

ANNUAL REPORT ISSUE
see page 179



GSA NEWS & INFORMATION

Monthly Newsletter of
The Geological Society of America

ISSN 0164-5854

Volume 11, Number 7, July 1989

Council Approves New Dues Structure

by T. Michael Moreland
GSA Membership Services Manager

GSA members will pay low basic dues and choose which journals they want to receive beginning with the 1990 dues statements. The new dues structure was approved by the Council at its May 6 meeting in Boulder, Colorado. Professional membership dues will be reduced from the previous \$70 to \$35, while the Student Associate rate will drop from \$32 to \$15. These lower fees include receipt of *GSA News & Information*, ballots, and other GSA mailings—but not the *Geological Society of America Bulletin* and *Geology* as in the past. Members may subscribe to the *Bulletin* or *Geology* separately or may purchase them both as a package in conjunction with their dues payment.

This major change in structure provides a more affordable membership fee, particularly for students, and gives members greater selectivity in choosing which publications and services they receive.

Membership dues and subscription fees for Members and Fellows and Student Associates are summarized here. Note that *Bulletin* and *Geology* subscriptions may be ordered separately or as a package at substantial savings.

As in the past, all members will have the opportunity to

	Member, Fellow	Student Associate
Dues only	\$ 35	\$15
Dues and <i>Geology</i>	\$ 75	\$35
Dues and <i>Bulletin</i>	\$ 85	\$40
Dues, <i>Geology</i> , and <i>Bulletin</i>	\$105	\$45

purchase supplementary items such as division affiliation, *Abstracts with Programs*, and the membership directory on their annual dues statement. Other membership benefits such as the discount on publications and reduced registration fees for meetings will remain intact.

As a result of this major restructuring, the Spouse Membership category is no longer necessary and will be eliminated in 1990. Honorary Fellows and Life Members will continue to receive both *Bulletin* and *Geology* automatically under the new system.

Watch for your 1990 dues statement next month for further information on GSA's new membership dues and publication choices.

GSA Membership Inquiry: Geology and Public Policy for the 1990s

The GSA Committee on Geology & Public Policy wishes to evaluate the role of geologic information in the formulation of public policy. Rather than focus on current issues, the committee wishes to determine what geologic issues will be in the forefront of public policy debates in the next decade and beyond. Please assist the committee in developing an insight into these future issues.

On page 197 of this issue of *GSA News & Information* is a tear-out response form for the following questions. Your responses will be used to provide a list given on a poster at the Geology & Public Policy booth at the 1989 GSA Annual Meeting, Frontiers in Geoscience, in St. Louis. Such a listing of

future issues and directions will provide a stimulus to discussion and policy initiatives.

On the response form

1. Identify what you consider to be the geologic issues of national and global importance during the next ten years.
2. Identify what you consider to be the geologic issues of regional importance during the next ten years. Please identify the GSA section to which it pertains.
3. Which national or regional issues should GSA be involved in, as a nonpartisan, nonprofit, professional scientific society? Are there any issues in which GSA should *not* become involved? Please provide your reasons for either situation.



DNAG NEWS

by Allison R. (Pete) Palmer

Volume A: The Geology of North America—An Overview, Now Available

As of this writing (early June), barring any disasters with the printer, it looks as if Volume A will make it to publication for the International Geological Congress. The book is now at the bindery; and all plates are printed (last one received April 26!) and are now being collated into the accompanying slipcases. This book will be a good complement for the individual synthesis volumes.

Two More Volumes Wrapped Up!

Business seems to be booming. The Eastern Pacific volume should be at the printer by the time you read this; also, the editors for the Appalachian-Ouachita volume should have been here in mid-June and their volume should be ready to send to the printer. These two major volumes of The Geology of North America bring to 8 the number of volumes of this set that have been completed. The Arctic, Caribbean, and Surface Water Hydrology volumes are right behind them, and are expected to be out before the end of 1989.

Kudos to Another Section of the Marine Geological Community

The completion of the Eastern Pacific volume finishes the coverage of the major ocean basins adjacent to the eastern and western margins of North America. Your colleagues who made this possible during the 3½ years between receipt of the first and last chapter manuscripts are listed below. This brings the total number of authors in completed DNAG volumes to 1,185! Thanks to all!

Atwater, T.
Barron, J. A.
Batiza, R.
Clague, D. A.
Dalrymple, G. B.
Decker, R. W.
Duennebie, F. K.
Duncan, R. A.
Fox, P. J.
Gorsline, D. S.
Gutmacher, C. E.
Haymon, R. M.
Heath, G. R.
Hey, R. N.
Holmes, M. L.
Hussong, D. M.
Hyndman, R. D.
Johnson, H. P.
Klein, F. W.
Koyanagi, R. Y.
Kulm, L. D.

Leinen, M.
Lonsdale, P.
Macdonald, K. C.
McCulloch, D. S.
Mammerickx, J.
Mayer, L. A.
Normark, W. R.
Piper, D. Z.
Riddihough, R.
Severinghaus, J.
Stinton, J. M.
Spencer, J. E.
Teng, L. S-Y.
Theyer, F.
Thomas, D. M.
Vincent, E.
von Huene, R.
Watkins, J. S.
Winterer, E. L.
Wright, T. L.

1989 GSA ANNUAL MEETING

Frontiers in Geoscience

St. Louis, Missouri

November 6-9, 1989

Cervantes Convention Center

Abstracts Deadline	July 19
Abstract forms available in geology departments, or contact GSA Abstracts Coordinator	
Preregistration and Housing Forms and Event Information	August 1
GSA News & Information	
Joint Technical Program Committee	August 18-19
GSA division, associated society, and at-large representatives meet in Boulder	
Abstract Notices Mailed (First Class)	August 25
Speaker Kits Mailed (First Class)	August 30
Technical Program Schedule Available	September 1
GSA News & Information	
Preregistration Deadline	October 6
Information available from GSA Meetings Coordinator	
Abstracts Volume Mailed to Subscribers (First Class)	October 12

For Meeting Information (303) 447-2020

In Memoriam

Ralph W. Imlay
Goleta, California
March 4, 1989

Robert T.D. Wickenden
Victoria, Canada
March 14, 1989

Vol. 11, no. 7 GSA News & Information July 1989

GSA NEWS & INFORMATION (ISSN 0164-5854) is the monthly newsletter of The Geological Society of America, Inc., 3300 Penrose Place, Boulder, Colorado 80301. Second-class postage rates paid at Boulder, Colorado, and additional mailing office. GSA, a scholarly society, neither adopts nor supports positions of advocacy. We provide this and other forums for the presentation of diverse opinions and positions by scientists worldwide, regardless of their race, citizenship, gender, religion, or political viewpoint. Opinions presented in these publications do not reflect official positions of the Society. Postmaster: Send address changes to GSA News, Membership Coordinator, P.O. Box 9140, Boulder, CO 80301.

Subscriptions for 1989 calendar year: **Society Members:** GSA News & Information is provided as part of membership dues. Contact the Membership Department at (303) 447-2020 for membership requirements. **Nonmembers:** \$24.00 for United States, Canada, and Mexico; \$34.00 elsewhere. **Ordering:** Nonmember subscriptions may be ordered through the Subscriptions Department, P.O. Box 9140, Boulder, CO 80301, telephone (303) 447-2020. **Claims:** Nonmember claims for nonreceipt or damaged copies should be made to the Publication Sales Department. Member claims should be made to the Membership Department. Claims are honored for one year.

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

***Advertising:** Contact Ann H. Crawford or James R. Clark: (303) 447-2020; 1-800-472-1988; or fax 303-447-1133.

FOUNDATION NEWS

by Robert L. Fuchs



Memorial Fund Established

Since the Foundation receives numerous gifts in honor of deceased members, a Memorial Fund has been created within GEOSTAR for such gifts. Contributions to the Memorial Fund will be appropriately noted in accordance with the donor's wishes, and the income from the fund will be disbursed in conformity with the Foundation's policy in regard to its other unrestricted funds.

Memorial gifts of \$5000 or more can be segregated in a special fund and used as directed by the donor(s), a policy recently established by the Trustees.

Research Grants Funded

The Foundation recently contributed \$25,000 to GSA's Research Grants award program as part of the total 1989 research grants budget of \$180,600. Included among these grants were four awards from the following Foundation restricted funds:

1. Field Research Fund, Jeffrey A. Snyder \$1000
2. S. Oriel Memorial Fund, Carl-Henry Geschwind \$ 860
3. Earthquake Studies Fund, Maribeth Hughett Price \$1065
4. Nace Memorial Fund, Carl I. Steefel \$1000

The Research Grants Committee also made two additional awards from special Foundation funds. Arlene V. Anderson of the University of Alaska in Fairbanks received the John T. Dillon award of \$1000 for a structural study in the Brooks Range. A Geophysics Division award of \$500 from the Allan V. Cox fund was made to Robert V. Enright of Florida State University, who will study the response of well-water levels to tides on Florida's west coast.

Second Century Club Up and Running

Contributors in 1989 of \$100 or more to the Foundation will be named as members of the Second Century Club. This specially designated group had its beginnings in the mid-1980s, but in 1987 and 1988 the Foundation focused its efforts on Century Challenge, a fund in honor of GSA's Centennial. Now that GSA's second 100 years has begun, the Second Century Club will again honor major contributors. Special recognition will be given to club members at GSA's 1989 Annual Meeting in St. Louis.

Medlin Fund Scholarship Awarded

The first issuance by the Coal Division of a scholarship and award from the Antoinette Lierman Medlin Fund has been completed in the amount of \$750. Ken D. Ridgeway of the University of Rochester was the recipient. Ken is studying coal basins in the Yukon, and the work may be far enough along to allow presentation of results at the St. Louis meeting this fall.

Foundation Trustees Meet in San Antonio

The GSA Foundation's Board of Trustees met in San Antonio, Texas, on April 25, 1989, in conjunction with the AAPG Annual Meeting. A large part of the meeting was devoted to a discussion of various fund-raising activities currently underway. The results of the 1987-1988 Century Challenge campaign were reviewed, and the Board also accepted the 1988 annual audited financial report of the Foundation.

A proposed disbursement budget totaling \$56,000 was studied and approved by the Trustees. The money will be used for research grants, student matching travel grants, and the Donath Medal and Award.

A policy was established in regard to specially named, restricted funds. Such funds require an initial gift of at least \$5000 from the donor or donors. In addition, the fund should grow to at least \$10,000 over the ensuing two-year period in order to retain its special designation. This policy is intended to simplify fund administration, which had gotten unwieldy through the creation of several small restricted funds over the years.

Donors to the Foundation, March-April, 1989

Centennial

Freeport McMoRan Oil & Gas
Dale F. Stradling

Century Challenge

Atlantic Richfield Foundation
Charles A. Baskerfield
M. J. Benham
Thomas M. Berg
Paul R. Butler
Russell H. Campbell
Douglas S. Coombs
McLain J. Forman

Charles Fulmer
Michel T. Halbourt
William M. Jordan
Richard E. Kimmel
George E. Moore, Jr.
Barun K. Sen Gupta
Thomas P. Thayer
Roger M. Waller

GEOSTAR Funds

Minority

John F. Childs

Antoinette Lierman Medlin Scholarship Award Fund

Linda M. Donald
Jack H. Medlin
Harry A. Tourtelot

Allan V. Cox Research Award Fund

Philip H. Abelson
Laurie Brown
Rhea L. Graham
Edward H. Hildreth
Harold E. Maude
Robert P. Sharp

John T. Dillon Alaska Research Award Fund

Atlantic Richfield Foundation
John C. Crowell
Michael Lee & Sharon A. Dillon
Bruce C. Panuska

Research

Amoco Production Company
William E. Benson
Arthur Caldenwood
John M. Christie
Sterling S. Cook
Ralph M. Feather, Jr.

Lisa M. Pratt
Robert Raymond
John F. Sutter
Nasraldean A. Widatalla
Kurt Zeppetello

Unrestricted Fund

James R. Beerbower
Eric S. Cheney
E. Gay Gibson
Bruce Mitchell

Les Shepard
Robert R. Shrock
Phyllis D. Wilcken

Young Scientist Award

Fred A. & Mavis Donath

The Poster Session: A Guide for Preparation

by Carol Waite Connor
U.S. Geological Survey

Author's Note: This text, essentially as presented here, was submitted to the editor of the new USGS *Suggestions to Authors* (Hansen, in press) and will be included, as modified by the editor, in that volume. Because of the unusual number of recent requests for this material, it has been released as USGS Open-File Report 88-667 to make it immediately available.

Introduction

The primary purpose of a poster or oral presentation at a scientific meeting is communication of information and ideas to one's colleagues. The poster format has become an increasingly popular form of communication. At AAPG and GSA annual meetings between 1977 and 1988, the number of poster sessions has risen from less than 10% to about 40% of total presentations. There are a number of reasons for this popularity. Although most material could be presented either orally or in poster format, some material particularly lends itself to graphic presentation. Many authors prefer informal individual discussions with their illustrative material at hand to the prospect of speaking to a large audience in a formal setting. Authors and viewers alike find the opportunity to exchange ideas freely and at length to be rewarding. Viewers appreciate being able to take a quick walk past a large number of presentations (no captive audiences here!) getting the gist of a lot of science, and then returning to the displays they find of greatest interest.

Abstracts for poster presentations are published along with those for oral presentations, and carry the same prestige. Most scientific meetings now allow abstracts to be submitted for either an oral presentation or a poster presentation. At the larger 3- and 4-day meetings, poster sessions commonly run for a half-day each; authors are present during a specified period, generally at least 2 hours. During each of these half-day sessions there may be 30-80 posters displayed, so competition for attention is keen. At smaller gatherings a single group of posters may be shown during the entire meeting.

The Poster

As poster sessions are a fairly recent innovation, participants have had few guidelines to help them produce an excellent poster. They have mostly learned, in the typically scientific fashion, by observation: good science, uncluttered and colorful design, legibility and brevity of text, and straightforward organization equal a good poster.

The sponsoring society should inform the author of the specific location of the display area (by map and/or number designation) and the size and orientation of the display boards. Commonly, individual display areas have tack board mounted horizontally at eye level and measuring 4' x 8' or slightly less. Three boards of this size, forming a booth, are not uncommon. Occasional vertical placement of the display boards by the organizers makes design of a poster difficult because so much of the area is well above or below eye level, and should be discouraged. It is imperative that an author know the dimensions of the display boards, and whether they are horizontal or vertical, before designing a poster. The author should call the sponsoring society if it does not provide this information along with notification of acceptance of the abstract. It is also helpful to know the color of the display boards to avoid a color clash with the poster material.

As a general rule, allow 6 weeks of discontinuous work to prepare an attractive poster. This allows time to take photos or order photo enlargements, gather all materials, and actually execute the poster.

New and exciting ideas based on sound research can draw deserved recognition through a well-written abstract and an eye-catching poster design. Scientists must recognize that participants at a scientific meeting probably have not had the opportunity to read a particular abstract before they walk into the display area. Attention will invariably be drawn to posters with a crisp, clean design and a snappy title. The title must have this strolling audience in mind. It helps to think of a title as a newspaper headline vying for attention. Once the viewer has come to take a closer look at an interesting-looking display, all aspects of the design and the science work together to keep, or lose, the viewer's attention.

Science

Obviously, the story to be told should be interesting and the research should be sound. However, the ideas need not be uncontroversial. Work that encompasses or might interest other disciplines, or has broad application and/or implications, is the type most likely to be accepted for inclusion in a poster session and receive considerable feedback.

A common criticism of poster sessions is that the author attempts to tell the entire research history. Present only enough data to support your conclusions. However, modesty is not a particular virtue; you should make the significance and originality of the work very clear because viewers from other specialties may not be aware of its importance.

Design

The subject of design is complex, and any rule can be broken creatively and pleasingly by one with an artistic flair. There are suggestions, however, that generally will make a poster more accessible, attractive, and interesting.

1. At first glance from 10-15 feet away the viewer should see an easy-to-read title and an uncluttered, neat arrangement of photos and/or illustrations and text. It should be obvious where to start inspecting the poster and where to go from there (generally left to right, top to bottom). As this progression is vital, the component parts should either be numbered to facilitate this or have arrows that graphically lead the viewer through the display. (Figure 1).
2. Leave some open space in the design. The same rule applies as in packing a suitcase: when you're finished, take out half. Tightly packed space tires the eye and the mind.
3. Use elements of different sizes and proportions. Same-size and size-proportioned components result in a boring design. For areas of particular emphasis try a mixture of shapes and straight lines to attract the viewer's attention. (Figure 2).
4. A large and/or bright center of interest can draw the eye to the most important aspect of the poster—a simplified, bold cross section illustrating a structural feature, a colorful paleogeographic map, a blowup of a photo of a new species, or a large outcrop photo illustrating depositional environments. Color poster prints, 12" x 18" or 20" x 30", can be ordered from photographic slides or negatives for a modest price at most photo shops.

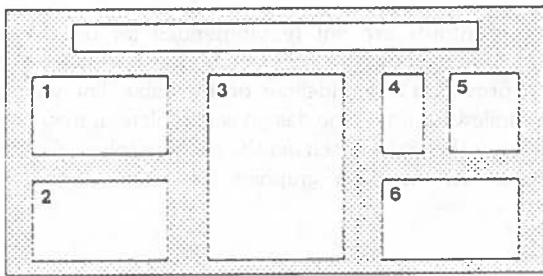


Figure 1. Two methods of leading viewer through a poster: numbers, arrows.

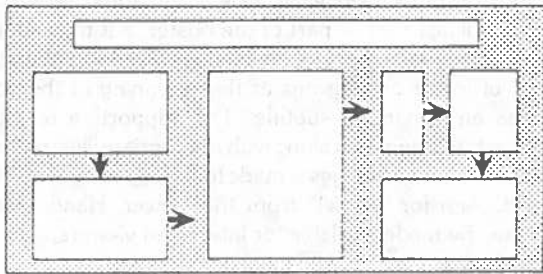


Figure 2. Attention-getting curved shape and lines.

5. Enlarge all photos enough for pertinent details to be clearly evident.
6. Make all illustrations simple and bold. Leave out any unnecessary detail in the story being presented.
7. Convert tabular material to a graphic display if possible. Try scatter plots, bar graphs, or triangular diagrams.
8. The inclusion of actual rocks or fossils is a nice touch. They can be fastened to poster board with silicone glue. Alternatively, if a table is included in the display area, specimens can be put there.

This is 18 point type, the smallest size you should use. Can you read it from 5 feet away?

This is 24 point type. Better?

Figure 3. Examples of type size.

9. Make a scale drawing of your layout. Have a few colleagues comment on the overall design before final drafting. If you have access to professional drafting personnel, ask for their suggestions.
10. The main tenet of good poster design: simplicity.

