

- Fossils as Living Organisms** (Paleontological Society Symposium). William I. Ausich, Department of Geology and Mineralogy, Ohio State University, Columbus.

- Pander Society Symposium.** Carl B. Rexroad, Indiana Geological Survey, Bloomington.

- Evolving Earth Science Education** (National Association of Geology Teachers Symposium). J. Stewart Monroe, Department of Geology, Central Michigan University, Mount Pleasant.

#### FIELD TRIPS

- The Kentland, Indiana, Structural Anomaly.** Attila Aydin, Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, Indiana; Gary L. Pavlis, Department of Geology, Indiana University, Bloomington.

- Shoreline Deposition and Erosion in Northwest Indiana.** Todd Thompson, Indiana Geological Survey, Bloomington; William Wood, Department of Civil Engineering, Purdue University, West Lafayette, Indiana; Steve Davis, Indiana Department of Natural Resources, Indianapolis.

- Quaternary Geology of the Kankakee-Tippecanoe Area, Northwestern Indiana.** Richard Dunning, Department of Geography, Valparaiso University, Valparaiso, Indiana; Wilton N. Melhorn, Department of Earth and Atmospheric Sciences, Purdue

(continued on p. 284)



**North-Central Section** (continued from p. 283)  
University, West Lafayette, Indiana; Allan F. Schneider, Department  
of Geology, University of Wisconsin—Parkside, Kenosha.

### POSTER SESSIONS

Ample space will be provided for poster sessions; we strongly encourage student and professional members to take advantage of this highly effective means of communication. *Please indicate "poster session" on the GSA abstract form.* Poster sessions will be available for viewing for one-half day.

### ABSTRACTS

GSA Abstracts for oral and poster sessions are limited to approximately 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) 447-8850

and from GSA Campus Representatives at all college and university campuses.

### ABSTRACTS ARE DUE DECEMBER 1, 1988

Send one original and five copies to:

Michael J. Murphy, GSA General Chairman  
Department of Earth Sciences  
University of Notre Dame  
Notre Dame, IN 46556-1020

All abstracts will be reviewed for informative content, correct structure, reliability of data, appropriate geographic coverage, and originality. Authors will be notified of acceptance well in advance of the meeting.

### PROJECTION EQUIPMENT

Projection equipment will be provided for 2" × 2" slides only. *Please bring your own loaded carousel trays identified with your name, session, and speaker number.* A speaker ready room equipped with projectors will be available for review and practice.

### BUSINESS MEETING

The GSA North-Central Section will hold its business meeting with breakfast at the Morris Inn on Thursday, April 20, 1989, at 7 a.m.

### EXHIBITS

Exhibits of educational and commercial organizations will be on display at the Center for Continuing Education in proximity to the area for poster sessions. *Exhibit space must be reserved by February 1, 1989.* For exhibitor information, contact General Chairman Michael J. Murphy.

### SOCIAL EVENTS

A reception will be held on the evening of Wednesday, April 19, 1989, at the University of Notre Dame Alumni/Senior Club from 7 to 9 p.m. On Thursday evening the annual banquet of the North-Central Section will be held at the Monogram Room of the Joyce Athletic and Convocation Center at 7:15 p.m.

### HOUSING

The Morris Inn, across the road from the University of Notre Dame Center for Continuing Education and connected to it by an

underground tunnel, will be the headquarters for the 1989 GSA North-Central Section Meeting. Accommodations are also available at other hotels and motels. Shuttle buses providing transportation from most of the motels will run from 7 to 9:30 p.m. Wednesday evening and from 7 to 9 a.m., 11:30 a.m. to 1:30 p.m., and 3:30 to 5:30 p.m. Thursday and Friday. Bus service will also be available for transportation to and from the banquet on Thursday evening.

### TRAVEL ARRANGEMENTS

The University of Notre Dame is located in northern Indiana, about equally distant from the Illinois and Ohio borders and less than 10 miles south of the Michigan State Line. The Indiana Toll Road is just north of the university. The exit for Notre Dame connects with U.S. 33 on the northwest corner of the Notre Dame campus. Most of the motels that will be used for the meeting are located north of the Toll Road on U.S. 33 within 1 mile of the exit.

Michiana Regional Airport, serving South Bend and surrounding cities, is located about 5 miles west of Notre Dame. It is serviced by Northwest, Piedmont, and United Express. Most major airlines have air link service connecting with O'Hare Airport about 60 air miles west in Chicago.

### DETAILED INFORMATION

Information concerning registration, hotel accommodations, and other activities will appear in a future issue of *GSA News & Information* and as part of *Abstracts with Programs* for 1989.

Symposia and field trips listed for this meeting are tentative; further suggestions are always appreciated. Inquiries, additional information, requests, or suggestions should be directed to

Michael J. Murphy, GSA General Chairman  
Department of Earth Sciences  
University of Notre Dame  
Notre Dame, IN 46556-1020

### STUDENT PAPERS AND TRAVEL ASSISTANCE

The North-Central Section of GSA will award \$100 to each of the four best papers written and presented solely by graduate or undergraduate students. Abstracts submitted for these awards must be clearly indicated. In addition, awards for travel assistance will be made to students who are members of the GSA North-Central Section as of January 1, 1989. The student must present a paper at the meeting (can be a co-author). Applications for awards may be obtained by writing to the General Chairman. Applications must be submitted before February 15, 1989.

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### People

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GSA Member **Allan H. Atkinson** has joined the San Francisco office of Dames & Moore as a senior geologist. Member **Lloyd Cluff**, San Francisco, has been appointed chairman of the California Seismic Safety Commission. Fellow **Philip Cohen**, U.S. Geological Survey, Reston, Virginia, has received a Presidential Distinguished Rank Award. Member **Kim L. Marcus** has joined the Portland, Oregon, office of Dames & Moore as a senior geologist. Member **Bimal Mukhopadhyay**, Albuquerque, New Mexico, has joined Roy F. Weston, Inc., as a senior project manager. Fellow **Jack E. Oliver**, Cornell University, has been awarded an honorary Doctor of Science degree by Hamilton College, Clinton, New York. Fellow **Donald D. Runnells**, University of Colorado, Boulder, has been elected second vice-president of the Association of Exploration Geochemists. Member **Lawrence S. Sims** is directing operations at Geraghty & Miller's new Melbourne, Florida, office.



Preliminary Announcement and Call for Papers

**CORDILLERAN SECTION, GSA, 85th Annual Meeting**  
**ROCKY MOUNTAIN SECTION, GSA, 42nd Annual Meeting**

**Spokane, Washington**  
**May 8-11, 1989**



The Cordilleran and Rocky Mountain Sections of the Geological Society of America will meet jointly at the Spokane Convention Center in Spokane, Washington, in conjunction with the Rocky Mountain and Pacific Sections of the Paleontological Society, the Pacific Northwest Section of the National Association of Geology Teachers, and the Association for Women Geoscientists. The meeting is cosponsored by the Department of Geology, Eastern Washington University, Cheney, Washington, and the Department of Geology and Geological Engineering, University of Idaho, Moscow, Idaho. The meeting is also hosted by the Spokane office of the Geologic Division, U.S. Geological Survey; the Western Field Operations Center, U.S. Bureau of Mines; the Northwest Mining Association; the Washington State Department of Natural Resources, Division of Geology and Earth Resources; and the Idaho Geological Survey.

**ENVIRONMENT**

Spokane is a medium-sized city with many of the amenities of larger metropolitan areas, but with few of the hassles. It is situated between the Cascade Mountains, the Columbia Plateau, and the Northern Rocky Mountains, and as such, it is near a diverse geologic landscape.

**CALL FOR PAPERS**

Papers are invited for presentation in technical sessions, symposia, theme sessions, and poster sessions. Technical sessions will allow 15 minutes for presentation and 5 minutes for discussion. Papers dealing with all aspects of the geology of the western region of North America are encouraged. Abstracts for symposia and theme sessions should be submitted to the session convener.

**FIELD TRIPS**

An ambitious program of both premeeting and postmeeting field trips is planned. For details, contact the field trip leader or Field Trip Coordinators Nancy Joseph, Washington Department of Natural Resources, Division of Geology and Earth Resources, Spokane County Agricultural Center, N. 222 Havana, Spokane WA 99202, (509) 456-3255, or Valerie Chamberlain, Department of Geology and Geological Engineering, University of Idaho, Moscow, ID 83843, (208) 885-6192.

**Premeeting**

- 1. Structure and Tectonics of the Newport Fault Zone and the Priest River Complex.** Brady P. Rhodes, Dept. Geological Sciences, California State University, Fullerton, CA 92631, (714) 773-3882; Tekla A. Harms, Amherst; Donald W. Hyndman, University of Montana.
- 2. Volcanism, Plutonism, and Sedimentation Associated with Core Complex and Graben Development in the Central Okanogan Highlands, Washington.** Grace A. McCarley-Holder, Dept. Geology, Georgia Southern College, L.B. 8149, Statesboro, GA 30460, (912) 681-5757; R. Wade Holder, Georgia Southern College; David R. Gaylord, Washington State University; Kenneth F. Fox, Jr., U.S. Geological Survey.
- 3. Paleogene Sedimentary Basins of Central Washington.** James E. Evans, Dept. Geology, Bowling Green State University, Bowling Green, OH 43403, (419) 372-2886; Samuel Y. Johnson, U.S. Geological Survey.
- 4. Structure of the Yakima Fold Belt and Adjacent Margins.** Stephen Reidel, 620 W. Bonneville, Pasco, WA 99301, (509) 545-8886; Newell P. Campbell, Yakima Valley College.

- 5. Cambrian of Northern Idaho and Northwestern Montana.** John Bush, Dept. Geology and Geological Engineering, University of Idaho, Moscow, ID 83843, (208) 885-6192.
- 6. Some Major Gold Mines and Districts of Southwestern Montana.** James E. Elliot, Robert C. Pearson, U.S. Geological Survey, Box 25046, M.S. 930, Federal Center, Denver, CO 80225, (303) 236-5650.
- 7. Geology, Alteration, and Chemistry of the Gem Stocks, Shoshone County, Idaho.** Kate Schalck, Dept. Geology, Washington State University, Pullman, WA 99163, (509) 332-0643.
- 8. Miocene Flora of the Clarkia Fossil Beds, Northern Idaho.** Jack Smiley, Dept. Geology and Geological Engineering, University of Idaho, Moscow, ID 83843, (208) 885-7950.
- 9. Accreted Terranes in the Southern Willowa Mountains.** Allan Kays, Dept. Geology, University of Oregon, Eugene, OR 97403, (503) 686-4578.

**Concurrent with Meeting**

Several half-day (3-hour) field trips are scheduled in conjunction with specific symposia during the meeting.

- 1. Aerial Overview of the Channeled Scablands and the Grand Coulee.** Dale F. Stradling, Dept. Geography, Eastern Washington University, Cheney, WA 99004, (509) 359-7904.
- 2. Geologic Factors Influencing Residential Radon.** Raymond Tekverk, Jan E. Fay, Faytek, Inc., 1115 Lambert Lane, Coeur d'Alene, ID 83814, (208) 667-3263.
- 3. Geologic Controls of Ground-water Movement in the Spokane Aquifer.** George E. Maddox, George Maddox and Associates, Inc., E. 223 Augusta, Spokane, WA 99207, (509) 326-4335.

**Postmeeting**

- 1. Precambrian Belt Supergroup: Is the Deer Trail Group Belt?** Fred K. Miller, James W. Whipple, U.S. Geological Survey, Federal Building, W. 920 Riverside, Spokane, WA 99201, (509) 456-4677.
- 2. Paleozoic Biostratigraphy and Paleogeography of Northeastern Washington.** J. Thomas Dutro, Jr., U.S. Geological Survey, Museum of Natural History, Room E 311, Washington, DC 20560, (202) 343-3222; Ernest H. Gilmour, Eastern Washington University.
- 3. Mineralization and Tectonics in the Kootenay Arc.** Richard Lambert, Dept. Geology, University of Alberta, Edmonton, Alberta T6G 2E3, Canada, (403) 432-2942.

(continued on p. 286)

**Cordilleran-Rocky Mountain Sections** (continued from p. 285)

4. **Elements of the Cascades "Collisional" Orogen: A Transect from the Methow Basin to the San Juan Islands, Washington.** Michael F. McGroder, Dept. Geological Sciences, AJ-20, University of Washington, Seattle, WA 98115, (206) 543-1996; Robert B. Miller, San Jose State University; Mark T. Brandon, Yale; Ralph Haugerud, U.S. Geological Survey.
5. **Gold Deposits in Northeastern Washington.** Richard Tschauder, Hecla Mining Company, Box 467, Republic, WA 99166, (509) 775-3022.
6. **Source for the Columbia River Basalts.** P. R. Hooper, Dept. Geology, Washington State University, Pullman, WA 99164, (509) 335-6746.
7. **Lake Missoula Floods and Channeled Scablands: (A) Evidence for the Ice Dam and Floods in the Purcell Trench; (B) Glacial and Multiple Flood History of the Northern Borderlands; (C) Loess Stratigraphy and the Flood Record.** (A) Roy M. Breckenridge, Idaho Geological Survey, Morrill Hall, Room 332, University of Idaho, Moscow, ID 83843, (208) 885-7991; (B) Eugene P. Kiver, Dept. Geology, MS-70, Eastern Washington University, Cheney, WA 99004, (509) 359-7959; Dale F. Stradling, Eastern Washington University; (C) Alan J. Busacca, Eric McDonald, Dept. Agronomy and Soils, Washington State University, Pullman, WA 99164, (509) 335-1859.
8. **Geology and Landslide Mitigation at Grand Coulee Dam.** Greg W. Behrens, Phil J. Hansen, U.S. Bureau of Reclamation, P.O. Box 620, Grand Coulee, WA 99133, (509) 633-1360, ext. 513.
9. **Synplutonic Mafic Dikes, Granite Intrusion Migmatites and Mylonite of the Northern Idaho Batholith.** Donald W. Hyndman, Dept. Geology, University of Montana, Missoula, MT 59812, (406) 243-2244 or 2341.
10. **Subaqueous Basalt Eruptions in the Western Snake River Plain and Evidence for the Existence of Pliocene Lake Idaho.** Margie Jenks, Bill Bonnicksen, Idaho Geological Survey, University of Idaho, Moscow, ID 83843, (208) 885-7991.
11. **Hydrogeologic Problems in Silver Valley, Northern Idaho.** Dale Ralston, Dept. Geology and Geologic Engineering, University of Idaho, Moscow, ID 83843, (208) 885-7977.
12. **Geology of the Basalts and Pre-Tertiary Rocks of the Snake River Canyon** (river float trip). Rolland Reid, Roy Williams, Dept. Geology and Geological Engineering, University of Idaho, Moscow, ID 83843, (208) 885-7977.
13. **A Structural Section Through a 25-km-thick Thrust Plate in West-Central Montana.** Jim Sears, Carl Weiss, Dept. Geology, University of Montana, Missoula, MT 59812, (406) 243-5573 or 2341.
14. **History of the Coeur d'Alene Silver District and a Visit to a Working Mine.** Peter Siems, Earl Bennett, Dept. Geology and Geological Engineering/Idaho Geological Survey, University of Idaho, Moscow, ID 83843, (208) 885-7948 or 7991.

**SYMPOSIA**

The following symposia have been organized with a theme dealing primarily with the geologic evolution of western North America. Authors are encouraged to contact individual symposium chairpersons if they have relevant abstracts. Abstracts for symposia should be submitted directly to individual chairpersons.

1. **Geophysical Overview of the Cordillera.** Christopher J. Potter, Dept. Geology, Lafayette College, Easton, PA 18042, (215) 250-5196; Walter D. Mooney, U.S. Geological Survey.
2. **Evolution of the Proterozoic Rocks of the Northern Cordillera** (sponsored by the Belt Association). **Session I: Sedimentation and Tectonics.** James W. Whipple, U.S. Geological Survey, Federal Building, Room 656, W. 920 Riverside, Spokane,

WA 99201, (509) 456-4677. **Session II: Economic Geology.** John C. Balla, ASARCO, N. 2900 Nevada, Spokane, WA 99207, (509) 489-7870.

3. **Synoptic Paleozoic Biogeography of Selected Tectonic Fragments, Western North America.** J. Thomas Dutro, Jr., U.S. Geological Survey, Museum of Natural History, Room E 311, Washington, DC 20560, (202) 343-3222.

4. **Upper Paleozoic Biostratigraphy and Stratigraphy of the Northern Rocky Mountains.** Bruce R. Wardlaw, U.S. Geological Survey, National Center, M.S. 970, Reston, VA 22092, (703) 648-6916; Ernest H. Gilmour, Eastern Washington University.