Lettering, Line Weights, and Color; Computer Printouts

All lettering should be legible from 5 feet away. The over-40 crowd should not have to put on reading glasses. The minimum type size should be no less than 18 points, and the style should be bold or semi-bold in simple, clean-looking type (Figure 3). The title lettering should be the largest, about 2"-3", with subheadings 1/2"-1" high. Office and art supply stores have a wide variety of stick-on and rub-on individual letters in various colors and sizes which are ideal for titles and subheadings. The sponsoring organization may indicate it will prepare the title, but take along your own in case theirs is too small, as usually is the case. For material other than titles and subheadings, capitals and lower-case letters in combination are much easier to read than all capitals (Figure 4). Text material can be typed at about 12 points, then enlarged on a copying machine to as large as 24 points without significant loss of clarity if a carbon ribbon and a clean type element have been used. This is an inexpensive method of producing very neat-looking text material (Figure 5). The typed material may also be enlarged photographically.

UPPER v lower case

"MOST OF THE PRINTING MATERIAL FOR ORDINARY READING, AS IN NEWSPAPERS, MAGAZINES, AND BOOKS, IS IN LOWER-CASE LETTERS EXCEPT FOR THE CAPITALIZATION OF A FEW WORDS SUCH AS PROPER NAMES AND THE INITIAL WORD IN THE SENTENCE."

"Most of the printing material for ordinary reading, as in newspapers, magazines, and books is in lower-case letters except for the capitalization of a few words such as proper names and the initial word in the sentence."

M. Tinker, "Legibility of Print"
Iowa State University Press

Figure 4. Legibility of upper-case letters alone compared with combined upper- and lower-case letters.

A professional appearance can be obtained by use of a lettering machine that produces strips of stick-on text. These lines of text, in the final size, are applied to plain white paper and then photographed so that the tape does not show.

Both typed lettering and stick-on lettering can be combined with black and white line drawings before the final copy (copy-machine enlargement or photograph) is made. Line drawings—maps, diagrams, fossils, cross sections, etc.—should use a line weight that will be no thinner than 0.70 mm (#2 pen) in the final product. Bolder lines are preferable. Keep the drawing simple and leave out all extraneous details.

Color is as complex a subject as design, and it is not possible to give any set rules. Some authors prefer soft muted colors; others like deep or very bright ones. Any type can be used attractively, within some constraints. The temptation is to use color everywhere—don't. The viewer's eye will jump erratically around the poster instead of tracking through it to the crucial points. The less important parts of the poster—the necessary background information, the supporting data—will seem to recede into the back-

(continued on p. 166)

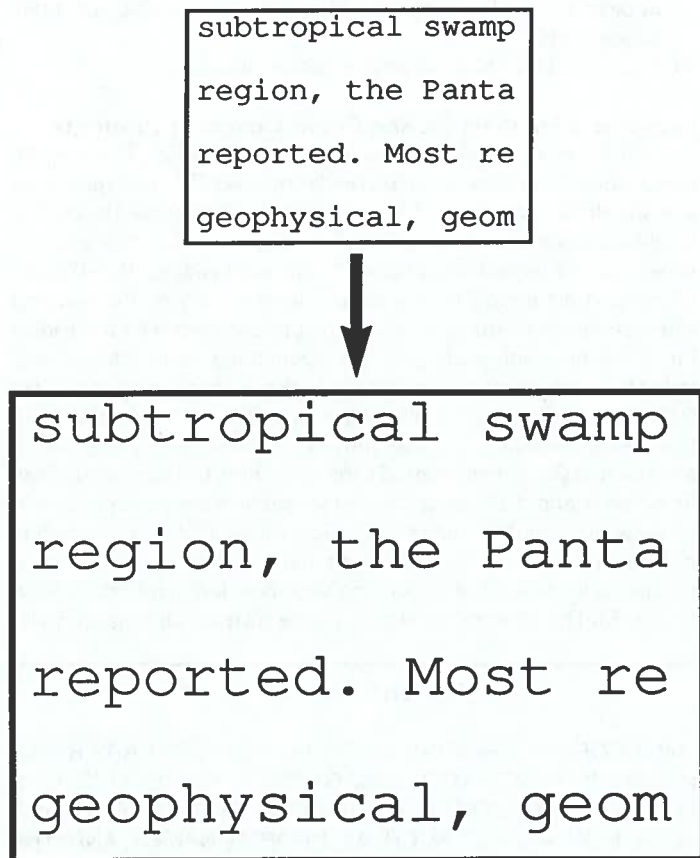


Figure 5. Typed text enlarged on copying machine to approximately 24-point size.

ground if done in cool or cool-neutral colors (blues, greens, and some grays). The featured parts can be highlighted by using warm colors (reds and yellows), or black if the background colors are soft, or white if the background colors are bright or deep. In choosing colors be aware that lighting in the display area may not be optimal.

Color should be applied to black and white drawings after they are photocopied unless the cost of color printing is no object. Transparent or opaque sheets of stick-on color (use non-glare, matte-finish type) provide the most even shading. Colored stick-on tape comes in widths up to 2". The flexible kind can be used for line work. The standard kind is perfect for bar graphs and histograms, for borders, and as leaders from one element of the poster to another. Colored stick-on dots, squares, and triangles are available in various sizes. Large arrows can be cut from stick-on tape or from stick-on color sheets.

"Reverse-color" photo prints make a striking poster. These prints have colors the reverse of what were used on the original drawing. White background becomes black, black lines become white, red becomes blue, etc. A chart showing original colors to use to obtain the desired reverse may be acquired from some photographic studios, or advice may be sought from drafting shops or colleagues experienced in drafting for reverse-color prints or slides.

A computer is an excellent tool for preparing text material for posters. However, standard computer printouts are poor material for posters. The standard type size is too small and the line weight is too thin. If printouts must be used, enlargement can improve legibility of tabular material, and addition of color and enhancement of lines with stick-on tape can enliven graphics. Although standard

computer printouts are not recommended for use on posters, illustrations using some computer graphics programs can be very effective, providing the guidelines on type size, line weights, and color are followed. Once the design is complete, it may be printed out in color or the screen itself may be photographed. Consult your local expert on computer graphics for details of the available system.

Text

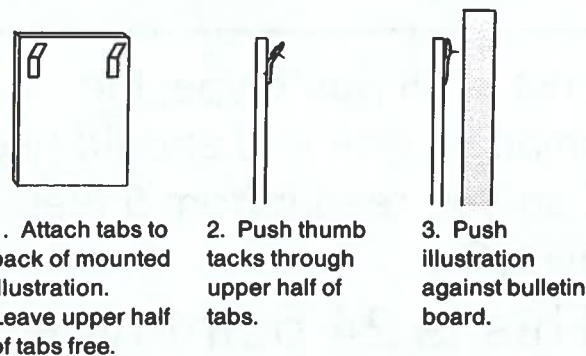
The text material included on a poster should be extremely brief or most of the audience will walk away. Some authors like to include the full abstract as part of the poster, but they should not rely on its being read. More successful is placement of a succinct statement of major conclusions at the beginning of the poster—perhaps as an expanded subtitle. The supporting text is then presented in brief segments along with appropriate illustrations, and the significance of the findings is made forcefully and concisely clear at the end. Aim for "Wow!" from the viewer. Handouts of the abstract may be made available for interested viewers.

Mounting, Packaging, Displaying

All poster elements should be mounted with an adhesive on poster board or on 1/8" foam-core board so that they will lie flat. A cleaner look is achieved if the caption is mounted on the same board as the illustration. A half inch or so of the colored poster board extending beyond the edge of an illustration attractively frames it. Select the mounting color carefully so that it does not overpower the picture. Illustrations mounted on the white foam-core board can be edged with colored stick-on tape.

Posters often have to be taken to distant meetings. If you know you may be flying, make the poster elements small enough to package with the carry-on dimensions (generally 17" x 22"; call the airline to be sure) to avoid the panic of lost luggage.

You may have only a short time to set up your display, so prepare for this in advance. Have these items in a poster emergency kit: tape measure, 9' length of string, box of clear push-pins (get longer than standard ones if mounted illustrations are thicker than 1/8") or box of dressmakers' round-headed pins, ordinary thumb tacks, roll of double-stick tape, scissors, glue, package of tissue paper. Have a sketch of the poster layout, with positions of a few key components measured off so you know where to place them. Set up a level line, if needed, by tying the string between two push-pins set a measured distance above the bottom of the display board. The poster elements can be fastened to the board without visible attachments as shown in Figure 6, or can be attached with the



1. Attach tabs to back of mounted illustration. Leave upper half of tabs free.
2. Push thumb tacks through upper half of tabs.
3. Push illustration against bulletin board.

Figure 6. A method of invisibly attaching poster components to display board.

(continued on p. 167)

POSTER SESSION (continued from p. 166)

push-pins (or dressmakers' pins), or with lots of double-stick tape. When you remove the display, if you've used double-stick tape, put a sheet of tissue paper between the components when stacking them to keep them from sticking together.

The Alternative Poster

The professional-looking poster discussed above has an attractive counterpart. The artistically inclined scientist can make a poster by sketching it entirely by hand. This has to follow the same science and design guidelines as previously described, but is produced with colored felt-tip pens on poster board of pleasing complementary or neutral color. Text material (a minimum of 18 point type) is easy to do by hand with felt markers if there are lightly penciled lines to follow. This less formal kind of poster is fast and inexpensive to do and if neatly and imaginatively done can have a very special charm.

Further Reading

- Hansen, W. R., editor, 1989, Suggestions to authors of the reports of the United States Geological Survey (7th edition): Washington, D.C., U.S. Government Printing Office (in press).
- Severson, R. C., Gough, L. P., McNeal, J. M., and Ropes, L. H., 1979, Poster sessions: An alternative to formal presentations: *GSA News & Information*, v. 1, p. 17-18.
- Singleton, Alan, 1984, Poster sessions. A guide to their use at meetings and conferences for presenters and organizers: Elsevier International Bulletins, 50 p. Has helpful information for poster-session organizers. Listed suppliers of equipment are all British.

People

GSA Member **Thomas A. Vinckier**, Santa Barbara, California, has been named a limited partner of Dames and Moore. Fellow **Raymond L. Ethington** has been installed as president of the Society of Economic Paleontologists and Mineralogists. Also serving on the SEPM council are Fellow **Roderick W. Tillman**, president-elect; Fellow **David J. Bottjer**, editor; and Member **Barbara H. Lidz**, editor of special publications. GSA Fellow and former councilor **Don U. Deere** was appointed as chairman of the Department of Energy's Nuclear Waste Technical Review Board. Fellow **John F. Burst** has been elected to distinguished membership in the Society of Mining Engineers.

Engineering Field Manual Published

The U.S. Bureau of Reclamation has announced publication of *Engineering Geology Field Manual*, compiling information in a "how to" format. The manual is available for \$23.00 from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, and from the Bureau of Reclamation, Denver Office, Denver Federal Center, P.O. Box 25007, Denver, CO 80225-0007, Attention D-7923-A.



**The Age of Dinosaurs
Short Course**

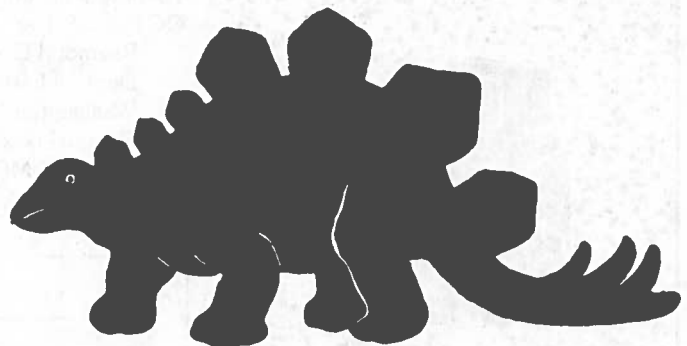
Sunday, November 5, 8:15 a.m. to 5:30 p.m. Adam's Mark Hotel. Cosponsors: National Association of Geology Teachers, Paleontological Society, and Society of Vertebrate Paleontology.

This course is designed to bring nonspecialists up to date on recent advances in the knowledge of dinosaurs and to provide participants with a basis on which to develop an introductory dinosaur course in their own institutions. Dinosaurs are an endless source of interest for students, and they can be used to teach a spectrum of concepts from molecular evolution to geophysics. Dinosaur courses currently enroll 600 or more students and can stimulate all kinds of students to learn more about earth and life history. (Department Chairs, please note!) This course will be taught by 12 dinosaur specialists, and ample discussion time is planned. Short course notes will supplement lectures and provide references. Geological, ecological, and evolutionary aspects will be covered along with new ideas and issues. The focus will be on both explaining recent advances and on showing participants how to set up a dinosaur course.

Faculty: K. Padian, D. Fastovsky, B. H. Tiffney, P. Sereno, D. B. Norman, J. McIntosh, T. Rowe, P. J. Currie, J. A. Gauthier, M. Lockley, J. D. Archibald, D. Chure.

No cost. Short course notes will be available on-site for approximately \$15. PREREGISTRATION IS REQUIRED. To reserve a seat, please fill out the form and send by **OCTOBER 1, 1989** to

Kevin Padian
Museum of Paleontology
University of California
Berkeley, CA 94720

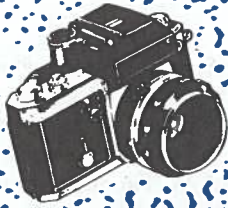


Please reserve a seat for me at the Age of Dinosaurs Short Course, Sunday, November 5, 1989 at the GSA Annual Meeting in St. Louis.

Name _____

Institution _____

Address _____

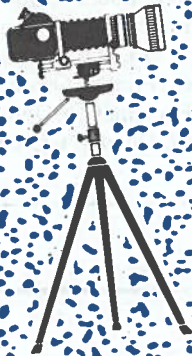


PHOTOGRAPHY

Frontiers Photo Salon

An attraction at the GSA Annual Meeting in St. Louis this year will be GSA's first photo contest. Entries will be judged on basis of impact, content, composition, and overall presentation.

- Color or black and white prints.
- Print size: minimum of 8" x 10"; up to maximum of 20" x 24".
- Prints mounted on white, blue, beige, or black mat board.
- Description of print on front lower edge of mat board.
- Your name and address on back of mat board.
- Only 1 entry per photographer.



Entries will be screened for suitability. Photos will be displayed on the second level of Cervantes Convention Center. Judging, by GSA editors, will take place on Sunday, November 5. First, second, and third place prizes will be awarded. First place color winner will appear on the cover of *Geology*. (Photos that have already appeared on the cover of *Geology* are not eligible.)

All entries will be returned by November 30, 1989.

To enter, fill out the entry form and send it, along with your photo, before **OCTOBER 1** to

Raymond E. Arvidson
Dept. of Earth & Planetary Sciences
Washington University
Campus Box 1169
St. Louis, MO 63130

Questions? Call GSA Meetings Dept., (303) 447-2020



Clip and send with entry by October 1

Name _____

Institution _____

Address _____

City _____ State _____ ZIP _____

Telephone number: () _____

Description of photo: _____



1989 Annual Meeting Symposia Highlights

This is the second in a series of four articles highlighting symposia to be presented in St. Louis at the 1989 GSA Annual Meeting. The first article in the series appeared in the June issue of *GSA News & Information* and the third and fourth will appear in the September and October issues. The August registration issue of *GSA News & Information* will give a complete listing of symposia titles and authors.

S6. Remote Sensing and Geographic Information Systems: Techniques on the Frontier of Change

Sponsored by the National Association of Geology Teachers
Conveners: Richard C. Stenstrom, Beloit College; Robert J. Krumm, Illinois State Geological Survey.

Remote Sensing and Geographic Information Systems (GIS) technology are relatively new tools for geologists, but use of this technology has increased dramatically in the 1980s. Remote sensing and GIS can work together to allow geoscientists to compile and manage large data sets on many aspects of a particular problem; remote sensing provides a method for obtaining very up-to-date information, while GIS provides the ability to efficiently manage and manipulate the data. Current remote sensing and GIS applications include studies on mineral resource assessment, hydrocarbon potential, landslide hazard analysis, ground-water and surface-water analysis, and hazardous waste disposal facility siting.

As we approach the next century, GIS and remote sensing will continue to serve both the geoscience community and the general public. These technologies will allow geologists to interact with other professionals to analyze diverse data sets. This ability to combine, overlay, and analyze many data elements will allow the geologists to make informed contributions to the decision-making process at the local, state, national, or global scale.

S8. Potential for Olympic Dam-Type Cu-Au-U-REE Deposits in the Proterozoic Granite-Rhyolite Terranes, Midcontinent, USA

Sponsored by the Society of Economic Geologists
Conveners: Geza Kisvarsanyi, University of Missouri, Rolla; Paul K. Sims, USGS, Denver; Eva B. Kisvarsanyi, Missouri Geological Survey, Rolla.

Speakers: Steven Hauck, University of Minnesota, Duluth; Naomi Oreskes, Stanford University; Rudyard Frietsch, Luleå University of Technology, Sweden; John Philpotts, USGS, Reston; Murray Hitzman, Chevron Resources; Richard Hagni, University of Missouri, Rolla; Eva Kisvarsanyi and Laurence Nuelle, Missouri Geological Survey, Rolla; Gandhi S. S., Geological Survey of Canada.

This symposium will provide comparisons between complex Fe-REE deposits exemplified by the giant Olympic Dam deposit, South Australia, and will examine similarities and differences between Kiruna district deposits, Sweden; southeast Missouri; and Bayan Obo, P.R.C. Recent developments in structural evolution and metallogenesis of Proterozoic basement terranes support analogies between Fe-REE deposits on several continents and suggest similar ore-forming processes.

The U.S. midcontinent is underlain by extensive Proterozoic anorogenic granite-rhyolite terranes that are generally favorable for hosting Olympic Dam-type deposits. These terranes, mostly covered by 300 to 500 m of Phanerozoic strata, are locally exposed, as in southeast Missouri, where iron ore has been mined since 1815. Current research has disclosed Cu, Au, and REE mineralization associated with these deposits, and has reinforced the analogy with the Olympic Dam deposit. The symposium will emphasize new

research results and will provide a framework for defining a model for Proterozoic Fe-REE deposits. Better understanding of this class of ore deposits in the context of their host terranes is essential to formulate exploration for precious metals and rare-earth resources.

S9. Mississippi Valley-type Deposits

Sponsored by the Society of Economic Geologists
Conveners: David L. Leach, Raymond M. Coveney, Jr.
Speakers: G. M. Anderson and R. N. Randell, University of Toronto; Hubert L. Barnes, Pennsylvania State University, University Park; Dwight Bradley, USGS, Anchorage; J. C. Brannon and Everett Shock, Washington University, St. Louis; Raymond M. Coveney, Jr., University of Missouri, Kansas City; J. R. Craig, Virginia Polytechnical University; M. R. Farr, University of Kansas; Grant Garven and Dimitri A. Sverjensky, Johns Hopkins University; M. B. Goldhaber, Timothy S. Hayes, E. Lanier Rowan, and David L. Leach, USGS, Denver; J. M. Gregg and John Mavrogenes, University of Missouri, Rolla; Alex Halliday and S. E. Kesler, University of Michigan; Paul Hearn and John Repetski, USGS, Reston; David W. Houseknecht and Kevin L. Shelton, University of Missouri, Columbia; J. Richard Kyle, University of Texas, Austin; Tom Lane, Memorial University; Ernest L. Ohle, Tucson; James R. Palmer, Missouri Dept. of Natural Resources; Donald F. Sangster, Geological Survey of Canada; David T. A. Symons, University of Windsor.