5. **Upper Paleozoic Orogenies of Western North America.** Linda B. McCollum, Dept. Geology, M.S. 70, Eastern Washington University, Cheney, WA 99004, (509) 359-7473; Nancy L. Joseph, Washington Department of Natural Resources.

6. **Western Edge of the North American Continent: Mesozoic Tectonic Evolution.** Mel A. Kuntz, Karen Lund, U.S. Geological Survey, Box 25046, M.S. 913, Federal Center, Denver, CO 80225, (303) 236-1293.

7. **Deformational History of the Coast Mountains and North Cascades, Washington, British Columbia, and Southeast Alaska. Session I: North Cascades to Southern Coast Mountains.** Darrel S. Cowan, Dept. Geological Sciences, University of Washington, AJ-20, Seattle, WA 98195, (206) 543-4033; Robert B. Miller, San Jose State University; Paul J. Umhoefer, University of Washington. **Session II: The Coast Mountains.** Margaret Rusmore, Dept. Geology, Occidental College, 1600 Campus Road, Los Angeles, CA 90041, (213) 259-2823; George E. Gehrels, University of Arizona; Glenn J. Woodsworth, Geological Survey of Canada.

8. **Paleogene Sedimentation, Volcanism, and Tectonics of the Western United States.** Thomas D. Fouch, U.S. Geological Survey, Box 25046, M.S. 939, Federal Center, Denver, CO 80225, (303) 236-7064; Alan R. Niem, Oregon State University.

9. **Paleocene-Eocene Crustal Extension and Associated Deformation, Volcanism, Plutonism, and Dome Formation in Northeast Washington and Idaho.** Kenneth F. Fox, Jr., U.S. Geological Survey, Box 25046, M.S. 913, Federal Center, Denver, CO 80225, (303) 236-0213; John A. Watkinson, Washington State University.

10. **Tectonic Setting of Volcanic-hosted Ore Deposits in the Pacific Northwest.** Byron R. Berger, U.S. Geological Survey, Box 25046, M.S. 973, Federal Center, Denver, CO 80225, (303) 236-1185.

11. **Neogene Volcanism in the Western United States. Session I: Magmatism and Tectonism in and Adjacent to the Cascade Province.** Donald A. Swanson, U.S. Geological Survey, Cascades Volcano Observatory, 5400 MacArthur Blvd., Vancouver, WA 98661, (206) 696-7806; Rick M. Conrey, Washington State University. **Session II: Magmatism and Tectonism in the Cordilleran Continental Interior.** William P. Leeman, National Science Foundation, Earth Sciences Division, Washington, DC 20550, (202) 357-7911; William K. Hart, Miami University.

12. **Use of Soils for Correlation and Interpretation of Quaternary Geologic Events.** Eric V. McDonald, Alan J. Busacca, Dept. Agronomy and Soils, Washington State University, Pullman, WA 99164, (509) 335-0933.

13. **Earthquake-induced Landslides.** Robert L. Schuster, U.S. Geological Survey, Box 25046, M.S. 966, Federal Center, Denver, CO 80225, (303) 236-1633; Gerald W. Thorsen, Washington Department of Natural Resources.

14. **Radon in the Natural Environment.** Raymond Tekverk, (continued on p. 287)

**Cordilleran-Rocky Mountain Sections** (continued from p. 286)  
Jan E. Fay, Faytek, Inc., 1115 Lambert Lane, Coeur d'Alene, ID 83814, (208) 667-3263.

**15. Geoarcheological Research in the Pacific Northwest.** Jerry R. Galm, Dept. Archeological and Historical Services, Eastern Washington University, M.S. 168, Cheney, WA 99004, (509) 359-2239.

**16. Hydrogeologic Investigation for Waste Management.** Barbara C. Williams, U.S. Bureau of Mines, Spokane Research Center, E. 315 Montgomery Ave., Spokane, WA 99207, (509) 484-1610.

**17. Earth Science Education.** Kurt L. Othberg, Idaho Geological Survey, Morrill Hall, Room 332, University of Idaho, Moscow, ID 83843, (208) 885-7991.

For details, contact the first-listed symposium convener or the symposia co-chairmen: Keith Stoffel, Washington Department of Natural Resources, Spokane County Agricultural Center, N. 222 Havana, Spokane, WA 99202, (509) 456-3255, or Peter Isaacson, Department of Geology and Geological Engineering, University of Idaho, Moscow, ID 83843, (208) 885-6192.

### THEME SESSIONS

Theme sessions are similar to symposia in that they are focused on a special geologic topic. However, theme sessions are an open forum where papers are entirely volunteered, not necessarily invited as in symposia. Authors are encouraged to contact the session convener if they have relevant abstracts. The following theme sessions have been proposed.

**1. Paleozoic and Early Mesozoic Paleogeographic Relations between the Klamath Mountains, Northern Sierra Nevada, and North America.** M. Meghan Miller, Div. Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, (818) 356-6465.

**2. Neotectonics of the Cascadia Subduction Zone.** Robert S. Yeats, Dept. Geology, Oregon State University, Corvallis, OR 97331, (503) 754-2484; Brian F. Atwater, U.S. Geological Survey.

**3. Quaternary Catastrophic Floods Generated by the Failure of Natural Dams in the Western United States.** Keith L. Stoffel, Washington Department of Natural Resources, Div. Geology and Earth Resources, N. 222 Havana, Spokane, WA 99202, (509) 456-3255; John P. Buchanan, Eastern Washington University.

### 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) 447-8850.

### ABSTRACT DEADLINE: DECEMBER 12, 1989

Send one original and five copies of abstracts to be considered for the technical or poster sessions to

John P. Buchanan  
Program Chairman  
Department of Geology, M.S. 70  
Eastern Washington University  
Cheney, WA 99004  
(509) 359-7493

Abstracts will be reviewed for informative content, correct structure, reliability of data, appropriate geographic coverage, and originality. Only one paper will be accepted from a single author; if papers are co-authored, no more than one paper may be presented by an author. These restrictions apply to sessions other than invited

symposia. Abstracts for symposia and theme sessions should be submitted (one original and five copies) to the first-listed convener.

### PROJECTION EQUIPMENT

All slides must be 2" x 2" and fit a standard 35-mm carousel tray. Two projectors will be available for all symposia and theme sessions, whereas technical sessions will have only one projector available. Please bring your own loaded carousel tray, if possible. Overhead projectors will *not* be available.

### POSTER SESSIONS

Ample space will be available for poster sessions, and we strongly encourage student and professional members to take advantage of this highly effective means of communication. Poster sessions will be displayed in a prominent, highly visible area in the Convention Center. Please identify poster sessions on the GSA abstract form.

### EXHIBITS

Exhibits will be adjacent to the poster session and meeting rooms in the Convention Center. The cost of booths for educational and nonprofit institutions will be \$100, and for commercial exhibitors, \$250. For further information and space reservations, contact the exhibits coordinator, Russell Boggs, Department of Geology, M.S. 70, Eastern Washington University, Cheney, WA 99004, (509) 359-7497.

### STUDENT SUPPORT

The GSA Cordilleran and Rocky Mountain Sections have funds available for grants to GSA Student Associates who are contributing to the meeting. *Students are strongly encouraged to apply for these grants.* We anticipate that most students who qualify will be funded to some degree. Application letters must be sent by April 15, 1989 to the respective section secretaries:

Cordilleran Section	Rocky Mountain Section
Bruce A. Blackerby	Kenneth E. Kolm
Department of Geology	Department of Geology
California State University	and Geological Engineering
Fresno, CA 93740	Colorado School of Mines
(209) 294-2955 (direct)	Golden, CO 80401
(209) 294-3086 (department)	(303) 273-3932 (direct)
	(303) 273-3800 (department)

Applications should include certification that the student is a GSA Student Associate in the Cordilleran or Rocky Mountain Section and is presenting a paper or poster session at the Spokane meeting.

### SPECIAL EVENTS

If running or walking is your style, don't miss Bloomsday! Bloomsday's 12 km (7.46 mile) course provides the field for the largest timed race in America—more than 59,000 participants. Everyone who officially enters the race and crosses the finish line is awarded a T-shirt. For GSA meeting participants who enter the Bloomsday race, special prizes will be awarded by age categories. The race will be run Sunday, May 7, 1989, at 9 a.m.