For most of this century, Missouri has been the main domestic U.S. source of lead and an important supplier of zinc. Throughout the United States and the rest of the world, lead-zinc ores deposited in the undeformed sedimentary rocks, remote from igneous activity, are referred to as Mississippi Valley-type deposits.

From several lines of evidence, many investigators believe that most Mississippi Valley-type deposits in the United States formed 250–300 m.y. ago from hot brines that migrated through sedimentary beds. Results of 27 studies of fluid sources, ages, temperatures, and causes of deposition will be presented in the symposium. These have significance to the genesis of lead-zinc ores but also to basic questions about the origins of sedimentary basins and deposits of other metals, petroleum, and natural gas.

Zinc is used mainly for galvanizing, a process that retards corrosion and which is of considerable importance to those concerned about the longevity of automobile bodies or other objects made of steel. Lead is essential for car batteries. The relative self-sufficiency of the United States for these metals can be attributed mainly to the large deposits of Missouri, where deep modern underground mines operate unobtrusively beneath forests. Geologic studies of origins can help find new deposits as exemplified in Missouri, where investigations of ores in ancient reefs of the Old Lead Belt (est. 1720) led to discovery of the giant deposits of the New Lead Belt near Viburnum in 1955.

S17. Site Characterization for Conditions of Non-Darcian Flow

Sponsored by the Hydrogeology and Engineering Geology Divisions
Conveners: John F. Harsh, Roy F. Weston, Inc., West Chester, Pennsylvania; Jeffrey R. Keaton, Sergeant, Hauskins & Beckwith, Salt Lake City, Utah.

Speakers: Tom Aley, Ozark Underground Laboratory; Calvin Alexander, Jr., University of Minnesota; John Hickey, USGS, Tampa; Chris Neuzil, USGS, Reston; James Quinlan, National Park Service, Mammoth, Kentucky; Bridget R. Scanlon, University of Texas, Austin; David Lee, AECL, Chalk River, Ontario; Wendell Miller and Allen Kimbrell, Geotechnical Laboratory Waterway

(continued on p. 170)

SYMPOSIA (continued from p. 169)

Experiment Station, Vicksburg, Mississippi; John Cherry, University of Waterloo, Canada; Jane Long, Lawrence Berkeley Laboratory; Kandiah Arulanandan, University of California, Davis; William Haneburg, New Mexico Bureau of Mines; Philip LaMoreaux, University of Alabama; Hal Olsen, USGS, Denver; Jeff Carman, Jacobs Engineering, St. Charles, Missouri; William Wilson, Florida Sinkhole Research Institute, Orlando.

The purpose of this symposium is to present technical advances that solve hydrogeological and engineering problems for conditions of non-Darcian flow. It is expected that these advances will examine the theoretical and practical limitations, especially if extensions to the Darcian approach are used. Darcy's law is an empirical law used to provide an accurate description of ground-water flow in almost all hydrogeological and engineering environments. The Darcy equation computes rates and quantities of flow using the ideas that fluid flow is linear from one point to another when a hydraulic head difference exists between the two points.

However, theoretical and experimental evidence indicates that fluid flow can be induced to flow under nonhydraulic gradients. The upper limit of Darcy's law is usually based on the Reynolds number. The lower limit is less easily determined, especially for flow in low-permeability material. Because an increasing number of contaminant transport problems from hazardous waste involve non-Darcian flow conditions, interpretation strategies and conceptual models are needed to more accurately represent the flow system. These developments need to be incorporated into the efforts directed toward solving contaminant transport problems. The papers of this symposium will be selected to emphasize hydrogeological and engineering investigations associated with site characterization where Darcy's law may not be valid. The papers will stress the need to obtain information and develop technical approaches that can be used to characterize conditions of non-Darcian flow. This information includes the acquisition of hydrogeologic, hydraulic, geochemical, and electrical parameters, and the spatial variations of these parameters for input to flow and transport models.

S19. Rates and Duration of Deformational Processes and Orogenic Events

Sponsored by the Structural Geology and Tectonics Division
Conveners: Gregory A. Davis, University of Southern California; Randall R. Parrish, Geological Survey of Canada; Robert J. Twiss, University of California, Davis.

Speakers: Jason Saleeby, California Institute of Technology; John Christie, Brad Hacker, and An Yin, University of California, Los Angeles; Randall Parrish, Geological Survey of Canada.

This symposium will address one of the most fundamental parameters of the earth sciences—*TIME*. The symposium will present a state-of-the-science review of contemporary ways of assessing (1) the rates of real time of deformational processes (= natural strain rates) and (2) the duration of orogenic events and episodes.

The earth sciences have experienced a quiet revolution in the past decade or two in understanding more about the timing of deformational processes and events. It seems appropriate in light of the 1989 Annual Meeting's overall theme "Frontiers in Geoscience" to focus attention on those various means by which our understanding of the role of time in structural processes and events has been dramatically improved. Some papers will focus on advances in geochronology that enable surprisingly precise determinations of how quickly major orogenic events have evolved. We will discuss the rapid pulse of "Nevadan" orogenic events in northwestern California and southwestern Oregon using a combination of U/Pb geochronology and biostratigraphy. Another geochronologic-based approach to understanding orogenesis has developed through interactions between petrologists, structural geologists, and geochronologists, where variations in the pressure(*P*)-temperature(*T*) history of igneous and metamorphic mineral assemblages are related to geochronologic studies of the same or associated minerals. *P-T-t* (time) paths for Mesozoic and Cenozoic evolution of the Canadian Rocky Mountains will be examined. A promising new field of research relates the development of microstructures in naturally deformed rocks to experimental studies on flow rate and deformational mechanisms in laboratory-induced rock deformation. Such studies by the UCLA group have produced estimates of strain rate within extensional ductile shear zones that are closely compatible with estimates based on mapping and *P-T-t* studies. The presentation should provide geologists with a fascinating review of the directions, goals, and diversity of current research in the timing of deformational processes.

Air Transportation to 1989 Annual Meeting

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

TWA, Delta, and United Airlines have been named the official carriers. Reduced rates are 5% off any available discount fare, generally having restrictions. If you do not meet the requirements for the discount fare, you will be offered 40% to 45% off the unrestricted coach fare.

To make a reservation:

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



For Meeting Information (303) 447-2020

Frontiers in Geoscience Theme Sessions

To submit an abstract for consideration for a theme session, the author is asked to use the 1989 abstract form as follows:

1. Write in the number of the theme (T1, T2, . . . T20) and the first five key words of the theme title in the space provided.

2. Check ONE appropriate discipline for purposes of technical review.

- Each title has a theme advocate who will evaluate abstracts initially only on the basis of topical relevance. Eliminated abstracts will be automatically considered as volunteered papers (if desired by the author).

- All abstracts will be evaluated by three appropriate Joint Technical Program Committee reviewers in the ONE discipline for which they are submitted; a fourth review will be provided by the theme advocate.

- During the August 18-19 meeting, the designated technical program representative (in consultation with the theme advocate) will organize theme sessions from the abstracts approved for presentation.

Theme titles and disciplines are listed below. The discipline number is a reference to the abstract form. Authors will select ONE of the disciplines. This will be the review category. For a complete description of each Theme Session, see the April issue of *GSA News & Information*.

T1. Geological Mapping in the Next Several Decades.
Geoscience Information (11), Planetary Geology (25), Remote Sensing (28).

T2. The Effects of Man on the Mississippi River and Its Delta.

Engineering Geology (4), Environmental Geology (5),
Geomorphology (9).

T3. Correlation and Basin Analysis of Nonfossiliferous Sedimentary Rocks.

Geochemistry (7), Precambrian Geology (26), Stratigraphy (30).

T4. Magma Currents, Melt Migration, and Geochemical Transport in Mafic Igneous Complexes.

Economic Geology (3), Geochemistry (7), Petrology, Igneous (22).

T5. The Effects of Greenhouse Warming on North American Deserts: Holocene Analogues.

Environmental Geology (5), Quaternary Geology (27).

T6. Trace Element and Isotopic Studies with the Ion Microprobe.

Geochemistry (7).

T7. Sub-Mediterranean "Giant Salt" as a Deep Water Brine Precipitate: An Alternative to the Evaporite Hypothesis.

Geochemistry (7), Petrology, Sedimentary (24),
Sedimentology (29).

T8. Quantitative Structural Geology: The Nature, Mechanism and Implications of Natural Deformation.

Mineralogy/Crystallography (17), Structural Geology (31),
Tectonics/Geophysics(33).

(continued on p. 172)

BE SURE TO STOP BY AND VISIT THE
GSA BOOKSTORE

1989 GSA ANNUAL MEETING
NOVEMBER 6-9 • ST. LOUIS

NEW TITLES AND PRODUCTS
WILL BE ON DISPLAY AND
AVAILABLE FOR SALE.

*Enter our daily drawings ...
Receive a gift just for visiting
the GSA Bookstore!*

**LOOK FOR US
UNDER THE BANNER!**

BOOKSTORE

G S A

THEME SESSIONS (continued from p. 171)

T9. The First Half of Earth History.

Precambrian Geology (26).

T10. Seismic Tomography and Mantle Dynamics.

Geochemistry (7), Geophysics (10), Tectonics/Geophysics (33).

T11. Global Sedimentary Geology.

Oceanography (18), Petrology, Sedimentary (24), Sedimentology (29).

T12. A Growing Crisis in (Geo)Science Education.

Geology Education (8).

T13. The Lunar Science Frontier: Implications for the Earth's Past and Future.

Geochemistry (7), Petrology, Igneous (22), Planetary Geology (25).

T14. Tectonometamorphism.

Petrology, Metamorphic (23), Tectonics (32), Tectonics/Geophysics (33).

T15. Continental Dynamics.

Petrology, Igneous (22), Tectonics (32), Tectonics/Geophysics (33).

T16. Volcanism and Climate.

Volcanology (34).

T17. Mantle Plumes and Mass Extinctions.

Paleontology/Paleobotany (19), Tectonics/Geophysics (33).

T18. Geoscience and the Arts.

Geology Education (8).

T19. New Concepts in Understanding Fluid-Rock Interactions at High Temperatures: Problems and Solutions.

Geochemistry (7), Petrology, Igneous (22), Petrology, Metamorphic (23).

T20. Physical Properties of the Lower Continental Crust.

Geophysics (10), Tectonics/Geophysics (33).

T21. Frontiers of Fluid-Inclusion Research.

Geochemistry (7), Petrology, Experimental (21).

T22. Application of Artificial Intelligence, Expert System, or Knowledge-Based System Methods in Geological Sciences.

Mathematical and Computer Geoscience (35).

T23. Determining the Relative Timing of Pluton Emplacement and Regional Deformation.

Petrology, Igneous (22), Structural Geology (31), Tectonics/Geophysics (33).

T24. Geomorphic Processes and Landform Evolution.

Geomorphology (9), Hydrogeology (14), Remote Sensing (28).

T25. Late Eocene-Oligocene Climatic and Biotic Evolution.

Marine Geology (15), Paleontology/Paleobotany (19), Stratigraphy (30).

T26. Hydrothermal Organic Geochemistry.

Geochemistry (7).

T27. Cretaceous Record of the Eastern Margin of the Western Interior Seaway.

Paleontology/Paleobotany (19), Sedimentology (29), Stratigraphy (30).

T28. Hydrogeologic Challenges for the Next Decade.

Hydrogeology (14).

T29. Thermal and Hydrologic Evolution of Accretionary Prisms: Modern and Ancient Examples.

Geochemistry (7), Marine Geology (15), Tectonics (32).

T30. Origin of Brines in the Earth's Crust.

Geochemistry (7), Hydrogeology (14), Petrology, Sedimentary (24).

T31. Geologic Causes of Natural Radionuclide Anomalies.

Environmental Geology (5), Geochemistry (7).

T32. Rock-Water Interactions in Carbonate Rocks and Sediments.

Petrology, Sedimentary (24), Sedimentology (29), Geochemistry (7).

1990-1991 FULBRIGHT SCHOLAR-IN-RESIDENCE PROGRAM

Opportunities for American colleges and universities to host a visiting scholar from abroad for all or part of the 1990-1991 academic year are available through the Fulbright Scholar-in-Residence Program. Institutions are invited to submit proposals for visiting scholars in the humanities or social sciences, or in professional specializations with a strong international focus. Of particular interest for the 1990-1991 program year will be proposals to bring professionals from the media or in government; scholars interested in the bicentennial of the U.S. Constitution; the quincentennial of Columbus' discovery of the Americas, and—from the Western European countries—those interested in topics related to European economic unity in 1992.

A Fulbright Scholar-in-Residence may teach regular courses from a comparative or foreign area perspective, serve as a resource person in interdisciplinary courses, assist in developing new courses, and may participate in special seminars. An institution hosting a

scholar-in-residence is expected to share the scholar's expertise among departments and neighboring institutions, involve him/her in community activities and professional organizations, as well as provide opportunities for the visitor to advance professional research interests.

The program provides roundtrip travel for the grantee and, for full-year awards, one accompanying dependent; a monthly maintenance allowance; and incidental allowances for travel, books, and services essential to the assignment. The host institution is expected to share some costs in the form of supplementary funding and in-kind support such as housing.

The deadline for receipt of proposals is November 1, 1989. Detailed program guidelines and proposal forms may be requested from the Council for International Exchange of Scholars, 3400 International Drive NW, Suite M-500, Washington, DC 20008-3097; (202) 686-7866.

For members about to take a trip, here's a going away present.

Discounts on National Car Rental's daily, weekend, weekly and monthly rates.

Just show your membership card or your National discount card. You'll also get guaranteed reservations, simplified car classes, and National's Paper-Less Express,[®] the simplest way to rent a car.

And of course, a stylish GM car like a new Buick LeSabre. Our only regret is that it's too big to gift wrap. For reservations, simply call 1-800-CAR-RENT.sm

 **National Car Rental.**



We feature GM cars like this Buick LeSabre.



The Geological Society of America

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

NEW GSA MEMBERS

The following 597 Members have been elected to Membership by Council action during the period from September 1, 1988, through January 31, 1989 (* indicates transfer from Student Associate to Member).

- | | | | | |
|--|---|---|--|--|
| <p>Neville W. Agosto
Rafael Alexandri-Rionda
*Michelle M. Allard
*Arnold W. Allison
*Barbara A. Am Ende
Robert A. Anderson
Steven R. Anderson
*Linda M. Angeloni
*Irvine R. Annesley
Lawrence M. Anovitz
*T. Bruce Appelgate, Jr.
*Sara Arav
Gregory P. Arnold
Richard N. Ashcraft
*Kenneth E. Ashton
*Yemane Asmerom
*Pamela A. Aubuchon
Elkanah (Ken) Babcock
*Kevin L. Baker
Mark W. Ballesteros
Arthur H. Barabas
Douglas J. Barber
*Wendell L. Barner
Jack R. Barch
*Penelope N. Bassett
Paul J. Bateman
*Paul W. Bauer
*David A. Baxter
*George W. Bergantz
Karen S. Bergmann
*Wayne M. Bevan
*Snehal Bhagat
Laura R. H. Biewick
*Richard J. Binder
*Janet M. Blabaum
*Thomas D. Blackman
Paul E. Blanchard
William D. Blankenship
*Margaret H. Bloom
Andrew H. Bordiuk
*Jeffery L. Borhauer
Michael A. Boring
*Brad H. Boschetto
Ray M. Boswell
David Q. Bowen
*David A. Bristol, Jr.
Larry N. Bristol
E. Stephen Brown
James R. Brownell
Robert L. Brownfield
*Robert M. Bruce
Edward G. Bryant
*Charles J. Budney
*Anna V. Buising
Victoria A. Burkhardt
*Bradford R. Burton
*Elizabeth A. Burton
*James H. Burton III
Remelle E. Burton
Susanna S. Calvo
Wayne R. Campbell
Lawrence R. Cann
Donna C. Caraway
*Jeffrey A. Cary
*Tracey E. Cascadden
Jeffrey D. Cassidy
*Corilane G. Cathyl-Bickford
*William Cavazza
*Burton Chadwick
*Alan K. Chamberlain
Bradley H. Chapman
David S. Charlton</p> | <p>Sankar Chatterjee
James J. Chenard
*Joseph R. Chepega, Jr.
*Frederick M. Chester
Michael P. Chornack
*Geoff Christie
*Linda J. Christianson
Seung Soo Chun
Stephen B. Church
Robert M. Cipolletti
*Jane M. Cleland
J. Michael Clinch
*Jay C. Close
James F. Coble
Nicholas W. Coffey
*Dana Q. Coffield
Nora I. Colburn
*Katharine L. Coley
Paul A. Comet
Peter J. Coney
*John D. Conway
*J. Calvin Cooper
*Kevin P. Corbett
Jose C. Corral
*Rachel Cowan
*Henry Clay Crow
Gordon B. Curry
Frederick Curtis
*Robert A. Cushman, Jr.
Simon J. Cuthbert
Linda J. Dahl
*Christopher M. Dail
Jules A. Darras
Oscar B. Davidson
Owen K. Davis
Lee A. Day
*Paul L. Decker
Norma Del Giudice
Dale R. Dell Osso
*Allen J. Dennis
*Hugh Blase Devery
*C. Lockwood De Witt
Sharon F. Diehl
*William H. Di Guiseppi
Christopher G. Di Leonardo
Thomas E. Dill
*James F. Dolan
*Joseph L. Domagalski
David F. Dominic
R. Lee Dooley
*James P. Dorian
Thomas P. Doriski
A. Milo Dowden
Dorothea M. Downs
*Thomas G. Drake
*Eric A. Draper
Steven G. Driese
*Martin R. Duffy
William L. Duke
*Katherine E. Duncker
Gregory R. Dunning
*Matthew R. Eaton
James R. Ebert
*Cynthia J. Ebinger
*Cortland F. Eble
*James O. Eckert, Jr.
Werner U. Ehrmann
*Eric J. Ekstrand
*Colleen G. Elliott
*Paige A. Embry
Bruce H. Eppler
Bradley G. Erskine</p> | <p>*J. Dykstra Eusden
*James E. Evans
*David C. Ewing
Yehuda Eyal
Edward L. Falk
Patricia L. Fall
*Martin B. Farley
*John R. Farver
*Craig S. Feibel
*Steven R. Fekete
*Richard M. Felton
Rene L. Fernandez
Alysa M. Fisher
*Donald M. Fisher
*Anita G. Fite
*R. Farley Fleming
*Joan L. Florsheim
Thomas Flottmann
*Cynthia L. Fong
*John H. Fournelle
*Peter A. Fraley
Barbara V. Frank
Charles J. Franks
Ulrich A. Franz
Raymond P. Freeman-Lynde
*Richard M. Friedman
*Larry D. Friend
Michelle C. Frodey-Hutchins
William E. Fuchs
Keizo Fujii
*Carlos M. Galceran, Jr.
*Julie E. Gales
William B. Gallagher
Roland A. Gangloff
Javier Garcia-Fons
*Kathleen A. Garland
*Anthony C. Gary
Jack E. Geary
Theresa M. Geisler
Steven S. Gerritsen
Florin Gheorghiu
*Richard G. Gibson
Robert Giegengack
*Deborah J. Gilbert
Jay P. Gilbertson
Thomas D. Gillespie
*Thomas J. Glancy, Jr.
*Linda Lee Glick
*Brian R. Globerman
*Michael D. Godwin
Fraser E. Goff
*Deborah R. Goldblum
Enrique Gomez De La Rosa
*York R. Gorzolla
*Wendy C. Grant
*Matthew D. Gray
*Thomas E. Gray
Wayland E. Gray
*Ray Greely
Alan G. Green
*Julian W. Green
*Laurence R. Greene
*Timothy W. Grover
*Anne M. Grunow
Jeffrey J. Gruskiewicz
*Bradley R. Hacker
*Polly A. Haessig
*James D. Haines
*John D. Halfman
*John Hall
*Steve Hambos
Lonn P. Hamp</p> | <p>Simon Hanmer
*Diana K. T. Hansen
David L. Hanson
John K. Hardie
*Mark T. Harris
Timothy D. Harris
*Kurt K. Hayden
*Joseph J. Hayes
*Lee F. Haymon
John S. Hazlitt
*Ann L. Heatherington
*Darla J. Heil
Nikolaus H. Heine
*Laura A. Helsel
*James P. Hibbard
Toshino Higashino
*Scott J. Hills
Marshall D. Himes
*David L. Hippensteel
Murray W. Hitzman
*Michele M. Hluchy
Stephen D. Hochman
*Jean L. Hoff
*Grace A. McCarley Holder
*Brantley Holt III
Matthew J. Hopwood
Craig S. Horne
Robert A. Horntvedt
*Louise D. Hose
Alan D. Howard
Mark J. Howell
*Jeffrey T. Hsu
*Mary S. Hubbard
*Mark R. Hudson
Lance D. Hughson
Gloria G. Hunsberger
Ian E. Hutcheon
Teruaki Ishii
*H. Jens Islev-Petersen
Makoto Ito
Tanio Ito
James C. Izzell, Jr.
Steven E. Jakatt
*Pamela E. Jansma
George A. Jenner
*Pliny Jewell IV
Rex J. E. Johnson
*Jay S. Johnston
*F. Ross Jones
*Michael Bryan Jones
*William E. Jones
*Frank F. Jordan, Jr.
*Frances E. Julian
Dawn S. Kaback
Theresa A. Kalaghan
Vivek S. Kale
John R. Kane
Susan M. Karl
Hasen Z. Karwa
*Kerry L. Keen
*Peter B. Kelemen
*Kevin M. Kelly
Kevin J. Kemmerer
Jerome J. Kendall
*Brian C. King
Roy C. Kirkman
*Mark A. Klefner
*Martin O. Klein
*Martin C. Kleinrock
*Cheryl L. Knight
*Martin A. Knoll
Philip S. Koch</p> | <p>Laszlo Korpas
Nicholas S. Koske
*Susan M. Koszalka
David E. Krantz
*Bridget P. Krause
Robert G. F. Krause
*Bryan J. Kriens
*Donald A. Kubik, Jr.
*Roger J. Kuhns
H. Tom Kuper
*Richard P. Langford
*John S. Latta IV
*Thomas S. Lawrence
*Charles A. Laymon
*Paul I. Lazaar
*Alain D. Leclair
Stephen C. Lee
John G. Leede
James L. Lemine
Mary E. Lennon
Christopher J. Lewis
*Jonathan Clinton Lewis
*Aaron R. Liesch
*Ron Curtis Linton
*Frederick K. Lobdell
*Eckhard Loebel
*Bradley A. Loewen
*Christer J. Loftenius
*James P. Lombard
*John D. Long
Mark W. Longman
*Mark L. Lord
*John N. Louie
*William M. Lowrie
Robert M. Lowry
*Richard P. Lozinsky
Stephen E. Lucas
*Virgil W. Lueth
Kateri A. Luka
*Kathryn C. Luther
*David Mark MacBean
Hans G. Machel
Julianne P. Mahler
*Ned Mamula
*Cathryn Allen Manduca
*Joseph A. Marchesani
*Jacob Margolis
*Robert M. Markoff
*Robert Marquis
*Vito P. Marrone
*Robin L. A. Marymont
*Larry G. Mastin
Steven M. Matthews
Glen S. Mattioli
*Jerald Richard Maughan
*Brent A. May
*Kris K. McCandless
William L. McConihe
Robert L. McConnell
Charles R. McDaniel, Jr.
Mark S. McDonald
*James W. McDougall
*Alfred S. McEwen
*Terry G. McGraw
*Michael F. McGroder
Norman L. McIver
Robert C. Melchior
Joseph E. Mello, Jr.
*Anne S. Meltzer
Joel G. Metcalf</p> |
|--|---|---|--|--|

(continued on p. 175)

New Members (continued)

- Eric J. Meyer
 *Kevin L. Mickus
 Robert G. Middleton
 *Debbie A. Miller
 *Cynthia D. Miller-Corbett
 *James G. Mills, Jr.
 *Charles V. H. Mims
 *Webster N. Mohriak
 Alessandro Montanari
 *Homer Montgomery
 *Howard D. Mooers
 David W. Moore
 John A. Morel
 John W. Morley
 *John C. Morris
 Michael D. Morris
 *Jean Morrison
 *Robin F. C. Morriss
 *Joseph F. Mueller, Jr.
 Matthew J. Mullin
 Tetsuji Muto
 Paul M. Myrow
 Edward M. Myskowski
 James B. Naser
 *William E. Nellist
 Arthur D. Nelson
 *Paul R. Nettles
 *Philip J. Nicolay
 Dennis J. Nikols
 Laurence C. Nodler
 *John E. Nordenstam
 Gary A. Nowlan
 Nelson R. Nunnally
 Mary L. Nuzum
 Mark R. Nyman
 *Jennifer A. O'Brien
 *William K. O'Connor
 *Eric H. Oelkers
 *Ernest H. Olsen
 *Timothy J. Olson
 Gail K. Osborne
 *James B. Paces
 Shaun P. Parent
 *Rosann Park-Jones
 *Matthew J. Parsley
 Suresh G. Patil
 *Joseph P. Pavletich
 Scott E. Peace
 Helmut Peer
 *Russell R. Perry
 *Bruce D. Peterman
 *Scott W. Petersen
 Curt D. Peterson
 *Maria L. Peterson
 Jan C. Phillips
 *Beverly A. Pierson
 Donn M. Pillmore
 *John C. Pitlick
 *Michael L. Pomes
 Gisela Prasad
 Tore Prestvik
 *Christopher M. Prince
 Walter J. Protheroe, Jr.
 *Eleanor I. Prussen
 Muhammad A. Qureshi
 Nelson B. Rader, Jr.
 Kristin V. Ragnarsdottir
 Ata U. Rahman
 Victor A. Ramos
 *Todd W. Ramsden
 *Kelvin W. Ramsey
 Rajbir S. Rahr
 David A. Rasmussen
 *Frank Raviola
 Carolyn B. Reaber
 John B. Reid, Jr.
 *Steven L. Reneau
 *Juan F. Restrepo
 Richard J. Richardson
 *Joseph G. Richter
 Cheyenne O. Riley
 David G. Roberts
 *Jack C. Robinson
 Keith Rolick
 Eric P. Rose
 *Sally A. Rothwell
 *Carolyn L. Roundtree
 Dana E. Rowan
 Elisabeth L. Rucell
 *Michael W. Ruddy
 Anthony G. Ruedi
 Janice Ruggles
 *Merlin D. Russell, Jr.
 Michael J. Russell
 *Dorothy Sack
 *Stephen L. Salyards
 William F. Samaras
 *Mark Van Dyke Sander
 *Marc W. Sanford
 Daniel B. Sanger
 *Scott A. Sauchuk
 *Elizabeth R. Schermer
 Laurie E. Scheuing
 *Nicholas P. Schneider
 *Theresa M. Schneider
 Martin Schoell
 *Dennis L. Schubbe
 Martin A. Schuepbach
 *Peter Schwans
 Martha I. Schwartz
 Norman Scott
 Mary E. Scott-Wiecek
 Michael V. Scully
 *Sheila J. Seaman
 *Richard L. Sedlock
 Cheryl M. Seeger
 R. William Selden
 *Angela J. Sewall
 *Christopher J. Sexton
 Karen M. Seyfert
 *James R. Shannon
 *Christopher W. Shaw
 Michael K. Shimamoto
 *R. Craig Shipp
 Charles L. Shirley
 Kenneth N. Shonk
 *Julianna M. Shultz
 *Steven R. Silva
 Wm. B. Simmons
 Edvardas K. Simonis
 Shirley C. Sixt
 Michael F. Skelly
 Roger C. Slayman
 Steven J. Sletten
 Jan Smit
 A. Richard Smith
 Charles D. Smith
 J. Dungan Smith
 *Larry N. Smith
 Roger F. Smith
 Marty R. Smithey
 Jesse O. Snowden
 *Diana Nelson Solie
 Karen E. Souza
 *David M. Spatz
 David J. Springer
 Deepak C. Srivastava
 *James D. Standish
 Michael J. Starbuck
 Patrick K. Starnes
 *Carola H. Stearns
 *George E. Stewart
 Peter B. P. Stewart
 Richard J. Stewart
 Carl W. Stock
 *Joann M. Stock
 *William E. Stone
 Robin A. Strachan
 *Bart A. Stryhas
 *Edmondo Sugar
 Jacek K. Sulanowski
 Yuichiro Suzuki
 *John R. Tabor
 *Jill E. Tagudin
 *Peter R. Tauvers
 *Vatche P. Tchakerian
 Donald L. Thie
 *Alan D. Thompson
 *John N. Thompson
 Connie Throckmorton
 Daniel D. Tisoncik
 Deepak R. Tiwari
 Steven J. Tkach
 *Maria Tobia
 Paul B. Toft
 Markos D. Tranos
 *Carol J. Treadwell
 Richard J. Trippel
 *Faye A. Troisi
 James D. Tucker
 Marda L. Tyree
 *Anne G. Udaloy
 Jane Uptegrove
 *Volker C. Vahrenkamp
 *David W. Valentino
 *Wilhelmus T. Van Middelaar
 Miguel A. Vazquez
 *Margaret E. Venable
 John J. Viveiros
 *Donald Von Bergen
 Sven Von Loga
 Henry D. Wadleigh
 James A. Walker
 *E. Timothy Wallin
 *James E. Walters
 Harold R. Wanless
 *David A. Wark
 *Janusz J. Wasowski
 *Barbara J. Waugh
 *Jeff J. Weatherly
 *Stephen George Weaver
 Daniel D. Weed
 *Suzanne D. Weedman
 *Carol A. Weinstein
 *Eric R. Wells
 Brian H. Werle
 *Christopher E. Wernicke
 John R. Wesling
 Steven G. Wesnously
 *Gregory R. Wessel
 Robert West
 *Karen L. Wetmore
 *Charlene K. White
 David J. White
 Roger L. White
 *Timothy S. White
 *Jill M. Whitman
 George W. Whitney
 Jeffrey P. Widmeyer
 Peter R. Wilcock
 Kenneth E. Williams
 James F. Wilmeshier
 Daniel L. Wilson
 *Ellen E. Wohl
 Miriam A. Woods
 Brian N. Woody
 Beth M. Wrege
 Lawrence Wu
 *Richard L. Wunderman
 *Signe K. Wurstner
 Anthony K. Yeo
 *An Yin
 *Jeanne M. Yost
 *J. Douglas Yule
 Willem J. Zachariasse
 *James C. Zachos
 *Andrew Zdon
 *Anna M. Zeman
 David M. Zur

NEW GSA STUDENT ASSOCIATES

Listed are the 558 Student Associates who became affiliated with the Society during the period from September 1, 1988, through January 31, 1989.

- | | | | | |
|------------------------|-----------------------|-----------------------|-----------------------|--------------------------|
| Susan L. Abston | Dana Bahar | Andrew T. Benoit | Nicholas G. Boyd | Peter R. Chronowski |
| Jannie Adams | Jim W. Bahle | Mary E. Benson | Susan Carol Bradford | Stephanie A. Clasen |
| Mark G. Adams | Thomas B. Bailey, Jr. | Herbert E. Berger | Steven C. Brady | Charles E. Cline |
| Ronnie L. Adams | Cynthia L. Balek | Sonja A. Bickel | John D. Bray | Cecilia M. Collier |
| Janet P. Albert | Thomas J. Balogh | Kay Bierbrauer | Stephen R. Brinkman | Margarita E. Conkright |
| Constance S. Albrecht | Edward M. Baltzer | Paul R. Binns | Eric Brodeur | Katherine A. Connors |
| Teklewold A. Alemayehu | Jillian F. Banfield | Kim M. Bishop | John M. Brogden | Vincent J. Coringrato |
| Douglas L. Alexander | Chris A. Barker | Peter E. Bittenbender | Kathleen M. Browne | Elizabeth C. Cornell |
| Kenneth B. Alexander | Richard D. Barnhart | Mark Blaisdell | Jeffrey S. Burdick | Jean-Francois Couture |
| Joseph L. Allen | Mark L. Barnhill | John J. Blandin | Jerry L. Burgess | Christine A. Cram |
| David T. Allison | Glenda K. Barrington | Randy C. Blomquist | Lynda L. Burgess | John J. Crashell |
| Charles B. Andersen | Ginger A. Barth | David M. Bloom | Patrick A. Burkhardt | Robert A. Creaser |
| Sally I. Andersen | Roy C. Bartholomay | Diedra Bohn | Cynthia S. Burris | Ernesto O. Cristallini |
| David M. Anderson | Peter E. Barys | Andree M. Bolduc | Edward L. Burrows | Timothy J. Crnkovic |
| Dennis J. Anderson | Edward L. Basham | Mary B. Booth | Donald P. Butcher | Jeffrey L. Cunningham |
| James D. R. Applegate | Lynnette D. Batatian | William T. Boria | Angelo A. Camerlenghi | Alan H. Cutler |
| A. Tefvik Arguden | Eric C. Beam | Sam F. Borries | Theodore W. Carlsen | Caroline A. Czank |
| John G. Arnason | Barbara A. Beasley | Stephen K. Boss | Carla M. Cary | Kathy J. Danti |
| Christopher J. Arnold | Dale C. Beeson | Shelley June Bougan | Michael L. Cassiliano | Thomas A. De Boer |
| Francis X. Ashland | Christopher J. Bell | Daniel L. Bowman | Cinzia Cervato | Patrice De Caritat de P. |
| Joseph G. Aylor, Jr. | Michelle R. Bell | James A. Bowman, Jr. | Kevin R. Chamberlain | Robert J. Delorme |
| Loren E. Babcock | Wallace M. Bell | Austin E. Boyd | Janet L. Chase | (continued on p. 176) |

New Student Associates (continued)

Allison L. Dennen
 J. Laurent De Verteuil
 Michael T. Dolan
 Kenneth J. Domanik
 Thomas Dombrowski
 Diane E. Donovan
 Robin P. Dover
 Kevin F. Downing
 Alan J. Driscoll, Jr.
 Thomas J. Dumas
 Karen A. Duttweiler
 James D. Eades
 Peter M. Eaton
 Ulrike Eberle
 William R. Eckhoff
 Robert B. Ede
 Stephen J. Edwards
 Elizabeth A. Eide
 Douglas D. Ekart
 Don R. Elder
 Mariano Elias-Herrera
 Bruce C. Eloff
 Erika R. Elswick
 Donna S. Erickson
 Brent H. Everett
 Susan L. Faircloth
 Thomas Richard Fargo
 Christie A. Farnham
 Stephane Faure
 Kristen L. Fehlhaber
 Paul E. Fejer
 Lori J. Felts
 Ann M. Fenner
 Charles A. Ferguson
 Jonathan R. Ferris
 Jonathan K. Filer
 Heather C. Finlayson
 Andrew K. Finley
 Angela R. Finney
 Anthony R. Fiorillo
 William D. Fischer
 Mark L. Fishel
 Len Fishkin
 Kathryn M. Flanagan
 Federico F. Florendo
 John W. Gaul
 Michael J. Gawedzinski
 Hongxing Ge
 Michael J. Gefell
 John R. Gelting
 George J. Gerhold
 Janice M. Gillespie
 Mark A. Glenn
 Karsten Gohl
 Steve C. Good
 Douglas T. Gordon
 Michael J. Goydas
 G. Michael Grammer
 Thomas X. Grasso, Jr.
 Cinda M. Graubard
 Richard C. Green
 Benjamin P. Gresser
 Nancy E. Griesau
 Craig A. Griffin
 Grady C. Grissom
 Rosalio F. Guillen
 Kristin L. Gunckel
 Lori L. Guthrie
 Rosa E. Gwinn
 Amy J. Haak
 Johnson R. Haas
 Volkmar G. Hable
 James P. Haerter
 Mark R. Hageman
 Bereket Haileab
 Christopher J. Hall

Daphne A. Hall
 Jeffrey L. Hall
 Lars R. Halvorsen
 Catherine L. Hanks
 Stuart P. Hansard
 Katherine M. Hansen
 Teresa A. Harding
 Kevin D. Harris
 Robert N. Harris
 James B. Harrison
 Kenneth A. Hartman
 Scott E. Hassler
 Daniel O. Hayba
 David E. Haymes
 Ming He
 Peter J. Heaney
 Jon D. Heberer
 George D. Hecht
 Theresa P. Hecht
 Daniel E. Helgeson
 A. H. Henke
 Lance Hess
 Lillian M. Hess
 Robert W. Hettenbach
 George F. Heuler
 David A. Hickey, Jr.
 Kevin F. Higgins
 Patrick J. Higgins
 Eileen S. Ho
 Kathy J. Hockman
 James E. Holl
 David J. Hollander
 Fred R. Holzel
 Jacquelyn J. Hoover
 Stephen C. Howard
 Paul D. Howell
 Brian A. Howman
 William Hoyt
 James K. Huber
 Richard A. Huchison
 Diane L. Hunt
 Gary A. Icopini
 Scott W. Imbus
 Chalumchai Intrasook
 Grace V. Irby
 Neal R. Iverson
 Andrew I. James
 Gregory H. Jameson
 Jonathan L. Jee
 Wayne E. Jepson
 Allan W. Johnson
 David M. Johnson
 Michael Johnson
 Marsha A. Jones
 Jason L. Kahlert
 Edward J. Kandl
 Danny Katzman
 James D. Keith
 Mike J. Kelley
 Larry B. Kellison
 Edward W. Kempema
 David C. Kendrick
 Randall M. Keyser
 Kathleen G. Kidd
 Kathryn C. Kilroy
 Cheong B. Kim
 David D. King
 Tammy D. Knott
 Steven R. Koehler
 Lois Koehnken
 Sandra F. Koenig-Keller
 Sarah M. Koerber
 Jack Kohler
 Shari L. Kolak
 Andrea M. Koziol
 Stephen R. Kraemer