On Tuesday night, May 9, there will be a dinner and dance cruise on beautiful Lake Coeur d'Alene, 53 km (33 miles) from Spokane. Price will include bus transportation to and from the lake.

### GUEST ACTIVITIES

A full program of spouse and guest activities is planned, including excursions to Spokane wineries, Henley's Aerodrome and  
(continued on p. 288)

**Cordilleran-Rocky Mountain Sections** (continued from p. 287) Frontier Settlement, and the Museum of Native American Cultures, a tour of Spokane's historic district, and the 1974 Expo site in Riverfront Park. A special luncheon featuring fine Italian cuisine is planned on top of Mount Spokane. Child care will be available for the duration of the meeting.

**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

**General Chariman**

Ernest H. Gilmour  
Department of Geology, M.S. 70  
Eastern Washington University  
Cheney, WA 99004  
(509) 359-2201

**Registrar**

Margie Wallace  
Conference Coordinator  
Regional University Conferences, M.S. 11  
Eastern Washington University  
Cheney, WA 99004  
(509) 359-2406

**Going to Denver for the GSA Centennial Celebration?**

Don't miss the exhibit on Colorado mining history (photo below) or the special exhibit on remote sensing, *New Visions of Earth: The Technology of Reading Our Planet*, both at the Denver Museum of Natural History through November 6, 1988. The Colorado Scientific Society will host daily trips to the museum during the GSA Centennial Celebration (see *GSA News & Information*, August 1988, for more information).

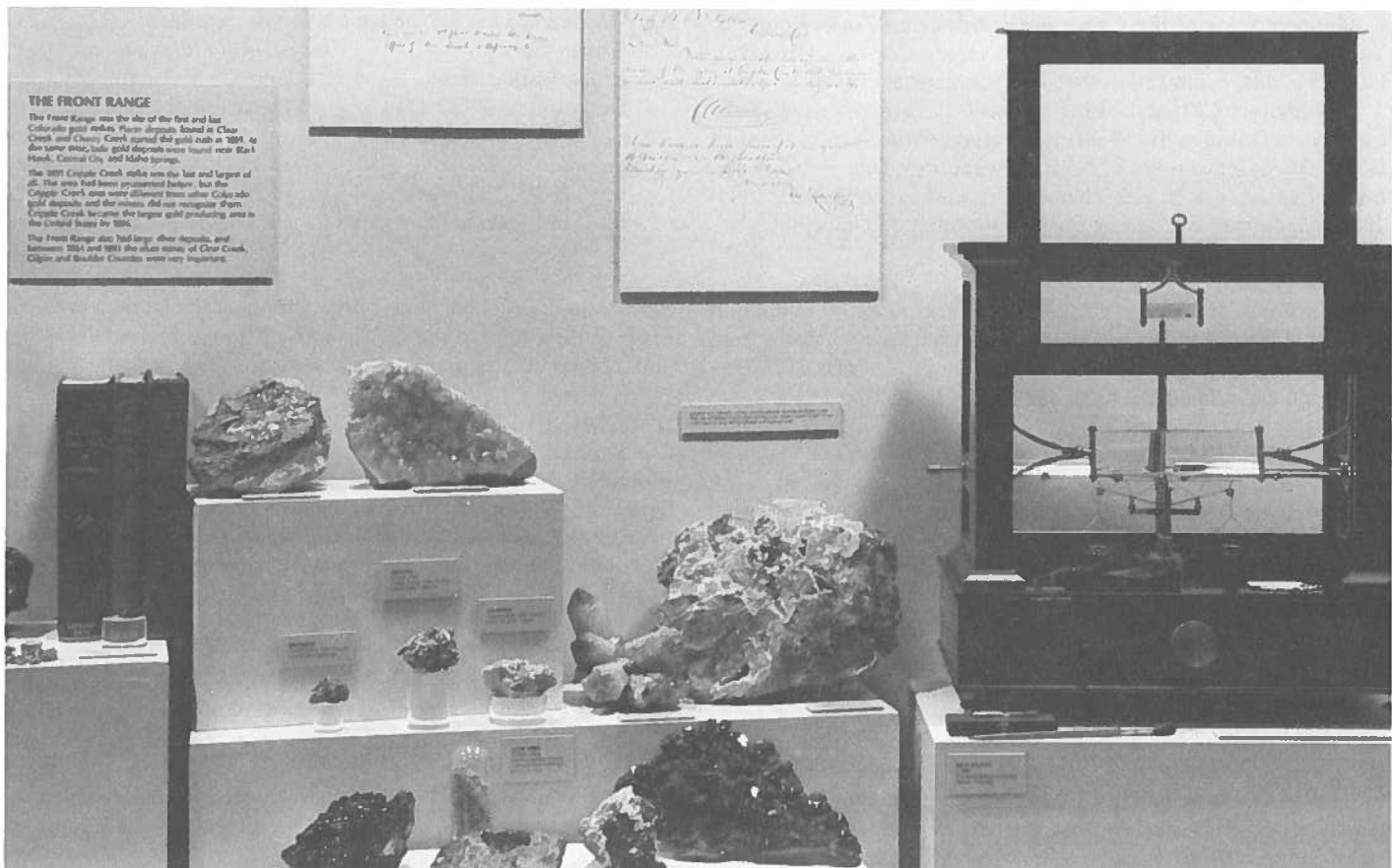
**AIP Offers Reduced Subscription Rates**

The American Institute of Physics (AIP) offers reduced-rate subscriptions for its own journals to *individual* members of Affiliated Societies, of which GSA is one. This offer is limited to one subscription per person to each journal. Following is a list of AIP-owned journals showing the member rates for 1989 which are available to individuals who are members of GSA and, for reference, the nonmember rates.

	Domestic rates		Foreign rates incl. Canada & Mexico	
	Member	Non-member	Member	Non-member
<i>Applied Physics Letters</i>	\$ 55.00	\$ 485.00	\$ 95.00	\$ 525.00
<i>Computers in Physics</i>	20.00	125.00	30.00	135.00
<i>Journal of Applied Physics</i>	100.00	805.00	150.00	855.00
<i>The Journal of Chemical Physics</i>	130.00	1335.00	205.00	1410.00
<i>Journal of Mathematical Physics</i>	60.00	875.00	75.00	890.00
<i>Journal of Physical and Chemical Reference Data*</i>	65.00	290.00	75.00	300.00
<i>Physics of Fluids-A</i>	40.00		60.00	
<i>Physics of Fluids-B</i>	40.00		60.00	
<i>Physics of Fluids--Both</i>	65.00	765.00	105.00	805.00
<i>Physics Today</i>	25.00	85.00	40.00	100.00
<i>Review of Scientific Instruments</i>	40.00	455.00	60.00	475.00
<i>Current Physics Index</i>	80.00	450.00	105.00	475.00
<i>General Physics Advance Abstracts</i>	14.00	165.00	29.00	180.00

\*Nonmember subscriptions are handled by the American Chemical Society in Columbus, Ohio.

Send subscription orders with remittances directly to the American Institute of Physics, 335 East 45th St., New York, NY 10017-3483. Include a statement indicating that you are a member of GSA.





**Geological Society of America**



# **CONGRESSIONAL SCIENCE FELLOWSHIP 1989-1990**

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

## **CRITERIA**

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

## **AWARD**

The GSA Congressional Science Fellowship carries with it a \$28,000 stipend and a limited relocation and travel allowance.

## **TO APPLY**

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

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



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



THE GEOLOGICAL SOCIETY OF AMERICA

# Annual research awards program

# 1989

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

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

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

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

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

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

**ALL APPLICATIONS MUST BE SUBMITTED ON THE 1989 FORMS**

**AND POSTMARKED BY FEBRUARY 15, 1989**

## Cornell Symposium Marks GSA Centennial

A symposium at Cornell University, Ithaca, New York, on June 9 commemorated the founding of the Geological Society of America there in 1888. Featured speakers were Frank H.T. Rhodes, president of Cornell; F. Michael Wahl, GSA executive director; Wallace Broecker, professor of geological sciences, Columbia University; and Michel T. Halbouty, chairman of the board and chief executive officer, Michel T. Halbouty Energy Company, Houston, Texas. The addresses by Rhodes and Halbouty are reproduced here.