Dale A. Kramer
 Harry D. Kranis
 Lin J. Krause
 Mathew J. Krawczyk
 Kristine L. Kuntzman
 Timothy M. Kusky
 Jean Y. Labbe
 John D. Lachenmayr
 Lynn A. Lande
 Robert N. Lannon
 Heather A. Laswell
 Tom La Tourrette
 Gavin R. Lawson
 Douglas M. Leafgren
 Insung Lee
 Joongjeek Lee
 Lauryl A. Le Febvre
 Arthur W. Leibold
 Robert S. Leighty
 Kenneth C. Leinbach
 John F. Leland
 Lucian Lemak
 Robert E. Lemmer
 Bret W. Leslie
 Margaret A. Lessenger
 Janet A. Leventhal
 Claudia J. Lewis
 Richard W. Lewis
 Nathaniel A. Lifton
 Sandra P. Lilligren
 Ellen M. Limburg
 Hui-Ling Lin
 David N. Lindberg
 Paul E. Lindell
 Yuejin Liu
 Alison A. Lochhead
 Mark W. Longtine
 Christopher H. Lowe
 Thomas C. Lowndes
 Robert D. Lucci
 Matthew J. Lynn
 John N. Lytwyn
 Milena M. Macesich
 Allison M. MacFarlane
 Craig J. Mach
 Urs K. Mader
 Jill K. Mahoney
 Curtis R. Manley
 Renee S. Manton
 Rosemary E. Manty
 James Marina
 Andrew J. Marino
 Bernard Marsan
 Charles R. Marshall
 Ralph E. Martin
 Victoria B. Martinez
 Robert A. Masinter
 Allyson C. Mathis
 Julie A. Maxson
 Manju Mayer
 Charles A. McAllister
 Karen C. McBride
 D. Craig McCaa
 Richard G. McClean
 Thomas A. McClurg
 David H. McCormack
 Gregory J. McGovern
 Anne McKay
 Joseph G. Meert
 Bruce D. Meissner
 Ricardo N. Melchor
 Thomas Menard
 William P. Meurer
 Jayson B. Meyers
 Keith V. Might
 Barbara J. Milby
 Daniel J. Miller

William M. Miller
 Layne W. Millington
 Lee A. Monts
 Jared R. Morrow
 Jon Mosar
 Richard J. Moscati
 Michael G. Muggridge
 Kimberlee K. Mulhern
 Jane L. Murvin
 Kimberly J. Mutz
 Greg L. Myers
 Rebecca A. Myers
 Zulkornain B. Nayan
 Thomas A. Nelson
 Michael J. Neton
 Howard T. Nicholson
 Kevin E. Nick
 Edgar K. Nielsen
 Adam W. Norris
 James P. O'Brien
 Jim L. Oliver
 Lois K. Ongley
 Raymond R. Orloski
 Christopher Orzechowski
 Charlotte Otts
 Matthew W. Owens
 William R. Page
 John R. Paquin
 Chung-Hwa Park
 Jay B. Park
 Mary Parke
 Wayne H. Parker
 Anthony C. Parkins
 Cassi R. Paslick
 Charles G. Patterson
 Earnest D. Paylor II
 Brian J. Peck
 Wesley D. Peck
 Vicki A. Pedone
 William S. Pendexter
 Bruce D. Perry
 Jonathan C. Pershing
 Katerina E. Petronotis
 Andrew C. Phillips
 Alan L. Piechocki
 Michael A. Piepenburg
 Ron Pilette
 Pamela D. Pinson
 Jeffrey G. Pittman
 Lee E. Plansky
 Heather E. Plint
 Sydney K. Poole
 Michael L. Porath
 Jeffrey R. Porter
 Donna J. Pridmore
 Jorge M. Protti-Quesada
 Shaik M. Quadri
 Ibrahim Z. Qudsi
 Michael J. Quinn
 Paul D. Racenet
 Frank R. Rack
 Michael S. Ralbovsky
 Robert A. Reinmund
 David James Reynolds
 Patrick H. Reynolds
 Chul Woo Rhee
 Rodney W. Richter
 William J. Rink
 James L. Rogers
 Raymond R. Rogers
 Kurt Roggensack
 David J. Romero
 Julian E. Rooks
 Jane A. Rose
 Mark L. Rosenberg
 Robert M. Ross
 Mark G. Rowan

Stephen M. Rowins
 Carolyn D. Ruppel
 David M. Ryan
 Peter E. Ryan
 Ty J. Sabin
 Paul S. Safko
 Bradley B. Sageman
 David E. Salas
 Gertrude E. Samuel
 Diethard G. Sanders
 William F. Sangrey
 David C. Sassani
 Jeffrey P. Schaffer
 Tracy A. Schieber
 Carsten Schirnick
 Bennaeta L. Schmidt
 Douglas J. Schmoebelen
 Michael L. Schoemann
 Christopher E. Schubert
 Deborah A. Schueller
 Susan A. W. Schuler
 Marcia K. Schulmeister
 Paul A. Schwarzweiler
 Rebecca Seal
 Gail D. Sease
 William W. Seibert
 Geoffrey O. Seltzer
 Zuyi Shen
 Christian R. Sherry
 David T. Simpson
 Debra L. Simpson
 Christine M. Skirius
 John T. Skowronek
 Jerry Slack
 Graham N. Smith
 Karen E. Smith
 Andrew D. Smits
 Jeffrey A. Snyder
 Edward R. Sobel
 Marla T. Soester
 Michael L. Space
 Albert T. Spaid
 Praveen Srivastava
 Margaret W. Staub
 Andrea D. Steckerl
 Andrea B. Stein
 Daniel J. Ste. Marie
 Daniel C. Stephens
 Amy L. Stinson
 Jeffrey C. Strasser
 Uwe Strecker
 Brenda M. W. Strickler
 Amy Jean Strunk
 James H. Sullivan
 Chris A. Surville
 Christopher M. Swartz
 Wattana Tansathien
 Edward M. Tarjouman
 Paul L. Tashjian
 Steve B. Taylor
 David Terry
 Dennis O. Terry, Jr.
 Sara J. Tharp
 Theresa A. Theisen
 Edward R. Thieler IV
 Stephanie L. Thliveris
 Jeffrey T. Thole
 Andy P. Thomas
 Frank W. Thomas
 David L. Thompson
 Troy W. Thompson
 Geoff D. Thyne
 Anthony R. Tingle
 Robert L. Tolleriver
 Paul B. Tomascak
 David J. Topping
 (continued on p. 177)

New Student Associates (continued)

Mary K. Tozer
David A. Trepp
Paul L. Tromp
Christine Troskosky
Hillary Tulley
Junius E. Turner
Ted R. Turner
Carol J. Tyler
Thornton M. Tyson
Dana S. Ulmer
Susan Ungemach
Nuri Uzunlar
Peter J. Van Der Eb

Peter K. Van De Water
Harry F. Van Guilder
Timothy J. Van Haverbeke
Roderick W. Van Koughnet
Carl S. Van Orden
Richard K. Van Wagenen
Stephen M. Vasas
Jane E. Vasicek
Edward A. Venzke
David Verdonck
Michael D. Vickers
Robert J. Viens
Jacqueline Vince

Vincent J. Voegeli
James J. Vogl
Thomas J. Vogler
Georgia L. Vondra
W. Kent Waggoner
Scott R. Waichler
John Wakabayashi
James J. Walker
Jiamin Wan
David B. Ward
David M. Wayne
Annette M. Weathers
Robert P. Weaver
Gary R. Webber

Jacqueline K. Weber
Charles A. Weiss
Russell W. Wheat
Christopher E. White
Shelly K. Whitman
David S. Williams
Mark R. Williams
William C. Williams
Otis H. Willoughby
Vera R. Wilson
Martin W. Winberry
Robert K. Witbaard
Meredith R. Worden

Charles G. Wray
Hongbin Xiao
Wen Yang
Yingping Yang
Gene M. Yogodzinski
Andrew A. Young
Sidney A. Young, Jr.
Jeffrey S. Zawila
William G. Zempolich
J. Scott Ziegler
Tracey L. Ziegler
Anne M. Zielinski
Jan L. Zigler

NEW GSA FELLOWS

The following candidates were elected to Fellowship by Council action at the May 1989 meeting.

George S. Austin
Assem M. Badawy
Charles R. Bacon
Gerald R. Baum
David W. Beaty
George H. Brimhall, Jr.
Larry D. Brown
David S. Brumbaugh
Daniel J. Casagrande

Clement G. Chase
Terry Engelder
R. F. Hardyman
Arthur M. Hussey II
Douglas S. Jones
William M. Jordan
J. Richard Kyle
A. William Laughlin
Margaret S. Leinen

Paul W. Loubere
Louie N. Marincovich, Jr.
Hugh H. Mills
Kula C. Misra
Sharon Mosher
Carl W. Myers
C. Wylie Poag
John E. Repetski
Gregory J. Retallack

Stanley R. Riggs
Thomas K. Rockwell
Lee R. Russell
David R. Sharpe
A. F. Spilhaus, Jr.
David T. Vaniman
Chester A. Wallace

Rocky Mountain Coal Scholarships Awarded

In March 1989, the Rocky Mountain Coal Scholarship Committee selected two recipients for scholarships jointly awarded each year by the Symposium on the Geology of Rocky Mountain Coal and the Coal Geology Division of GSA. A \$600 scholarship was awarded to Thomas D. Demchuk at the University of Calgary, Alberta, Canada; a \$500 scholarship was awarded to Jason F. Hicks at Yale University, New Haven, Connecticut.

Demchuk's dissertation is titled "Coal facies and their economic and environmental significance, Highvale coal zone, Wabamun, Alberta." Hicks's thesis is titled "A delta plain environment of the Late Cretaceous Western Interior: A stratigraphic analysis of the Meeteetse Formation in the Crazy Mountain and Bighorn Basin of Montana and Wyoming." This is the seventh year that scholarships have been awarded.

Area of Study

The Rocky Mountain Coal Scholarship was established to further interest in and research on coal within the Rocky Mountain and Northern Great Plains coal provinces by providing scholarship funds for field and laboratory expenses, books, and tuition. Funding for the program comes from surplus money accumulated by the Symposium on the Geology of Rocky Mountain Coal. These funds have been invested in the Geological Society of America Foundation, and the interest now forms the basis of the scholarship. There is, however, no assurance of the amount of the funds or that funds will be available every year.

Coal research pertaining to coal in the states or provinces of Arizona, Alberta, British Columbia, Colorado, Idaho, Montana, New Mexico, North Dakota, Utah, Saskatchewan, South Dakota, and Wyoming is considered for support. Applicants for the scholarship must be currently enrolled in a graduate program (M.S. or Ph.D.) at a private or state college or university. The main theme of an applicant's research must be an aspect of coal research, and the research must pertain to coal in the states or provinces listed above (the institution where the research is being conducted need not be

in the listed states or provinces). Although the applicant must be involved in coal research, he or she need not be a geology major.

Application and Award

Scholarship applications can be obtained from the Geological Society of America, P.O. Box 9140, Boulder, CO 80301, or from Gary B. Glass, Chairman of the Rocky Mountain Coal Scholarship Committee, c/o Geological Survey of Wyoming, Box 3008, University Station, Laramie, Wyoming 82071. The deadline for applications for the 1990 scholarship is February 1, 1990.

A committee composed of two ad hoc members of the Symposium on the Geology of Rocky Mountain Coal and three GSA Coal Geology Division members screens applications and will select the most appropriate proposal by May 1, 1990. At that time, scholarship monies are transferred directly to the grantee by the GSA Foundation. When the scholarship winner's research is complete, one copy of the dissertation or thesis should be sent to the Chairman of the Rocky Mountain Coal Scholarship Committee.

Memorial Preprints

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

Jon Clark Cummings, by Elwood R. Brooks
Robert M. Garrels, by L. L. Sloss and Robert A. Berner
Alex W. McCoy III, by Carl A. Moritz
Harold William Burke, by Jean T. Burke, Robert Compton, David B. Doan, John Lowe III, and Khalil M. Malouf
Frank Thomas Connolly, by William C. Gibson
Charles D. Campbell, by Joseph W. Mills
Leo Hendricks, by Garner L. Wilde
Willis Parkinson Popenoe III, by Lou Ella Saul, Takeo Susuki, and Clemens A. Nelson
Truman Howard Kuhn, by Robert J. Weimer

Share your world of geology
with others and promote the
knowledge of your Society and
your science ... donate a copy of

THE *Art* OF GEOLOGY



to your local library ...
to a school library or
science club ...

to your company's employee lounge ...
to your doctor's office ... or ... !

The copy you donate today may inspire a scientific interest in a young person, who someday may make a significant contribution to the sciences and to society.

ABOUT THE BOOK ...

In his sparkling introduction to this Centennial volume, editor Eldridge M. Moores outlines the history of the geological sciences and of the Geological Society of America, and relates the timing of the development of both to events and personalities in world history.

The volume includes a colorful geologic time scale made especially for nonscientists. Then follow more than 250 color photographs, in 69 essays, depicting geology from around the world. Included are the familiar and the unusual, from Yellowstone to the moons of Jupiter, from Brazil to Alaska, from New York to China, from Spain to Antarctica ... from mountains to canyons, from glaciers to hot springs, from volcanoes to caverns, from mudflats to diamonds. All photos were contributed by working earth scientists.

The Art of Geology, edited by Eldridge M. Moores and F. Michael Wahl, 1988. Deluxe hardbound edition, 140 p., full color throughout, 9"X12", with dust jacket, ISBN 0-8137-2225-X. List price \$37.50.

Take Advantage Of Our Limited Time Offer!

A special NET price of \$25.00 (postpaid) will be given to those wishing to donate a copy of *The Art of Geology*. We will enclose a special "Presented by" label for you to include with your donation.

This offer good through August 31, 1989.



**THE
GEOLOGICAL SOCIETY
OF AMERICA**
P.O. Box 9140, Boulder, CO 80301
(303) 447-2020 or 1-800-GSA-1988

USE THIS HANDY ORDER FORM TODAY!

GSA Publication Sales, P.O. Box 9140,
Boulder, CO 80301, (303) 447-2020
1-800-GSA-1988 or FAX 303-447-1133



YES! I want to share my world of geology and donate a copy of *The Art of Geology*.



Please include GSA's specially designed "Presented by" label that I can complete and enclose with my donation.

Qty.	Description	Total
	The Art of Geology \$25.00 (SPE225D) special price	

PAYMENT

Check # _____

Credit Card _____

SubTotal _____

Colo. Res. Tax _____

TOTAL _____

Card Name / Exp. Date _____

Card Number _____

Signature _____

CUSTOMER INFORMATION

Name _____

Address _____

Address _____

City _____

State / Zip / Country _____

Phone _____

MAKE COPIES OF THIS FORM FOR ADDITIONAL ORDERS.
OFFER EXPIRES AUGUST 31, 1989

1888. Geological Society of America. 1988



1988
ANNUAL REPORT

Officers of The Geological Society of America, 1988

Albert W. Bally, President
Houston, Texas

Randolph W. Bromery, Vice-President
Amherst, Massachusetts

Robert L. Fuchs, Treasurer
Denver, Colorado

Jack E. Oliver, Past President
Ithaca, New York

Councilors

1986-1988
David L. Jones
C. Barry Raleigh
E-an Zen
Mary Lou Zoback

1987-1989
William W. Hay
Marcus E. Milling
John S. Scott
Stephen H. Stow

1988-1990
Zoltan de Cserna
Priscilla C. Grew
Donald C. Haney
Richard W. Hutchinson

Philip E. LaMoreaux, Ex Officio
Chairman Foundation Trustees

F. Michael Wahl, Executive Director
Lee D. Warkentine, Colorado Legal Counselor
Kay Collyer & Boose, New York Legal Consultant

1988-1989 Section Officers and Past Chairmen

CORDILLERAN SECTION

Robert S. Yeats Chairman
Mary Lou Zoback Vice-Chairman
Bruce A. Blackerby Secretary
Warren B. Hamilton Past Chairman

ROCKY MOUNTAIN SECTION

John H. Bush, Jr. Chairman
Peter E. Isaacson Vice-Chairman
Kenneth E. Kolm Secretary
Paul K. Link Past Chairman
William R. Hackett Past Vice-Chairman

NORTH-CENTRAL SECTION

Michael J. Murphy Chairman
James A. Rigert Vice-Chairman
Richard A. Hoppin Secretary
Arthur E. Burford Past Chairman
Lindgren L. Chyi Past Vice-Chairman

SOUTH-CENTRAL SECTION

Anthony W. Walton Chairman
Charles I. Smith Vice-Chairman
Page C. Twiss Secretary-Treasurer
Rena M. Bonem Past Chairman

NORTHEASTERN SECTION

Donald B. Potter Chairman
Nicholas M. Ratcliffe Vice-Chairman
Kenneth N. Weaver Secretary
Peter Robinson Past Chairman

SOUTHEASTERN SECTION

James F. Tull Chairman
Earl A. Shapiro Vice-Chairman
Michael J. Neilson Secretary-Treasurer
Dennis N. Bearce Past Chairman
William H. Kanen Past Vice-Chairman

1988 Division Officers and Past Chairmen

ARCHAEOLOGICAL GEOLOGY DIVISION

Fekri A. Hassan Chairman and continuing
First Vice-Chairman
Robert M. Thorson Second Vice-Chairman
Vance T. Holliday Secretary-Treasurer
John A. Gifford Past Chairman

COAL GEOLOGY DIVISION

Frederick J. Kuellmer Chairman
Peter J. McCabe First Vice-Chairman
James C. Cobb Second Vice-Chairman
Susan M. Rimmer Secretary
Daniel J. Casagrande Past Chairman

ENGINEERING GEOLOGY DIVISION

Ellis L. Krinitzsky Chairman
Thomas L. Holzer Chairman-Elect
Jeffrey R. Keaton Secretary
Christopher C. Mathewson Past Chairman

GEOPHYSICS DIVISION

Mary Lou Zoback Chairman
Walter D. Mooney First Vice-Chairman
Clement G. Chase Second Vice-Chairman
Francis S. Birch Secretary-Treasurer
Bryan L. Isacks Past Chairman

HISTORY OF GEOLOGY DIVISION

Léo F. LaPorte Chairman
Clifford M. Nelson First Vice-Chairman
Nancy Alexander Second Vice-Chairman
Michele L. Aldrich Secretary-Treasurer
William M. Jordan Past Chairman

HYDROGEOLOGY DIVISION

John M. Sharp, Jr. Chairman
Robert N. Farvolden First Vice-Chairman
Joseph S. Rosenshein Second Vice-Chairman
Darryll T. Pederson Secretary-Treasurer
Wayne A. Pettyjohn Past Chairman

PLANETARY GEOLOGY DIVISION

James W. Head III Chairman
Raymond E. Arvidson First Vice-Chairman
Ronald Greeley Second Vice-Chairman
Baerbel K. Lucchitta Secretary-Treasurer
Arden L. Albee Past Chairman

QUATERNARY GEOLOGY & GEOMORPHOLOGY DIVISION

James C. Knox Chairman
Dale F. Ritter First Vice-Chairman
Kenneth L. Pierce Second Vice-Chairman
Richard F. Madole Secretary
Victor R. Baker Past Chairman

SEDIMENTARY GEOLOGY DIVISION

Juergen Reinhardt Chairman
James R. Steidtmann First Vice-Chairman
Stephan A. Graham Second Vice-Chairman
Donald H. Zenger Secretary-Treasurer
Robert Raymond, Jr. Past Chairman

STRUCTURAL GEOLOGY & TECTONICS DIVISION

Gregory A. Davis Chairman
Arthur W. Snoke First Vice-Chairman
Peter J. Hudleston Second Vice-Chairman
Donald T. Secor, Jr. Secretary-Treasurer
John H. Spang Past Chairman

Report of the President by Albert W. Bally

During the centennial year of the Geological Society of America, we looked at the past, the present, and the future of our Society. I will here only report about the past year and muse a little about the future. But first let me thank my fellow members for their confidence in me and for the support they gave me throughout the past year. To serve as your president during its centennial year was indeed a most gratifying experience.