### A Century of Change in the Geological Sciences

**Frank H.T. Rhodes**  
President, Cornell University

I am happy to welcome so many of you to Cornell for this celebration of the Geological Society of America Centennial. It was here on this campus a century ago that our Society was born. And that is a cause for celebration. Perhaps, not the least benefit of an occasion such as this is that it encourages us to do something that few geologists feel comfortable about: to date something very precisely in terms of single years, rather than millions or billions,  $\pm$  a large degree of error. But although most of us feel more comfortable with very large, round numbers, even for geologists a centennial is a landmark occasion, and we are proud of the fact that Cornell played such a pivotal role in the founding and early history of the Geological Society of America.

The organizational meeting that marked the creation of the Society was held here at Cornell, in the Botanical Lecture Room of Sage Hall on December 27, 1888. At that first gathering in 1888, 13 members were present. Six of these people either had or soon would have a connection with Cornell. The list of original Fellows numbered almost 100, and included almost every working geologist in the country. Of those original Fellows, 13—more than 10% of the total—had some connection with Cornell. That is all the more remarkable considering that geology at Cornell was then less than 20 years old. My colleagues Don Turcotte and Jack Oliver have

gently reminded me once or twice that they would like to see a restoration of this sort of percentage, 13% or so, of the Fellows of the Society represented by members of the Cornell faculty.

Perhaps the leading spirit behind GSA, who occupied almost every office, except, strangely, that of president, was Henry Shaler Williams, professor of geology at Cornell. Williams, a paleontologist and stratigrapher, who did much to elucidate the Devonian strata of New York State, had earlier helped to found Sigma Xi, the scientific honorary fraternity, which also had its genesis at Cornell. He was also a founder of the Paleontological Society. With the encouragement and support of the university, Williams became one of GSA's early intellectual and organizational leaders.

Those early leaders of the Geological Society laid a firm foundation, not only in terms of organization and finances, but also in terms of membership and objectives. With their leadership, geology gained increased stature as a scientific profession. The twin characteristics of the Society, professionalism and collegiality, persist to this day. I was struck that even from the first meeting, these two qualities went hand in hand. Professor Alexander Winchell, one of the first vice-presidents of the Society, describing the meeting in Ithaca, noted, "In the evening a reunion was held at

*(continued on p. 292)*



**GSA Fellows in Cornell's Botanical Lecture Room during Centennial symposium. Front row, left to right: 1987 GSA President Jack Oliver; GSA Executive Director F. Michael Wahl; Cornell University President Frank Rhodes; speaker Wallace Broecker. Back row, left to right: GSA**

**Treasurer Robert Fuchs; speaker Michel Halbouty; symposium chairman Robert Kay; Cornell Department of Geological Sciences chairman Donald Turcotte; Cornell alumnus John Rodgers.**

**Century of Change** (continued from p. 291)

the private residence of Professor H. S. Williams, where a brilliant and accomplished hostess, with her aides, rounded off delightfully the graver occupations of the day." So, too, our gathering today, though properly occupied with "the graver occupations of the day" also continues that of fellowship and partnership, which is something we treasure.

There is an old Latin proverb, "Respice, prospice": Look backward, look forward. So today, as we look back to the founding of the Geological Society—100 years ago—we think inevitably of the changes that have occurred in our profession during that time. Indeed, even during our own lifetime, those changes have been profound. While I find it sobering to be reminded that I have been a Fellow for 33 years, one-third of the Society's history, I also reflect that such a thing is relative: the Earth has aged two or three billion years during the professional lifetime of many here.

But it is not just in such methodological refinement that revolutionary changes have taken place. In the early days of the Society, work was inevitably confined largely to the study of the continents, and to the limited rocks that their surface made accessible. The subsequent development of new techniques, especially those used in mining and the oil and gas industry, provided an impetus for subsurface studies.

In spite of the steadily accumulating detailed knowledge of some parts of some continents, and the refinement of some tools that helped in exploration and mapping, the conceptual framework of geology in the first three-quarters of our Society's century showed relatively little significant difference from that at the time that the Society was founded, while two-thirds of the Earth's surface beneath the oceans still remained largely unexplored.

That situation changed dramatically in the late '50s and '60s, thanks in large measure to the growing volume of data made available by new technology. These included not only extensive corings and soundings, which provided new understanding of the topography, configuration, and composition of the ocean floor, but also a harvest of geophysical data involving gravity, heat-flow, seismic, and magnetic characteristics, from which, in the 1960s, there emerged the powerful theory of plate tectonics. This new paradigm, which has changed forever the way in which we view the Earth and the forces that have shaped it, is as profound in its influence in geology as was evolution a century earlier in biology.

This new paradigm promises a future full of promise. While the specific challenges will surely change, often in ways that we cannot foresee, the overall strategy of the earth sciences will continue to be what it has long been: so to understand the present Earth that we may interpret its past (and predict and perhaps ultimately shape, in limited ways) its future, using wisely the resources of the planet which is our home.

But if our mission remains unchanged, certainly the context in which the Society conducts its affairs has undergone revolutionary changes during the last two decades.

- We have realized that the Earth's resources, for all their bounty, are not limitless.
- Our present nation states represent a degree of global dependence for earth materials—mineral resources and energy sources—which was undreamt of a century ago when the Society came into existence.
- We grow daily more aware of how easily the thoughtless pollution of our planet's waters can jeopardize whole communities, and how the careless disposition of our waste can imperil the lives of many.
- We have learned how susceptible is the frail atmosphere, on which we and all living things depend, to local damage that can, in time, pose threats of continental and even global proportions.

- We are conscious that our growing, densely populated modern cities are still almost as vulnerable to natural hazards—earthquakes, volcanoes, typhoons, and floods—as was Lisbon to the earthquake of 1755 or St. Pierre, Martinique, to the eruption of Mount Pélée in 1902.

This context requires a level of responsible planetary exploitation and a degree of planetary stewardship that demand, in turn, a new and heightened level of scientific knowledge as their basis. That is the challenge that will occupy the Society during the coming years.

This challenge implies to me a set of priorities that we might think of under five headings. My headings are no more than provisional, and others will undoubtedly have their own lists. These undertakings—if they are to succeed—will represent a style of research which is still only emergent within our profession. Our traditional methods of field work and research make us a fairly independently minded bunch, but increasingly it seems to me that success in research will require not simply cooperation between specialists in the earth sciences, but a level of cooperation between those in other disciplines, and a new level of international cooperation, in order to gather the data that we shall need. Let me list what seem to be the major challenges:

1. *Education.* The education of professional earth scientists will continue to be a high priority for our society and our profession. We must produce men and women, proficient in their specialties, creative and responsible in their professional practice, and global in their scientific outlook. I confess that I am not sure that the typical baccalaureate track, and still less the typical Ph.D. track, with the departmental culture that supports it, represent the optimum arrangements for the years ahead. There is a second kind of education which is vital to the well-being of our society. The education of the citizen, not as a technical geologist, but as somebody who will be a responsible voter and a thoughtful citizen, represents a continuing public challenge. We need to learn how to produce citizens who can view the Earth with understanding of its character, awareness of its beauty, and perception of its limits. This is, of course, a time of ferment in undergraduate education, with debates taking place on every college campus concerning the adequacy of the existing curriculum. We, as earth scientists, must become part of those debates, for there are few sciences more liberating or demanding than are the earth sciences. Beyond this there is a further challenge to educate our nation concerning the need for both exploration and conservation. The energy crisis that we shall face in years ahead is something that concerns us all, as is the increasing shortage of certain vital raw materials. This calls for a national policy in both energy and materials. We must also educate our fellow citizens to make them aware of the growing serious shortage of scientists and engineers. One estimate by the National Science Board suggests that we shall face a shortage of something like 700,000 scientists and engineers in our nation by the year 2010. We must be a part of the solution of that problem and not a part of the problem itself.

2. *Full exploitation of the plate-tectonic syntheses.* This will include but not be limited to the mechanisms that drive the process; the pre-Phanerozoic history of the Earth; global climatic changes; the style of organic evolution in relation to both continental configuration and development, on the one hand, and local environmental subtleties, on the other; and continental accretion and development.

3. Based on this synthesis, *comprehensive modeling of major earth processes*, including orogenic patterns and styles; metallogenic provinces and their development; the nature of the lower

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## **Century of Change** (continued from p. 292)

crust and mantle; fluids in the deep crust; structure, composition, and processes of the Earth's deep interior; continental development and accretion; sedimentary basin development; hydrocarbon accumulation; early development of the Earth's atmosphere and oceans; planetary comparisons; and others. These will need massive data development and modeling, and information gathered from across the globe.