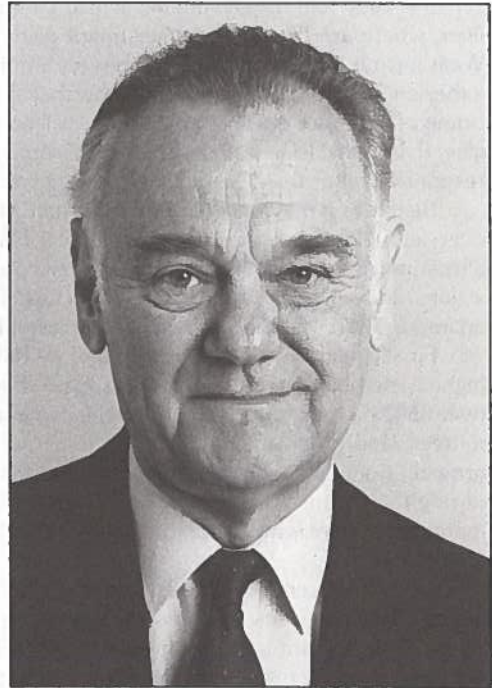
No doubt the most important activity of the past year was the planning and the organization of the 1988 Centennial Meeting. This monumental task involved over 50 colleagues, who under the leadership of Bob Weimer pulled off the largest GSA meeting ever. More than 50 additional organizations and sponsors also contributed to the program. Over 7000 people attended the meeting. I thank Bob Weimer and his centennial team for doing a truly outstanding job. I also thank Sue Beggs for looking after the logistics of our centennial meeting. She was everywhere at the same time, she never lost her cool, and she deserves our plaudits for a job well done. As it is with any celebration there are always moments that one will never forget. For me that moment came when the Colorado School of Mines Oredigger Band marched in during the opening party in the exhibit hall: a grand gesture by students in their week of exams and a good omen that a new generation of earth scientists plans to enter our next century in grand style.

The report of Mike Wahl, our executive director, follows mine, so I can limit myself to highlighting only some significant events.

The Council has established a new Young Scientist Award. This award, consisting of a medal and a cash prize, has been endowed by Dr. and Mrs. Fred Donath. The medal will be in gold, and will be known as the Donath Medal. The initial cash prize will be \$10,000. The award will be given to a young scientist for outstanding and original geologic research that marks a major advance in the earth sciences. I wish to thank Fred Donath and his wife for their generosity in endowing this award, which surely will become one of the most prestigious in the earth sciences.

The GSA Foundation, with its Board of Trustees under the capable chairmanship of Philip LaMoreaux and the leadership of its president Bob Fuchs, has been very active. Three new funds have been established: the Antoinette Lierman Medlin Scholarship Fund, the Allan V. Cox Student Research Award Fund, and the John T. Dillon Alaska Research Award Fund. The Century Challenge will surpass \$100,000. Adding all contributions together, the Foundation is now well on its way toward the first million dollars of new endowment funds. I thank Bob Fuchs for his outstanding help with the GSA Foundation. We all realize that any new programs that our Society wants to undertake will need to be funded by additional revenues. The growth and the role of our Society will always be a function of the generosity of its members, and many members have indeed been most generous.

Thanks to the dedicated drive of E-an Zen and his helpers we now have a GSA Committee on Education. It will plan and organize a coordinated effort to promote earth-science education at all levels. While having its own independent agenda, this committee will closely cooperate with parallel efforts by the American Geological Institute and other earth-science societies. The committee requests and welcomes suggestions and comments from the membership.



Pete Palmer has been appointed as Coordinator of Education Programs at headquarters, and will add this activity to his burden as coordinator of the DNAG project.

During the past year we have welcomed three new associated societies. They are the Association for Women Geoscientists, a courageous group which has done much to advance our science; the National Earth Science Teachers Association (NESTA), a group that is providing the foundation for the future of the earth sciences; and AGID, the Association of Geoscientists for International Development. We now can, with the help of AGID, greatly strengthen our ties with geologists in the developing countries. The associated societies are an integral part of the fabric of the Geological Society of America. It is important that associated societies are able to fully retain their own identity while at the same time taking advantage of our Society as a marketplace (the forum of the old Romans) for the earth sciences.

During the year there have been 22 GSA books published, more than any other year in our history. The *GSA Bulletin* was expanded with centennial articles, and *Geology* is getting better and better.

DNAG has been picking up considerable steam thanks to Pete Palmer's persevering but charming stewardship. The Centennial Field Guide series is complete, and other DNAG volumes and several maps have been published. Five additional volumes are very near completion.

On a more personal note, Pete Palmer has told me that the overview volume which he and I have been editing is ready to go to the printer. We hope to see *The Geology of North America—An Overview* published in time for the International Geological Congress

(continued on p. 182)

President's Report (continued from p. 181)

in Washington, D.C. Thus, during my year as president I had the opportunity to see the DNAG process simultaneously as an author ("Get off my back!"), as an editor ("Why can't they send their manuscripts on time, as they promised me a year ago?"), as a member of the GSA Executive Committee ("Why are there so many delays, which ultimately will affect the projected cash flow for DNAG?"), and finally, as the first subscriber of the complete DNAG series ("They told me all volumes would be out by the Centennial year, where are they? Is my investment going down the drain?"). Wearing four DNAG hats at the same time is indeed quite a sobering experience, particularly when you know that all are doing their best. Some of my more questionable friends will no doubt respond with glee that mine is a well-deserved punishment for having some responsibility for the DNAG project in the first place!

Be this as it may, I am particularly grateful to the authors of the overview volume, who had unusually critical deadlines and delivered all manuscripts "almost in time." The DNAG project is making great strides, and allowing for some delays, the DNAG series will become an important milestone for the geosciences of North America.

Finally, with over 16,000 members, we have now attained the highest membership in the history of GSA. Even more important, over 3500 members participated in the programs, meetings, committees, and other affairs of our Society. Ours is a vigorous and growing Society which has been able to more than hold its own during the recent economic downturn of the mineral and energy industries. There is much reason for optimism, but there is no room for complacency.

During the centennial year there was a lot of debate about the future of the earth sciences and the role of our Society within that future. Let me sum up a few impressions. As already mentioned, GSA is getting more involved with pre-college education. I also sense that at least some GSA members share my view that university earth-science curricula and the relation of academic earth sciences to industry and government both need to be re-examined. The glacial pace of academic change carries with it the risk that basic academic research at the frontier of our science will be limited to only a very small number of institutions, while many of our earth-science departments are having great difficulty maintaining a modern infrastructure, including support for rudimentary modern geochemical and geophysical equipment and for technicians. Thus, many of these departments are rapidly falling far behind the fast-paced technical progress occurring within industry and select government organizations.

In this context I hope that the planners of big science will some day recognize that big science can bloom only if the infrastructure for small science is preserved. By this I mean adequate funds for basic equipment and maintenance and funds for geologic field mapping programs in our undergraduate and graduate earth-science departments. In my judgment, the fallout from big earth-science projects does not really feed the grassroots of our science, which need careful nurturing instead of neglect.

Many of us anticipate an increased demand for geohydrologists, environmentally trained earth scientists, and geophysicists. Beginning this fall, industry recruiters will face a situation where there no longer is a pool of well-trained earth scientists from which to choose future employees. Recent economic woes that led to layoffs still overshadow the anticipated steady demand for earth scientists. Decreased basic support for earth-science departments will further exacerbate the problem. It will be up to us to resolve the issues just mentioned.

The Geological Society of America is ideally positioned at the crossroads between government, industry, and academic earth

sciences. Also Canadian, Mexican, and American scientists have traditionally participated in the management of the affairs of our Society, thus giving us a common North American flavor. Our Society indeed provides solid and impartial ground to discuss problems that affect the interactions between government, academia, and industry and particularly the subject of graduate education. Of course we don't want to be solely a debating society, but regarding the relationship of academia, industry, and government, any action will have to be preceded by in-depth discussions.

To put it more bluntly, right now, I don't really believe that earth scientists in government, academia, and industry adequately understand each other's problems, and I would like to see some change. During the past year it has been repeatedly suggested to me that GSA should get more deeply involved in a political process that would help to increase research funds for the earth sciences. On the other hand, a significant number of our members worry about us getting involved in any political lobbying. I believe that earth scientists will easily agree that the main societal problems of the future are (1) global to local environmental management, including hazard mitigation; and (2) clean resource management and use.

If we are to convince the public and its representatives that our research activities are indeed very important, then we must also demonstrate how our research and teaching activities adequately address these societal problems. Typically, researchers make generic and often extravagant claims that somehow their work in the long run will lead to the solution of societal problems. I think a much better way to make the point is for researchers to specifically recognize the contributions made by the many geologists who every day do their best to solve applied earth science problems despite the fact that we do not have all the answers to many geological problems. Yes, it is most important that basic researchers be adequately supported, but as a group we must be able to clearly state that environmental management, resource management, and hazard-mitigation activities are as important as basic research. Why should one activity be more "prestigious" than the other?

Take detailed geologic mapping as an example. Vast areas of our continent are not covered by reasonably detailed geologic maps, yet such maps are basic to an understanding of both environment and resources. Much of our shallow subsurface (say down to about 2 km depth) is not adequately mapped. Modern technology to do a good job is available, but not enough systematic mapping is done because funds for these activities are very limited. Some colleagues feel that geologic mapping is neither research nor solving an applied problem. Yet mapping is needed if we are to get an adequate inventory of the surface of the earth. Geologic mapping takes time and is less romantic than it used to be, and certainly today it lacks glamour.

We really must ask ourselves whether collectively we have tried hard enough to sell mapping and modernizing mapping methods. Company recruiters like to complain that students no longer work on mapping projects, but we often cannot find these very same companies when we need support for mapping projects.

It is easy to glamorize the earth sciences to the public. Today, moving plates are being dramatized, children are brought up with lively fantasies about dinosaurs, and we all like to ponder meteorite impacts leading to mass extinctions and the pros and cons of catastrophic scenarios. The media favor doomsday scenarios, and geologists can always deliver another and diverse epitaph for a defunct species. Similarly, the media also like to use perennially inadequate resource forecasts to serve both pessimists and optimists in their purpose.

(continued on p. 183)

President's Report (continued from p. 182)

All the glitz contrasts with an earth-science reality that for the majority of us often deals with detailed applied surface and subsurface projects that, like geologic mapping, are not so easily glamorized. We must find ways to convince the public that earth-science applications are as important as basic research. In this, colleagues in research and in the applications have to support each other if both want to prosper. For me, a fine example of this kind of mutual support is the many industry geologists I have met who stood up to defend the teaching of evolution in our schools.

Ultimately, it will all boil down to finding support for the proper mix between basic research and applications. As earth scientists we will be able to reach that goal much faster if in concert with many other earth-science organizations, we can help formulate a reasonably cohesive program that includes a solid measure of prioritization. Independent lobbying by GSA is legally constrained, but even without those legal constraints lobbying probably is not a realistic option as long as the earth sciences remain fragmented and as long as we have not worked out a reasonable consensus with some of our sister earth-science societies.

In recent years there has been much talk about technology transfer from academic and government research to industry. My own experience in the earth sciences is that in the near future much of the desirable technology transfer will have to be in the opposite direction—that is, from industry to academia and government. As an academic neophyte with petroleum industry associations it is my judgment that in the earth sciences many of today's logistic, geophysical, and geochemical technologies are well over 20 years ahead of their widespread application. Our task is to do all we can do to properly mesh these modern techniques with insightful basic research, resource, and environmental management.

Even so, the future of our science, like the past, will not really be solely driven by technology itself. Instead, the creative thoughts of geologists based on the comprehensive grasp of the frontiers of scientific research and the social context of our science will determine our future directions.

Of course, I always knew that the future of geology would be exciting and bright, but my one year as your president has given me a much better appreciation of how much still needs to be done and how limited our means are. Thus, I prefer to finish this report without grandiose schemes; instead, allow me to present a personal wish list:

1. I wish GSA had an endowment that would solely sponsor small workshops where futurists from other sciences and engineering, as well as colleagues from the liberal arts, could explore with us the consequences of various futuristic scenarios for the earth sciences. Such conferences may steer us away from the usual committees dominated by turf defenders.

2. I wish academic researchers would more actively recognize that in addition to their own very important research, there are numerous activities in the applied earth sciences that are also in need of recognition and are seriously underfunded. Conversely, would it not be great if people in the applied world would more openly, and perhaps more generously, recognize that academic research has often provided important background for and, on occasion, even the solution of their problems?

3. I have a vision of advanced earth research in academia and within the surveys being funded by a penny-per-gallon tax levied on earth resources such as fossil fuels and water, and an analogous tax on mineral resources. This technique for research support has been pioneered by the French Petroleum Institute for many years. Thus, for instance, the proposed water tax would defray the cost of all hydrological research and survey activities.

4. In another vision I foresee the time when industry and government pay a bonus to the earth-science departments of our universities for each graduate they hire. The bonus would be paid after assessing the hire for one year. With each promotion of the earth scientist so hired, the earth-science department would get an additional bonus. The bonus earned would be distributed equitably to both the graduate and undergraduate departments responsible for the education of the hired earth scientist.

5. I wish technology transfer from industry to academia could be accelerated. Let our academic institutions routinely invite, as well as remunerate, industry scientists to teach credit courses on the most modern technology and its applications. Is there really anything wrong with a department giving up one faculty position to replace it with a rotating chair (or stool) for top-notch industrial researchers and teachers, even if many of them do not have a Ph.D. and have not a pluridecimeter-thick publication record? Let us hope that industry will find ways to make these teachers available. It may be in their own self-interest.

6. Today, the centrifugal forces of increased specialization make it more difficult for the earth sciences to form a united front in times and on issues when this is necessary. Let us try to build more solid bridges between all earth-science societies. I hope that GSA will rapidly increase the number of its own associated societies, and that in exchange, we ourselves would also become associate members of other societies. The suggested small formal steps will facilitate our bridge-building efforts.

7. I would like to see an expanded *GSA News & Information* to include more opinions and views that relate to public policy, education, and other topics that need to be aired and debated. If the AAAS can present and discuss public policy issues in *Science*, we should do the same in a lively manner in the pages of our own newsletter. I don't view discussions of the technical pros and cons of a public issue and the sharing of different opinions as "political." For instance, I found the reports of our Congressional Science Fellows most informative even though I don't share some of the political views expressed in congressional debates that were reported.

8. Finally, let us help fellow earth scientists abroad—more specifically, the earth scientists of the developing nations. In Canada and the United States we have a vigorous earth-science community. Our internal laments over research funding must look quite unimportant to our colleagues in the developing nations who struggle to survive in their chosen field. The new GSA association with AGID (Association of Geoscientists for International Development) is the first step in the right direction. Next, we plan to establish an International Division of GSA. The principal mission of that division is to serve as a forum for meetings, symposia, and training courses with colleagues from overseas. Eventually, an International Division could serve as a GSA contact with foreign earth-science organizations. The new division may also assist in raising funds for overseas colleagues who want to attend our meetings, and for North American colleagues who volunteer to give short courses in the developing nations.

To sum up, GSA is a vigorous and healthy organization poised to solve the problems of the future. It was fun being your president, and again I thank you for the honor and for the confidence you placed in me. Without the help of the loyal and efficient headquarters staff I could not have discharged my responsibility. I thank them for their superb support. Let me thank the Sections for their hospitality and their constructive suggestions. The GSA Council was generously patient with me during our meetings (yes, I did suspend Robert's rules for one year, to replace them with custom-designed chaos). Finally, I wish all GSA members prosperous earth sciences for the second century of our Society.

Annual Report of the Executive Director

by F. Michael Wahl



The year 1988 was certainly a significant milestone in the history of the Society. The Centennial Celebration in Denver was the highlight of the year and the culmination of more than 5 years of planning.

Other significant accomplishments included maintaining membership roles at a fairly constant level in spite of a depressed job market; publication of a special series of centennial articles in the *GSA Bulletin*, resulting in the largest number of pages ever published during one year; publication of 17 new volumes in the *Memoir* and *Special Paper* series, the largest number ever in a single year; the approval of a standing Committee on Education to plan, organize, and oversee activities in that area; and the addition of three new GSA Associated Societies—the Association for Women Geoscientists, the National Earth Science Teachers Association, and the Association of Geologists for International Development.

In the fiscal category, we finished the year slightly on the upside in the operations section because of higher-than-anticipated revenue from the Centennial Celebration. As in 1987, several anticipated DNAG products were not completed during the year, resulting in overall publication revenue that was lower than projected. Both Member and Nonmember Periodicals were also in the negative because of higher production costs and reduced page-charge revenue.

Headquarters Operation

The performance of headquarters staff during the year was outstanding, as we not only continued operations at the same pace for ongoing programs but also added the responsibilities required to supervise and manage activities for the Centennial Celebration. The number of permanent GSA employees during 1988 was 44. In addition, the Society employed 11 persons on a part-time basis at different times throughout the year. This number does not include proofreaders or temporary editorial personnel who work on a contract basis as needed.

The Society is indeed fortunate to have a dedicated group of professionals who do whatever is necessary to meet the needs of our membership.