4. *International exploratory projects*, including structure and composition of the continental and oceanic crust; comprehensive international remote sensing surveys of both the continents and the oceans; Antarctica; global tectonic geometry; magmatic processes and plumbing; and others.

5. *International cooperative projects related to predictable human needs*, including global inventory of earth resources; arid zones; global hydrologic characteristics; long-term global monitoring: atmospheric, hydrologic, seismic, oceanic, climatic, other; earthquake prediction (and control?); volcano prediction (and control?); and more.

Within the various specialties of the earth sciences, research will no doubt continue at an increasing tempo, and I lack the competence to suggest the dazzling range of themes and topics that this will involve.

There is, as you may have noted, one assumption that I have made in suggesting the priority of projects such as these. It is that the everyday existence of our society and the future of our species depend in large measure upon the continuing advance of knowledge of the planet which is our home and upon the wise application of the earth sciences to our global stewardship. This is an area that is going to call for a far more active role in public advocacy and education than most of us have been willing to assume. Beneath the vicissitudes of federal, state, and corporate funding, there are massive fluctuations in the level of the support for science education,

research, and development. All of us here know that geology as an area of professional employment shows the most excessive swings from famine to surplus.

Geology here is not alone, for our own science depends intimately and increasingly upon the well-being and support of all the other sciences—chemistry, physics, and biology included.

I am convinced that geologists, in particular, but most scientists and engineers in general, have been too reticent in promoting the support of science and its benevolent role in our national prosperity and our international well-being. This is a challenge that we simply have to take seriously, for it is no longer possible to suppose that the public owes us a living.

There is, perhaps, in this somewhat daunting challenge, one ray of hope. I spoke a moment ago about the new context in which the earth sciences now pursue their quest. I deliberately omitted one small but vital part, and that is the unforgettable photographs of planet Earth as seen for the first time through the eyes of astronauts orbiting the Earth. This small globe, on which we spend our days—brown and pink, green and blue, ocean-lapped and cloud-veiled, solid and yet so small and so fragile—has, perhaps, been the most dramatic view that humankind has seen since our species emerged. And this view provides not only a new sense of proportion, but a new reverence for the home planet and a sense of responsibility.

Just as the Geological Society of America has done so much to promote the pursuit of geology as a preeminent science, exciting and intellectually challenging beyond any measure that most of us could have conceived, and yet has somehow managed to preserve in our thinking a sense of delight in the grandeur of our planet, so also the Society in its second century will need to address the dependency of our civilization upon the responsible stewardship of planet Earth, and the patterns of international partnership which will promote it.

## **The Role of Energy in the Reindustrialization of America**

**Michel T. Halbouty**

*Chairman of the Board and Chief Executive Officer  
Michel T. Halbouty Energy Company*

Ladies and Gentlemen, Officers and Members of the Faculty, and Distinguished Guests: As you have been told, on the 27th of December, 1888, a formal organizational meeting of the Geological Society of America was held at this university. The Society was founded for the purpose of "the promotion of the science of geology by the issuance of scholarly publications, the holding of meetings, the provision of assistance to research, and other appropriate means."

It is remarkable to note that during the 100 years of the existence of the Society the purpose as originally stated has remained unchanged. The phrase "and other appropriate means" safeguarded the objectives of the Society, as the phrase gave it the authority to delve into whatever is necessary to enhance the science of geology. To partake in the activities and contributions of the Geological Society of America is to also become involved in a continuous educational experience because its publications and meetings are structured to add to the knowledge and the heritage of the science of geology. As a Fellow of the Society, I have treasured my membership and am indeed honored to have been invited to speak at the site where the Society was founded a hundred years ago and to participate in its Centennial Celebration.

The title of this presentation, "The Role of Energy in the Reindustrialization of America," is the third topic of subject matter I worked on in preparing this address. The first was "Providing Future Energy Resources," which I found too general. The second, "Exploration: The Highest Imperative," strictly covered the nation's current petroleum dilemma, and I concluded that was too restrictive, as it would have discussed only petroleum. This conclusion came about after I re-read Don Turcotte's invitation letter to me which suggested that a presentation on future energy policies would be appropriate. Therefore, I changed the address to meet that suggestion. The changes were a little confusing, I'll admit, but I felt this presentation places the nation's energy issues in the proper perspective, and would be more meaningful and would comply with Don's suggestion.

America stands at the crossroads. We can take charge of our future and strengthen our domestic industrial and business complexes or we can continue down the road we are currently traveling, which is toward a greater deterioration of their infrastructure. There is a grave lack of investment by the United States in the United States; lack of investment in technological improve-

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### **Role of Energy** (continued from p. 293)

ment at home; lack of investment in energy and minerals research and development; and lack of planning for our economic growth and stability.

The entire world is involved today in a redistribution of labor and production, and as a part of that process, most if not all of the developed countries are involved in some kind of deindustrialization. The unstable world economy has dictated sweeping changes in all commercial ventures. The United States and the rest of the highly industrialized countries are rapidly on their way to losing many of their industries to Third World nations. This is not a new trend. Advanced countries have continually given up labor-intensive industries to newly developing countries who have lower wage rates. The advanced countries have then found comparative advantages in new areas, in totally new industries, or in extremely high technology fields. Because of our failure to advance our technology in certain key industries, the U.S. has in many areas deindustrialized itself without its awareness.

There are many economists, politicians, and representatives from business and academia who are speaking out on many of these problems facing the United States. They put the "blame" in various categories: waning productivity, lagging academic and industry research and development expenditures, restrictive government controls, high energy costs, poor management, and the deterioration of the work ethic, to name just a few. There is no one area totally to be held accountable and there is no one area where changes would solve the whole problem.

Americans are now living in a very complex world with strong competition from all quarters of the globe. Our country is faced today with the unassailable reality of what other countries have been able to achieve using U.S. ingenuity and technology. Notably, Japan and West Germany have outstripped us in many fields as a direct result of using the technology which we so readily shared with them at the conclusion of World War II. They have not only used this technology, they have improved upon it tremendously, whereas in the United States, we have not improved significantly our own designs. We just sat back, sure of ourselves, and apathetically watched some of our systems deteriorate. The teacher became the undiligent pupil, and the pupil became the new expert, the new master.

In many areas, United States industries have fallen behind their competitors, and we are now paying dearly for our lethargy. This loss of competitive advantage for some of our older industries, in both our domestic and export markets, has led to severe cutbacks in key areas such as the steel and automobile industries. And there are a multitude of lesser publicized failures due to this same loss of competitiveness and neglect.

This apathy and neglect have even permeated offshore. Since we are aware that the oceans are crucial to trade and that U.S. defense strategy emphasizes protecting freedom of the seas, it would seem that maintaining a strong merchant fleet would be a priority. However, the American merchant marine is dangerously close to being defunct—it is fast becoming a rusting relic. It has demerchantized itself.

The indolence of management in not improving technology and the product is a blight on our once-heralded American ingenuity. The smugness of those in control and the inaction associated with such complacency are unbelievable and unforgivable.

In a world with a growing population, declining nonrenewable resources, rising social and economic problems and expectations, science and technology are the ultimate beneficial resources which preclude stagnation. In the decades immediately following the war, the United States was the foremost international technological

leader. Today our lead has rapidly shrunk. It is more appropriate to say that we have lost many of our industrial competitive advantages. As a result, our exports have decreased and our imports have increased. There is grave concern that jobs which could have been created here have instead been created in foreign countries, leaving hundreds of thousands of American workers unemployed or in underpaid employment.

American industry is being affected by imports in practically every sector. These imports are reducing the productivity of our labor-intensive and basic industries. For example, in crude oil, our production continues to fall, exploration is practically nonexistent, and imports are continuously increasing. Our economic stability and strategic security are being jeopardized because of this one situation.

Before proceeding further, it is appropriate for me to pause here and comment on an article which appeared in yesterday's *New York Times*. It reported that the 33 nations meeting on the evolution of the Antarctic Treaty have agreed that the continent could be opened to permit prospecting for oil and minerals by seismic testing and other techniques with a relatively light impact on the environment. This means inventory exploration—not large rig drilling or mining operations—but to determine what is or might be available if and when the world's people would need Antarctica's resources. This is preparing for the future.