Membership

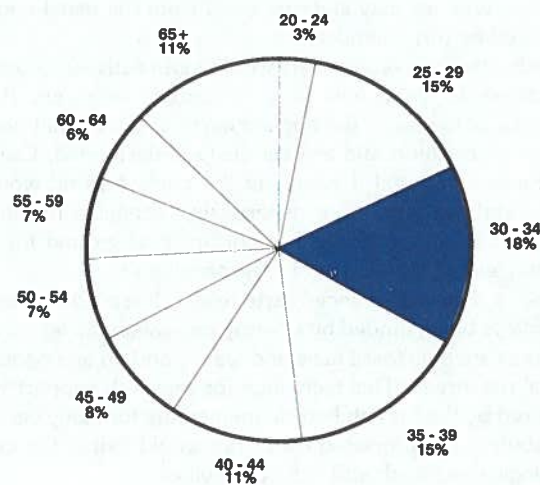
Total Society membership for the year was down slightly compared to 1987 statistics. Overall, we realized a net loss of 158 members. The largest decrease occurred in the Student Associate category, where the number dropped by 192. This, however, was partially offset by a net gain of 85 in the regular Member category.

Fifty-nine percent of our members are between the ages of 25 and 44. Also significant is the fact that 11% are 65 years of age or older. Of our total membership, nearly half have been affiliated with the Society for 6 years or less, while another one-fourth have been members for 21 years or more. In terms of section affiliation, slightly more than 30% of the membership belongs to the Cordilleran Section, followed by the Northeastern Section with 19%, the Rocky Mountain Section with 16%, and the Southeastern Section with

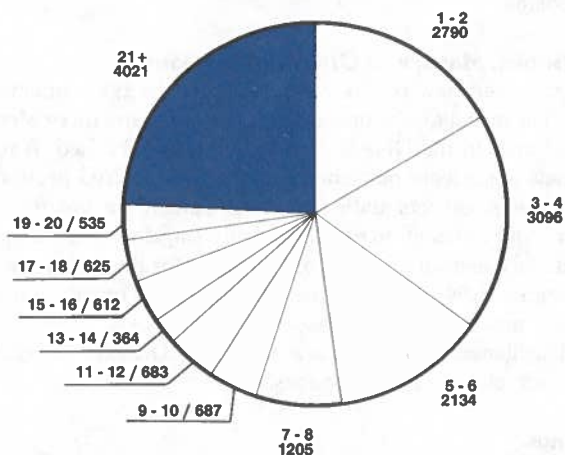
MEMBERSHIP STATISTICS
1972-1988

	Fellows	Members	Students	Honorary Fellows	Totals
1988	3020	9682	3672	53	16,427
1987	3074	9597	3864	50	16,585
1986	3108	9335	4076	49	16,568
1985	3143	9074	4001	49	16,267
1984	3182	8422	3713	45	15,362
1983	3164	7922	2871	44	14,001
1982	3199	7901	2243	43	13,386
1981	3214	7633	1828	43	12,718
1980	3229	7500	1834	40	12,603
1979	3237	7306	1874	42	12,459
1978	3251	7208	1903	42	12,404
1977	3282	6972	2095	42	12,391
1976	3334	6771	2377	45	12,527
1975	3347	6438	2224	45	12,054
1974	3327	5975	2917	44	12,263
1973	3332	5452	1871	46	10,701
1972	3293	5289	873	49	9504

MEMBERSHIP AGE
1988



YEARS OF AFFILIATION
(years/no. of members)
1988



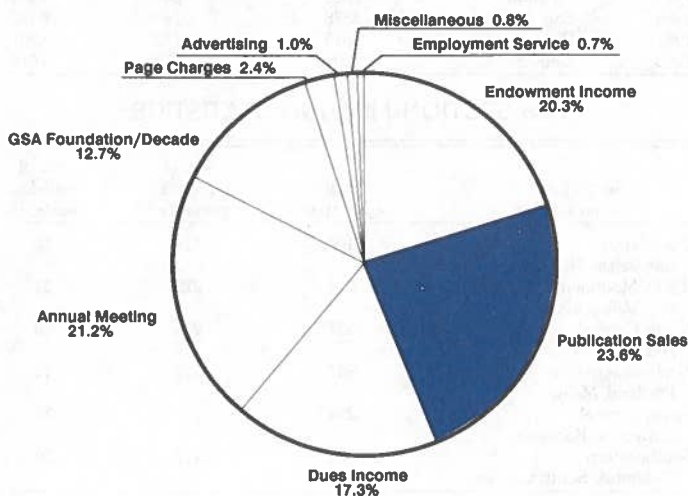
13%. The number of Senior Members and Fellows continues to grow each year—a category now comprising slightly more than 5% of the total membership.

The major professional interest of our membership is in structure/tectonics (13%), followed closely by petroleum geology (10%), and then by economic geology, mineralogy, sedimentology, and hydrogeology, which are all nearly equal at 9%.

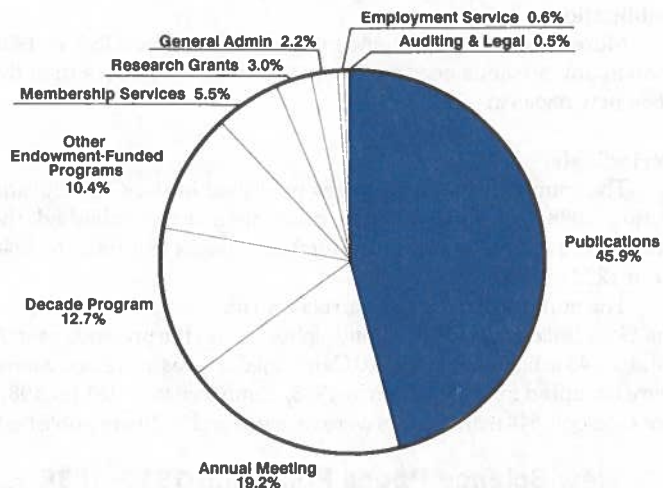
Sources of Revenue

Society dues in 1988 remained at \$70 for Members and Fellows. Of this amount, \$42 per member (60%) was allocated to cover the yearly costs of the *GSA Bulletin*, *Geology*, and *GSA News & Information*. The actual production and distribution costs for these publications were slightly more than \$87 per member for the year. The difference was paid from other publications revenue and through an endowment income subsidy. The remaining \$28 of each member's dues was assigned as Membership Department income and used to maintain membership records and cover the cost of all membership services and activities, including the GSA representatives program. For the year, income from dues represented only 17.3% of the total revenue of the Society. Publications sales continued to be the major revenue source, followed closely by

REVENUE BY SOURCE
1988



EXPENDITURES BY BUDGET CATEGORY
1988



endowment income, which subsidizes member publications and underwrites the cost of Council and committee activities. More than \$2.2 million was spent on the publication programs of the Society during 1988.

Employment Service Program

During 1988 the Employment Service program showed a net gain, compared with deficits for the three previous years. A statistical comparison shows that the total number of employers using the program was higher than in 1987 and 1986. The total number of positions advertised through the program was higher than in 1987. There was also a slight increase in the total number of applicants seeking employment.

EMPLOYMENT SERVICE STATISTICS

	1980	1981	1982	1983	1984	1985	1986	1987	1988
EMPLOYERS									
Year-round	47	57	43	32	27	27	15	20	16
Annual Meeting	116	77	41	42	39	33	31	30	50
Total	163	134	84	74	66	60	46	50	66
POSITIONS									
From employers year-round	47	57	43	32	27	27	76	67	37
From employers at Annual Meeting	193	165	70	71	61	111	132	58	104
Total	240	222	113	103	88	138	208	125	141
Types of positions									
Academic									
Year-round	28	19	33	16	9	14	6	7	5
Annual Meeting	100	95	54	50	46	39	29	26	42
Industry									
Year-round	16	32	8	12	16	10	70	54	29
Annual Meeting	82	58	10	8	11	32	21	11	56
Government and other									
Year-round	3	6	2	4	2	3	—	6	—
Annual Meeting	11	12	6	13	4	40	82	21	9
Total applicants at									
Annual Meeting	296	309	263	231	218	218	270	273	315
Total applicants for year	465	474	527	422	404	352	385	348	381*
Total applicant successes (joined year before)									
	40	41	22	8	20	19	15	20	20

*145 applicants used the form provided in *GSA News & Information*

Publications

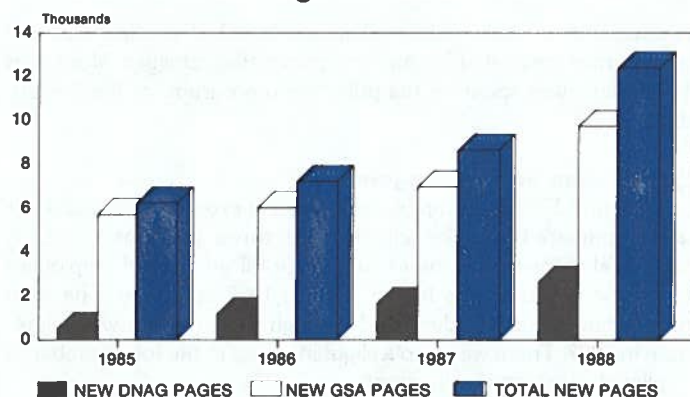
More new pages of science were published by GSA in 1988 than in any previous year on record—12,424—43% more than the 8684 new pages in 1987.

Periodicals

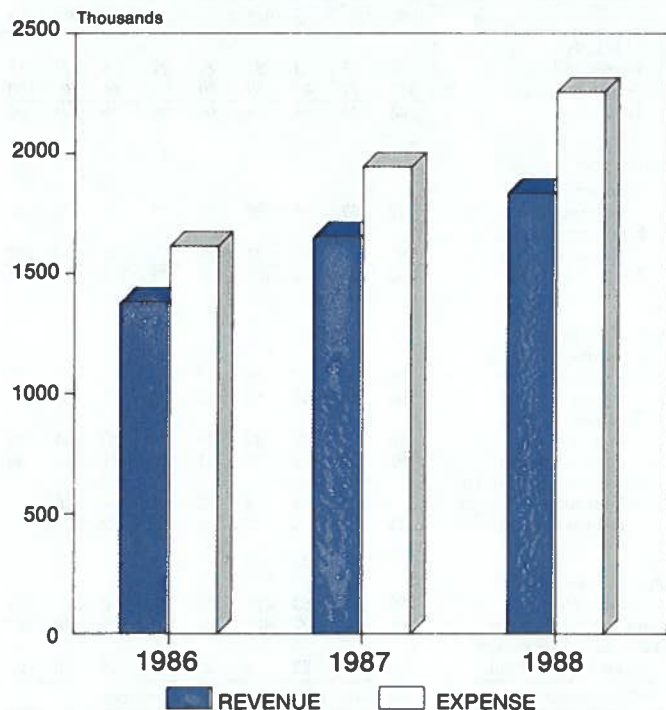
The number of science pages published in the *GSA Bulletin* during 1988 totaled 2064—398 more than were published the previous year. For *Geology*, the number of pages increased to 1244 from 1222 in 1987.

The number of manuscripts received for possible publication in the *GSA Bulletin* was 291, slightly higher than in the previous year. A total of 143 articles, including 20 Centennial articles and discussions, were accepted for publication in 1988, compared with 161 for 1987. For *Geology*, 644 manuscripts were received and 369 were published.

New Science Pages Published 1985–1988



PUBLICATIONS REVENUE/EXPENSE COMPARISON 1986, 1987, 1988



The average time interval from acceptance to publication remains approximately six months for the *GSA Bulletin* and three months for *Geology*.

New Books, Maps, and Other Publications

Seventeen new books were published in 1988 totaling 9762 pages. These included fourteen Special Papers and three Memoirs. Five volumes in the DNAG series were also published. A total of eight new maps were published including two DNAG products.

In the *Abstracts with Programs* series, six volumes were produced for the Section meetings, and a single volume for the 1988 Centennial Celebration. The total of pages for the series was 1025, compared with 944 in 1987, a growth rate of 9%. The total number of abstracts processed has increased 70% since 1981.

Miscellaneous publications including Division newsletters, Memorials, etc., totaled 696 pages.

Meetings

From all reports, the Centennial Celebration in Denver was a smashing success. The Denver experience was a first in many ways: the highest number of papers presented (2104); the largest number of poster presentations (593), half-day oral sessions (110), and exhibitor booths (273 compared with the previous high of 212 in 1987); as well as the highest registration ever (7478—an increase of 1413 over the previous high of 6065 in Reno in 1984). The opening ceremonies and megasymposium on Monday morning were both firsts for GSA, and were attended by more than 4300 persons. Other innovations included the GSA Founders exhibit, a Science of Geology exhibit, and an audio-visual presentation at the opening session which depicted GSA and its programs throughout our first 100 years. The GSA Symphony presentation on Tuesday evening was also a first.

ANNUAL MEETING REGISTRATION STATISTICS 1976–1988

Year	Site	Preregistration	Percent pre-registered	Total
1976	Denver	2797	52%	5351
1977	Seattle	1987	50%	3956
1978	Toronto	2404	50%	4826
1979	San Diego	2339	51%	4574
1980	Atlanta	2844	66%	4285
1981	Cincinnati	2875	62%	4670
1982	New Orleans	3026	63%	4793
1983	Indianapolis	2717	65%	4153
1984	Reno	4331	71%	6065
1985	Orlando	2665	60%	4409
1986	San Antonio	3378	76%	4452
1987	Phoenix	3813	73%	5201
1988	Denver	5509	73%	7478

1988 SECTION MEETING STATISTICS

Section and meeting location	Total registration	No. of papers presented	No. of half-day sessions
Cordilleran	1108	414	42
Las Vegas, Nevada			
Rocky Mountain	638	275	31
Sun Valley, Idaho			
North-Central	627	234	30
Akron, Ohio			
Northeastern	937	329	35
Portland, Maine			
South-Central	294	116	25
Lawrence, Kansas			
Southeastern	701	172	30
Columbia, South Carolina			

Section meetings during the year had a combined registration of 4305 persons. A total of 1540 papers were presented in 193 sessions, and 797 registrants participated in a total of 38 field trips. Field trip attendees at the Section meetings represented 18.5% of all meeting registrants, a good indication that they are still an important part of the Section meeting format.

Research Grants

The Committee on Research Grants awarded a total of \$178,800 for the support of research in 1988. This sum included \$150,000 from Penrose Endowment income, \$3300 income from the Harold T. Stearns Fund, and \$3000 income from the Arthur L. Day Fund. Funding also included \$20,500 from the GSA Foundation which includes contributions from individuals, companies, and corporations. In all, a total of 213 proposals were selected for funding from the 603 proposals received. These included 150 doctoral proposals, 62 master's proposals, and one postdoctoral proposal. The average grant was \$850, and the award rate was 35% of all proposals received.

Recipients of specialized Society awards in 1988 were as follows:

Robert K. Fahnestock Memorial Research Award

Jim E. O'Connor, University of Arizona, Tucson

Harold T. Stearns Fellowship Awards

Jeffrey Delon Corrigan, University of Texas, Austin

Jay L. Jackson, University of Arizona, Tucson

Suzanne A. McEnroe, University of Massachusetts, Amherst

Gladys W. Cole Memorial Research Award

Richard A. Young, State University of New York, Geneseo

Decade of North American Geology

During 1988, publication continued at a modest pace, constrained by the continuing difficulty of obtaining the last few pieces of each publication from the volunteer contributors. Three more volumes, incorporating 71 chapters, and two more maps of the Neotectonics series were published. The set of Centennial Field Guides was completed. Twelve volumes, three major North American maps, and eleven transects have now been published.

At the end of the year, one more volume was at the printer and expected in January 1989, work was nearing completion on six additional volumes, and ten more were in various stages of production. Two more wall maps were about to enter production, and three more transects were in production.

Published

North America and Adjacent Oceans during the Last

Deglaciation

The Atlantic Continental Margin: U.S.

Southeastern Section Centennial Field Guide

Sedimentary Cover—North American Craton: U.S.

Gravity Anomaly Map of North America

Seismicity Map of North America

In press

Hydrogeology

The combined efforts of more than 1100 geologists and geophysicists are represented in the books and maps that are published.

During 1988, manuscripts began arriving for one more volume of The Geology of North America series and two more special volumes. Eighty-six percent of all chapters for The Geology of North America have now been written, and 75% of the chapters for this set have reached or completed the production stage; 57% of the

chapters for the set of special volumes have also reached or completed this stage.

GSA Foundation Activities

The GSA Foundation continued to expand its development activities on behalf of GSA during 1988. The Century Challenge fund-raising program, honoring the Society's Centennial, raised over \$100,000 in contributions and pledges. GEOSTAR, Supporting The Advancement of Research, was initiated during the year as the Foundation's principal development program over the next four to five years. The proceeds of GEOSTAR will be used to support geologic research and other GSA programs. A gift to the GSA Foundation that will grow to \$250,000 was received from Dr. and Mrs. Fred A. Donath. Income from this endowment will support the annual Young Scientist Award and Donath Medal. Other GEOSTAR funds created during the year were the John T. Dillon Alaska Research Award Fund and the Allan V. Cox Student Research Award Fund. The endowment comprising the Antoinette Lierman Medlin Scholarship Award Fund continued to grow. Disbursements by the Foundation in support of research and student travel grants were \$33,000, a 50% increase over the prior year. DNAG activities included contributions of \$299,000, net sales revenues of \$218,000, and disbursements to fund this publication program totaling \$626,000. Fred A. Donath and Roy M. Huffington joined the Foundation's Board of Trustees, replacing Harrison C. Jamison and Lawrence W. Funkhouser, who retired.

Penrose Conferences

The Society sponsored five Penrose Conferences in 1988:

Paleozoic and Early Mesozoic Paleogeographic Relations Between the Klamath Mountains, the Northern Sierra Nevada, and North America, June 5–10, 1988, Redding, California; conveners: David S. Harwood, M. Meghan Miller.

Origin of Massif Anorthosites and Related Rocks, August 14–19, 1988, Chugwater, Wyoming; conveners: B. Ronald Frost, Donald H. Lindsley, E. Craig Simmons.

Volcanic Influences on Terrestrial Sedimentation, August 28–September 3, 1988, Crystal Mountain, Washington; conveners: Gary A. Smith, William J. Fritz.

Criteria for Establishing the Relative Timing of Pluton Emplacement and Regional Deformations, September 10–15, 1988, Mariposa, California; conveners: Othmar T. Tobisch, Ron H. Vernon, Scott R. Paterson.

Marine Evaporites: Genesis, Alteration, Associated Deposits, August 28–September 2, 1988, Oxley, Ontario, Canada; conveners: Peter Sonnenfeld, Christopher G. St. C. Kendall.