But in the U.S., where the environment is not as hostile as Antarctica's, we have been prevented from inventory exploration for energy and minerals on some of our own lands because of federal restraint placed on millions of acres of public lands. Nowhere has the threat of excessive environmentalism to the nation's energy and mineral development been felt more keenly than in the area of access to and inventory of these lands. For example, there is common agreement that the Coastal Plain of the Arctic National Wildlife Refuge (ANWR) is the most promising onshore petroleum frontier in the United States. This fact assumes special significance because the nation's proved reserves and its production of oil are declining, with the result that U.S. reliance on foreign petroleum imports is on the rise.

Some of ANWR's probable reserve estimates are much higher than the 10 billion barrels estimated to be recoverable from Prudhoe Bay. As much as 30 billion barrels of oil may lie beneath the 18-million-acre refuge. The Administration has pushed for Congressional approval to lease the lands for exploration and development for years, but prolonged debate on environmental issues has prevented such action. Environmental concerns and energy needs can be balanced in the ANWR area—Prudhoe Bay proved that. Although ANWR will not completely solve the nation's energy problems, it will go a long way to decrease the dollars spent on imported oil, significantly enhance our reserves and economic stability, and reduce the nation's vulnerability to an oil-supply disruption.

Truly, our economic vitality has been weakened by a complex set of interconnected problems—a combination of persistent economic instability, counterproductive and burdensome tax and regulatory policies, excessive government expenditures, inadequate technological growth and innovation, and neglect in fully developing our vast domestic energy and mineral supplies and potential. Of all of these, I am confident that counterproductive and burdensome tax and regulatory policies imposed on the entire industrial complex have been the most perplexing and destructive forces in our productivity growth.

The role of energy in the future of America will be more important than ever before in its history because energy supply in

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### **Role of Energy** (continued from p. 294)

whatever form of fossil fuel or alternate source will determine the success of America's industrial progress in the global community. The national economy cannot grow without energy. Those at the bottom of the economic ladder cannot rise without pulling someone down from the top.

The price of energy failure is not just economic stagnation, but social upheaval. I reject the notion that the energy dilemma can be solved only by halting the use of energy. Conservation, properly understood, does not mean non-use; it means optimal use over time. Energy resources are valuable only if they are produced and consumed. They will be used at the proper time only if producers and consumers see the correct signs of their value at each point in time. The assured availability of an adequate supply of energy for our existing and new industries of the future must be uppermost in our planning. Without a sound energy base, no new industry can even be started. Without the assurance of adequate energy supplies, no existing industry can grow or even maintain production on a modest scale.

The importance of energy as a factor in social and economic development throughout the world has been brought into sharp focus since 1973 with the rapid escalation of conventional fuel prices. Energy is now and in the future will be an integral part of the economic focus of the U.S. and the rest of the world, and, more so, it will be a constant component of foreign policy. This assumption was clearly brought into focus with the embargo of 1973 and 1974 by the Arab-member countries of OPEC, along with the Iranian oil cut-off of December 1979. These events dramatically altered the energy consumption patterns of the United States and changed, I feel, forever both the government and public perception of energy and the importance of its position in the economy.

In ideal terms, in the past we have had cheap, relatively secure energy supplies. Our entire nation was built on abundant energy resources, but we will never see the time again of unbounded cheap energy. We must, therefore, adapt to a new energy attitude and increase our energy efficiency in its every use. The whole of industrialized America must be changed to conform with the proper use of energy—more particularly, for the proper use of the kind of energy. Oil should not be used if gas is more efficient and available. Oil and gas should not be used if coal is more efficient and available. None of those should be used if solar energy is more efficient and obtainable. And so on, through the entire spectrum of our energy resources. We have abundant energy resources. We also have the scientific and technological know-how with which to tap this potential.

In this regard, geologists, geophysicists, and engineers have formulated more new concepts in the further search for petroleum in the past decade than in the preceding 50 years. Therefore, our petroleum potential is significant. We have not yet explored all the places that oil and gas might exist. Our future oil and gas discoveries will allow us time, probably well into the 21st century, in which to evaluate the feasibility and priorities of alternate sources. But we cannot afford to wait until there is no more oil left to be found. We must now prepare for the post-petroleum era and to be ready for it whenever it comes. In part, we are twenty-five years late in establishing that preparedness.

Therefore, it is vital that we should now concentrate on means of increasing our energy from nuclear, coal, shale, solar, wind, and whatever other energy sources which may be available. Our growing needs indicate especially that nuclear energy and coal will progressively have to be substituted for oil. But nuclear energy is often depicted in disaster scenarios, and coal conjures up visions of torn-up countrysides, grimy buildings, acid rain, and pea-soup fog. In ideal terms, both sources have some drawbacks, but our ever-

developing technology must make both of these resources more acceptable than the alternative of shutting down America as we know it. However, it is very evident that the more energy that is derived from coal and nuclear, the less oil we have to import.

Nuclear-generated electricity has already saved America over three billion barrels of oil, with billions more to be saved before the turn of the century. The truth is that nuclear energy is an everyday fact of life in the United States. It's been generating electricity here for nearly 30 years. Throughout the country there are 100 nuclear plants, and they are our second largest source of electric power. As our economy grows, we'll need more of those plants to avoid even more dependence on foreign oil. Our existing nuclear plants are preventing more than 2 million barrels of oil per day from being imported into the country. Although we have 100 plants operating, no new nuclear power plants have been ordered in the U.S. since 1978. This is tragic. I firmly believe reform of nuclear permitting regulations and standardization of design could revive the industry. One hundred new plants built with the improved technology could save us another 3 million barrels per day, which would solidify our domestic energy base.

Now let's talk about coal. Coal is the most abundant yet least utilized of our domestic energy resources. It represents 72 percent of our known remaining fossil fuel supplies, but accounts for only 19 percent of our current energy consumption. In terms of proven reserves, we have 60 times more coal than oil on an energy-equivalent basis and more than 40 times more coal than natural gas on an energy-equivalent basis. More important, coal is cheaper than the other two fossil fuels for large stationary energy sources such as electric power generating stations. Expanded use of coal can play a major role in alleviating the severe national security problem created by our dependence on imported oil. Coal can be mined, transported, and used safely. The technological and procedural know-how to achieve these objectives has clearly been demonstrated. In addition to easing our balance-of-payments problem by replacing oil in many applications and thereby reducing our increasing need for imports, coal can make a positive contribution by becoming a major export, which would be a boon to reducing our foreign deficits. Most experts agree that coal will be one of the basic ingredients for providing the synthetic gas and liquid fuels of the future. But no plans, no pilot plants, nothing has been done to implement this need. But for coal to fulfill its proper role in the energy market, we need to remove the unnecessarily restrictive regulatory burdens that have been retarding its use.

It is evident, and I want to stress, that the appropriate and compulsory role of the federal government in our quest for energy security is to create an atmosphere and an energy policy which will encourage the private sector to seek, produce, and develop all of our energy sources without undue interference. Yet, these requisites have been sorely lacking. There is no shortage in our energy potential. The only shortage we have had has been the desperate shortage of wisdom in the processes by which federal energy and environmental policies were created and enforced. The United States, unlike other major world powers, has never had a comprehensive national energy policy that worked. James R. Schlesinger, former Secretary of Defense and of Energy, put the energy policy dilemma in the proper perspective when he recently characterized U.S. energy policy, or the lack of it, as "the equivalent of unilateral disarmament." So it is indeed an enigma why the Congress and the Administration do not put aside special interests and look only toward providing a viable and comprehensive energy policy, a working core piece of legislation through which we can rationally evaluate our energy-resource options. It must transcend all political

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### **Role of Energy** (continued from p. 295)

parties and all power structures. This would guarantee that no matter what party controls the executive branch or the legislative branch that the United States has a commitment to energy security that cannot be easily overruled or changed at will. It must be a bipartisan energy policy formulated solely for the protection and the best interests of the national welfare. It must be viewed as a means of survival for this country. It must be a policy which reflects a fixed national purpose.

There are numerous proposals that could be adopted to restore stability and strength to the nation's energy security. Time does not permit me to discuss all of them, but just to mention a few. First, federal leasing policies could be enhanced to provide for more energy and minerals exploration. We could place environmental policy on a scientific cost-benefit basis and encourage private industry research and development of new energy technologies and environmental protection. We could provide for more research and development programs to fully exploit our energy alternatives. Some of the forms come readily to mind: oil from shale, solar, geothermal, wind, and tides. But there are more exotic forms to be developed: waste conversion, biomass, ocean thermal energy conversion, and fuel cells. These research and development programs must be implemented in the academic arena as well as in the government and private sectors. And, lastly, we could enact appropriate legislation to ensure that the results and recommendations become realities.

Without secure sources of energy supply, our military complex is in jeopardy, and with U.S. petroleum production continually declining, there is already concern in our military if even a conventional war could be successfully fought. Also, without relatively secure sources of energy and mineral supply, our industrial base is threatened, and our other domestic needs cannot be met.

It is unfortunate that nothing positive is being done to stop the trend of rising imports and declining domestic oil production. Exploration for new oil and gas reserves is practically nil, so instead of finding new reserves, we are producing and reducing those we have already found. Consequently, we are transforming ourselves from living, on-going entities to liquidationists. In this regard, since we do not now have other sources of energy to take the place of petroleum, there is no question that today exploring and finding new petroleum reserves is our highest imperative.

More awareness and more dedication on all fronts by the media, industry, the Administration, Congress, and especially the public are vitally needed now, not later when it could be too late to restore the search and development for our own energy and mineral sources. We also need the participation of the best scientific and industrial minds of the nation.

Our energy problems are technical challenges the resolution of which will require overcoming a number of hurdles. Innovation will be the cornerstone of a vital economy and the foundation for the continuous growth of American industry. The search for solutions must go forward on many fronts, but the surest path to economic growth is the development of our energy resources. More and more academic institutions are being called upon for ideas and concepts to meet the challenges of the future. There are many questions to be answered. And they can be best answered in a spirit of cooperation and risk-sharing that will bring together the best resources and the best minds to advance our national goals.

The coming decades will be a time of sweeping socio-economic and technological changes for the United States that will permeate every aspect of our lives. The 21st century will be fueled as much by technology as it will be by hydrocarbons and alternate energy sources. We will need new fuel-use patterns, new technologies, new

investments at unprecedented levels, and new policy initiatives to fulfill our total energy needs. The scientists, the engineers, the planners and builders of tomorrow, must provide the means of best utilizing America's energy for her revitalization and continued growth.

In closing, I want to speak briefly of the human resources we so desperately need to meet those requirements. The most dramatic impacts of the future will be felt not only in the area of energy resources but, more importantly, in human resources. And one without the other would be inconsequential. We have an ever-increasing demand for competent, qualified, and innovative scientific and engineering manpower. Our universities, such as Cornell, are being called upon to supply more and more scientists and engineers for industry and government projects. Yet, our supply of this vital human resource is desperately low. To provide the adequate numbers of these planners and builders of tomorrow, it is essential that academia, industry, and government cooperate. Scientists and engineers working together will play a vital role in all aspects of energy development and usage for the future. For without sufficient energy to build, to expand, to grow, to improve technology, and to increase productivity, the entire concept of economic growth and greater industrialization of America becomes meaningless.

### **AIH Conference To Address Advances in Ground-Water Hydrology**

The American Institute of Hydrology 1988 conference *Advances in Ground-Water Hydrology* will meet November 16-18, 1988 in Tampa, Florida. The conference, dedicated to the memory of C. V. Theis, is the third of its kind. Sessions will address advances in ground-water hydrology since the 1976 conference and the need for research and practical application in the 1990s. The Geological Society of America is one of the cooperating agencies of the conference. Preregistration deadline for the meeting is November 1, 1988. For information, write to American Institute of Hydrology, 3416 University Ave. S.E., Suite 200, Minneapolis, MN 55414, or call conference coordinator Helen Klose at (612) 379-1030.

### **Help Direct GSA's Future**

The GSA Committee on Nominations requests your help in compiling a list of GSA members qualified for service as officers and councilors of the Society. The committee requests that each nomination be accompanied by basic data and a description of the qualifications of the individual for the position recommended (vice-president, treasurer, councilor).

Nominations for 1990 officers and councilors must be received at GSA headquarters no later than **FEBRUARY 15, 1989**.

Please send nominations and backup material to  
Administrative Department  
Geological Society of America  
P.O. Box 9140  
Boulder, CO 80301



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## GSA Honors 50-Year Members

Beginning in this, its centennial year, GSA will honor annually those individuals who have attained their 50th year of membership in the Society. Each of these 50-year members will receive a specially designed lapel pin and a certificate of recognition.

This initial list of 50-year members includes all current members who joined the Society in 1939 or before.

**Ira S. Allison**  
*Corvallis, Oregon*

**Charles A. Anderson**  
*Pomona, California*

**Thomas L. Bailey**  
*Santa Barbara, California*

**George W. Bain**  
*Amherst, Massachusetts*

**Arthur A. Baker**  
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#### **GSA PROFESSIONAL VIDEO SERIES 1:**

**Symposium on Oil and Gas Exploration of the Great Basin**  
(Las Vegas, Nevada, 1988)  
A. K. Chamberlain and C. H. Scott, Presiding  
This symposium was presented at the 1988 meeting of the Cordilleran Section of the Geological Society of America.

It includes eight presentations of about 20 minutes each: (1) "A Brief History," by Walt Smith; (2) "The Grant Canyon Oil Field, Nye County, Nevada," by Herbert D. Duey; (3) "Blackburn Field, Nevada: A Case History," by Cheryl H. Scott; (4) "Application of Wildcat Oil and Gas Data to Hydrologic Studies in East-Central Nevada," by W. Alan McKay; (5) "Petroleum Potential of Microplate Accretions of the Basin-and-Range Province," by Joseph Lintz, Jr.; (6) "Delineation of Late Mesozoic Thrust Belt in East-Central Nevada," by Greg Cameron; (7) "Fold-Thrust Belt Exploration for Hydrocarbons in the Basin-and-Range Province," by Dietrich Roeder; and (8) "Petroleum Exploration in Nevada, Then and Now," by Alan K. Chamberlain. Visuals focus on the graphics presented, not on the presenters. VHS tape is edited to remove coffee breaks, etc., and is recorded at standard play speed (SP) to permit fast-scanning. Comes with a printed program containing abstracts of each presentation. PVS001, 1 VHS cassette, 2 hrs., 31 min., \$100.00

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# MEETINGS

(Asterisk indicates new or changed information)

## 1988

**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 5-9, 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) 521-6859.

**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 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.

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

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

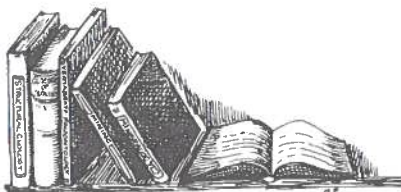
**Carolina Geological Society Meeting**, Geology of the Western Sauratown Mountains Window, November 11-13, 1988. Information: Robert D. Hatcher, Jr., Dept. of Geological Sciences, University of Tennessee, Knoxville, TN 37996-1410.

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

**Advances in Ground-Water Hydrology**, November 16-18, 1988, Tampa, Florida. Information: American Institute of Hydrology, 3416

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### Geology and Paleontology of Seymour Island, Antarctic Peninsula

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University Ave. S.E., Suite 200, Minneapolis, MN 55414; (612) 379-1030.

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

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

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

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

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

**ECORS Program: Deep Seismic Line across the Western Alps**, joint meeting of French, Swiss, and Italian geological societies, December 12-13, 1988, Paris, France. Information: François Roure, Inst. Français du Pétrole, 1-4 ave. du Bois Préau, 92506 Rueil-Malmaison, France.

## GSA 1988

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

## 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 80162-5002; (303) 973-9550; Telex 881988; Fax (303) 973-3845.

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

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

**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.

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

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

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

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

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

**\*Pacific Sections of American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, Society of Exploration Geophysicists, and Society of Professional Well Log Analysts Annual Meeting**, May 10-12, 1989, Palm Springs, California. Information: 1989 AAPG/SEPM/

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SED/SPWLA Pacific Sections, AAPG Convention Dept., P.O. Box 979, Tulsa, OK 74101-0979.

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

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

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

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

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

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

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

**Structural and Tectonic Modelling and Its Application to Petroleum Geology**, October 18-20, 1989, Stavanger, Norway. Information: Norwegian Petroleum Society, P.O. Box 1897 - Vika, 0124 Oslo 1, Norway; phone 47-2-207025; Telex 77 322 nopet n.

**\*Supercomputing World conference and exposition**, October 18-20, 1989, San Francisco, California. Information: Carol Y. Hurley, Meeting Brokers International, Inc., 5 Science Park, New Haven, CT 06511; (203) 786-5132.

**World Gold '89**, 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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