Medal and Award Winners

Penrose Medal: *Robert S. Dietz*

Day Medal: *Claude J. Allègre*

First GSA Distinguished Service Award: *Campbell Craddock, Robert D. Hatcher, Jr., Eldridge M. Moores, and William A. Thomas*

New Honorary Fellows

Ihsan Ketin

Department of Geological Engineering, Faculty of Mines, Istanbul Technical University, Tesvikiye, Istanbul, Turkey

Rashid A. Khan Tahirkheli

National Centre of Excellence in Geology, University of Peshawar (Pakistan), Peshawar, NWFP (Pakistan)

(continued on p. 188)

Medals and Awards(continued from p. 187)

Rupert W. R. Rutland

Bureau of Mineral Resources, Geology & Geophysics, GPO Box 378, Canberra, A.C.T., 2601, Australia

Isabella Premoli-Silva

Instituto di Paleontologia, Università Milano, Via Mangialli 36, 20133 Milan, Italy

Archaeological Geology Division Award: *Claude C. Albritton, Jr., and Glen L. Evans*

Gilbert H. Cady Award (Coal Geology Division): *Ralph J. Gray*

E. B. Burwell, Jr., Award (Engineering Geology Division): *Gerhard H. Eisbacher and John J. Clague*

George P. Woollard Award (Geophysics Division): (No award given in 1988)

History of Geology Award (History of Geology Division): *Stephen Jay Gould*

O. E. Meinzer Award (Hydrogeology Division): *Isaac J. Winograd*

G. K. Gilbert Award (Planetary Geology Division): *Don Edward Wilhelms*

Kirk Bryan Award (Quaternary Geology and Geomorphology Division): *Peter Wessel Birkeland*

Structural Geology and Tectonics Division Career Contribution Award: *John W. Handin*

1988 GSA Committees and Representatives

Executive Committee

Albert W. Bally—President and Chairman; Randolph W. Bromery, Vice-President; Jack E. Oliver, Past President; Robert L. Fuchs, Treasurer; Mary Lou Zoback, Council Member-at-Large

Audit Committee

William W. Hay—Chairman, 1987–1989; Donald C. Haney, 1988; Priscilla C. Grew, 1988–1990; Ex Officio: Robert L. Fuchs

Committee on Committees

Charles A. Baskerville—Chairman; John E. Frost; Rosemary V. Buden; William G.E. Caldwell; George W. Fisher

Committee on the Arthur L. Day Medal Award

C. Barry Raleigh—Chairman, 1988; Bruce R. Doe, 1986–1988; Frederick A. Cook, 1987–1989; Leigh H. Royden, 1987–1989; Russell S. Harmon, 1988–1990; Samuel M. Savin, 1988–1990

Committee on Geology & Public Policy

C. Edward Buchwald—Chairman, 1986–1988; MaryAnn L. Malinconico, 1986–1988; Diana C. Dale, 1987–1989; Robert C. Milici, 1987–1989; Howard G. Wilshire, 1987–1989; Marcus E. Milling, 1988–1990; Clement F. Shearer, 1988–1990; Samuel J. Tuthill, 1988–1990

Committee on Honorary Fellows

Robert S. Yeats—Chairman, 1988–1990; Judith A. McKenzie, 1986–1988; Robert E. Wallace, 1986–1988; Digby J. McLaren, 1987–1989; Peter R. Vail, 1987–1989; Samuel S. Adams, 1988–1990

Committee on Investments

Anthony Reso—Chairman, 1987–1989; William B. Heroy, Jr., 1986–1988; Brian J. Skinner, 1986–1988; Thomas W. Stern, 1986–1988; Kelsey L. Boltz, 1987–1989; Ex Officio: Robert L. Fuchs, Treasurer

Committee on Membership

Stephen H. Stow—Chairman, 1986–1988; Martin L. Stout, 1986–1988; James D. Aitken, 1987–1989; Penelope M. Hanshaw, 1987–1989; James O. Jones, 1988–1990; Robert M. West, 1988–1990

Committee on Nominations

Robert D. Hatcher, Jr.—Chairman; Genevieve Atwood; G. Arthur Barber; Sharon Mosher; Meredith (Buzz) E. Ostrom

Committee on Penrose Conferences

John L. Snyder—Chairman, 1986–1988; Daniel J. Stanley, 1986–1988; Paul D. Fullagar, 1987–1989; James F. Tull, 1987–1989

Committee on the Penrose Medal Award

E-an Zen—Chairman, 1988; Robert H. Dott Jr., 1986–1988; Steven M. Stanley, 1986–1988; Donald E. White, 1986–1988; Laurie Brown, 1987–1989; Kevin Burke, 1988–1990; Thomas Dunne, 1988–1990; Scott B. Smithson, 1988–1990

Program Committee

Mary Lou Zoback—Chairman, 1988; Clement G. Chase, 1987 JTPC Chairman; William W. Hay, 1988 JTPC Chairman; Robert F. Dymek, 1989 JTPC Chairman; Richard M. Mitterer, 1990 JTPC Chairman (Term begins at summer 1988 JTPC meeting); Stephen H. Stow, 1989 Councilor-member; Priscilla C. Grew, 1989–1990 Councilor-member; Ex Officio: F. Michael Wahl, GSA Executive Director; Sue S. Beggs, GSA Meetings Manager; A. R. (Pete) Palmer, GSA Science Coordinator

Committee on Publications

David L. Jones—Chairman, 1986–1988; Henry Spall, 1987–1989; Terry R. West, 1987–1989; Donald C. Haney, 1988–1990; Robert D. Hatcher, Jr., Editor, *Bulletin*; William A. Thomas, Editor, *Bulletin*; Raymond E. Arvidson, Editor, *Geology*; Marion E. Bickford, Editor, *Geology*; Campbell Craddock, Editor, *Memoirs and Special Papers*; Wallace R. Hansen, Editor, *Maps and Charts*; Conferee: F. Michael Wahl, Executive Director

Committee on Research Grants

Thomas H. Anderson—Chairman, 1987–1989; John A. Breyer, 1987–1988; Patricia H. Cashman, 1988; Elaine R. Padovani, 1987–1989; Richard H. Groshong, Jr., 1988–1990; Mitchell W. Lyle, 1988–1990; NSF Conferee: Ian D. MacGregor

Committee on Short Courses

Elwood R. Brooks—Chairman, 1987–1989; Carroll Ann Hodges, 1987–1988; George deVries Klein, 1987–1989; Doris M. Curtis, 1988–1990

Treatise on Invertebrate Paleontology Advisory Committee

Brian F. Glenister—Chairman, 1985–1988; Charles W. Pitrat, 1987–1990; F. Michael Wahl, Continuing

Report of the Treasurer by Robert L. Fuchs



In 1988, GSA finances showed little change from the prior year. The report of the Society's independent auditors, Touche Ross & Company, including financials for the six GSA Sections, indicates total assets as of December 31, 1988, of \$19,157,054, down 0.5% from 1987's \$19,258,604. Liabilities and deferred revenues at the end of 1988 were \$2,839,881, resulting in net worth of \$16,317,173, a decrease of 1.2% from 1987's net worth of \$16,512,545. The Society continued in a strongly liquid position at year end, with cash and cash equivalents of \$5,523,378 (maturities less than one year).

Investment performance in 1988 was lackluster, due in part to the aftereffect of the severe trauma suffered by the equity markets during 1987. Net realized investment gains for the year were a mere \$43,096. At year end the carrying value of cash and investments was \$15,504,055. This was down 2.5% from 1987's \$15,906,615.

The Society's operating income statement showed a deficit that was slightly larger than the 1987 deficit. Revenue and support items totaling \$4,944,557 failed to meet expenses by an amount of \$134,654 (2.7%). Investment income (dividends and interest) increased 20.1% to \$965,162 due to higher interest rates on GSA's large cash position. The operating deficit nearly matches the extraordinary expense of \$140,000 incurred in connection with 1988's Centennial activities.

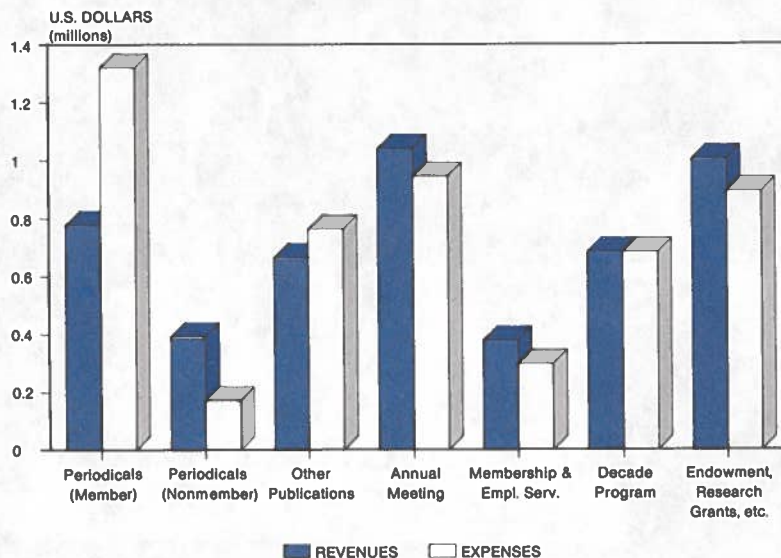
In the accompanying graph, revenues and expenses are allocated into the appropriate major sectors of the Society's activities. Support was required in Member Periodicals and Other Publications. Support was provided by Nonmember Periodicals, Annual Meeting, Membership and Employment Service, and Endowment. Excess costs of the Decade program over sales are reimbursed by the GSA Foundation. In this analysis we have placed general and administrative costs in the Endowment category. The graph clearly displays the continuing and important role played by the Penrose Endowment Fund and the Foundation in subsidizing GSA's publications.

The Society continues to maintain a very strong real estate position. Depreciated real estate value is \$1,762,977; market value was recently appraised at \$3,855,000, more than twice the value

carried on the books. GSA operations have rent-free use of a large amount of real property. This is another form of endowment support, less evident but equally important to the membership. New programs planned by the Society, particularly in the area of education, and the expansion of present activities will ultimately require enlarging present headquarters facilities. GSA and the Foundation are reviewing ways to finance this expansion when the time comes.

After 12 years of continuous increases in GSA's net worth, the 1.2% decrease in 1988 is disappointing. In part this stems from the conservative investment posture adopted by the Society and its money managers in 1987. Also, 1988 was a year in which some extraordinary costs were incurred. Investment policy and strategy remain under continual review. One under-performing money manager was terminated, and two new managers were employed—Berg Capital and Lincoln Investment Planning. It is hoped that this fine-tuning will return GSA's portfolio to its long-established growth pattern.

REVENUES & EXPENSES 1988



**Celebrating 100 Years of Service
to the
Geosciences**

Geological Society of America



GSA Council Actions—Spring 1989

Council Nominations for 1990

- For Councilor (1990–1991) and President (1990)
Raymond A. Price, Kingston, Ontario, Canada
- For Councilor and Vice-President (1990)
Doris M. Curtis, Bellaire, Texas
- For Councilor and Treasurer (1990)
Robert L. Fuchs, Denver, Colorado
- For Councilors (1990–1992)
Arden L. Albee, Pasadena, California
William L. Fisher, Austin, Texas
Marie Morisawa, Binghamton, New York
Elaine R. Padovani, Reston, Virginia

New Honorary Fellows

- Gabriel Dengo*
Apartado 468
Guatemala City, Guatemala
- Rushdi Said*
Intergeosearch
3801 Mill Creek Drive
Annandale, Virginia 22003

MEDAL AND AWARD WINNERS FOR 1989

Penrose Medal

Warren B. Hamilton
U.S. Geological Survey
Box 25046, DFC, MS-964
Denver, Colorado 80225

Day Medal

Dan P. McKenzie
Bullard Laboratories
Maddingley Road
Cambridge CB3 0EZ, United Kingdom

Young Scientist Award (Donath Medal)

Mark P. Cloos
Department of Geological Sciences
University of Texas
Austin, Texas 78713-7909

Archaeological Geology Division Award

Herbert E. Wright, Jr.
Department of Geology and Geophysics
University of Minnesota
Minneapolis, Minnesota 55455

Gilbert H. Cady Award (Coal Geology Division)

Robert M. Kosanke
U.S. Geological Survey
Box 25046, DFC, MS-919
Denver, Colorado 80225

E. B. Burwell, Jr., Award (Engineering Geology Division)

Robert B. Johnson
Department of Earth Resources
Colorado State University
Fort Collins, Colorado 80523

Jerome V. De Graff
1110 West Holland Avenue
Fresno, California 93705

George P. Woollard Award (Geophysics Division)

Seiya Uyeda
Earthquake Research Institute
University of Tokyo
Tokyo 113, Japan

History of Geology Division Award

Albert V. Carozzi
Department of Geology
245 Natural History Building
University of Illinois
1301 West Green Street
Urbana, Illinois 61801-2999

O. E. Meinzer Award (Hydrogeology Division)

Stanley N. Davis
Department of Hydrology and Water Resources
University of Arizona
Tucson, Arizona 85721

G. K. Gilbert Award (Planetary Geology Division)

Harrison H. Schmitt
P.O. Box 14338
Albuquerque, New Mexico 87191-4338

Kirk Bryan Award (Quaternary Geology & Geomorphology Division)

Kevin M. Scott
U.S. Geological Survey
Cascades Volcano Observatory
5400 MacArthur Boulevard
Vancouver, Washington 98661

Structural Geology & Tectonics Division Career Contribution Award

John Rodgers
Department of Geology and Geophysics
Yale University
P.O. Box 6666
New Haven, Connecticut 06511

Two unique ways to share your world of geology with others and promote the knowledge of your Society and your science ...

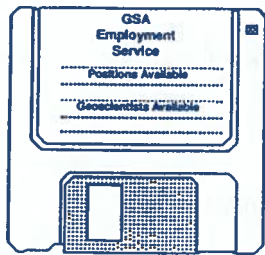
DONATE A COPY OF

The Art of Geology and The Earth Has A History

The Art of Geology (Special Paper 225) by E.M. Moores and F. Michael Wahl. List price \$37.50.

The Earth Has A History (Educational Video/Film Series 1) by A.R. Palmer. List price \$25.00

See our ads in this issue for these special products.



GSA Employment Service

Searching for a New Geoscientist?

When was the last time you hired a new employee? Did you waste time and effort in your search for a qualified geoscientist? Let the GSA computerized search file make your job easier.

How does it work? Complete the Employer's Request for Earth Science Applicants form on the following page. Remember to specify educational and professional experience requirements as well as the specialty area or areas of expertise your applicant should have. The GSA computer will take it from there.

You will receive a printout that includes the applicants' names, addresses, phone numbers, areas of specialty, type of employment desired, degrees held, years of professional experience, and current employment status. Resumés for each applicant are sent with each printout at no additional charge. In 1989, the cost of a printout of one or two specialty codes is \$150. (For example, in a recent job search

for an analyst of inorganic materials, the employer requested the specialty codes of geochemistry and petrology.) Each additional specialty is \$50. A printout of the entire applicant listing in *all* specialties is available for \$350. (Specialty codes printed in boldface type are considered major headings. If you select a specialty code printed in boldface type, your listing will contain applicants within the related subspecialties as well. If you request a listing of one of the subspecialties, applicants coded under the major category will be included but not those coded under the other related subspecialties.) If you have any questions about your personalized computerized search, GSA Membership Services will assist you.

The GSA Employment Service is available year long. However, GSA also conducts the Employment Interview Service each fall in conjunction with the Society's Annual Meeting (this year in St. Louis, Missouri, Nov. 6-9). You may rent interview space in half-day increments from GSA. Our staff will schedule all interviews with applicants for you, the recruiter. In addition, GSA offers a message service, complete listing of applicants, copies of resumés at no additional charge, and a posting of all job openings.

Looking for a New Job?

Are you looking for a new position in the field of geology? The GSA Employment Service offers an economical way to find one. Potential employers use the service to find the qualified individuals they need.

You may register any time throughout the year. Your name will be provided to all participating employers who seek individuals with your qualifications. If possible, take advantage of GSA's Employment Interview Service, which is conducted each fall in conjunction with the Society's Annual Meeting. The service brings potential employers and employees together for face-to-face interviews. Mark your calendar for Nov. 6-9 for the 1989 GSA Annual Meeting in St. Louis, Missouri.

To register, complete the application form on the following page, prepare a one- to two-page resumé, and mail it with your payment to the address given below. One-year listing for GSA Members and Student Associates in good standing: \$30, non-members: \$60.

NOTE: If you plan to interview at the GSA Annual Meeting, GSA *must* receive your material **no later than August 11, 1989**. If we receive your materials by August 11, your record will be included in the information the employers receive prior to the meeting. Submit your forms early to receive maximum exposure! Don't forget to indicate on your application form that you would like to interview in November. Good luck with your job search!

APPLICANT AND EMPLOYER FORMS ARE BACK-TO-BACK ON THE FOLLOWING PAGES

For additional information and submission of forms, please contact

T. Michael Moreland
 Manager, Membership Services
 Geological Society of America
 P.O. Box 9140
 Boulder, CO 80301
 (303) 447-2020

GSA Goes Kiwi

New Zealand: 1991



2½ to 3 Week Geological Vacation Trip

emphasis on South Island

*Exact dates to be announced;
 will be between mid-February and mid-March*

Approximate cost: \$2000-\$2400 plus airfare

Guests welcome

GSA members will receive a special discount

Call Sue Beggs, GSA Meetings Manager, (303) 447-2020

— Clip and return to —

GSA Meetings Dept.
 P.O. Box 9140, Boulder, CO 80301

GSA NEW ZEALAND 1991

____ YES, I'm interested. Send more information.

Name _____

Address _____

Address _____

City _____ State _____ ZIP code _____

() _____ () _____
 Business phone Home phone



**THE
GEOLOGICAL SOCIETY
OF AMERICA**

3300 Penrose Place, P.O. Box 9140
Boulder, Colorado 80301
(303) 447-2020

N&I 0789
FOR ACCTG. USE ONLY
Rec. \$30 \$60
Ck # _____
Ltr. _____
GSA _____
Add. _____

APPLICATION FOR EMPLOYMENT MATCHING SERVICE (Please type or print legibly with **black ink**)

NAME (Mr.) (Miss)
(Mrs.) (Ms.) _____ Date _____
(Dr.) (last name first)

Mailing Address _____

City _____ State _____ Zip Code _____

Date Available _____ Telephone (_____) _____ Business Home Visa _____
area code If not U.S. citizen, list visa

Members of GSA ONLY: Check here if you **DO NOT WISH** to have this number included in the Membership Directory

EXPERIENCE

Must use specialty codes listed below. Choose three that best describe your expertise in order of importance.

* 1. _____ 2. _____ 3. _____

TYPE OF POSITION DESIRED

- | | | |
|-------------------------------------|---|--|
| Interested in | Specific interest | Will accept employment in |
| <input type="checkbox"/> Academic | <input type="checkbox"/> Administration | <input type="checkbox"/> U.S. only |
| <input type="checkbox"/> Government | <input type="checkbox"/> Exploration/Production | <input type="checkbox"/> U.S. with foreign assignments |
| <input type="checkbox"/> Industry | <input type="checkbox"/> Field | <input type="checkbox"/> Either |
| <input type="checkbox"/> Other | <input type="checkbox"/> Research | |
| | <input type="checkbox"/> Teaching | |

* **PRESENT SPECIALTY**

Choose one from codes listed below _____ **YEARS EXPERIENCE IN THIS SPECIALTY** _____

PRESENT EMPLOYER _____

Give number of years experience for any of the following that are applicable:

Administrative _____ Exploration/Production _____ Field _____ Research _____ Teaching _____ Total geological working experience _____

KNOWLEDGE OF FOREIGN LANGUAGES: French _____ ; German _____ ; Russian _____ ; Spanish _____ ; Other _____

ACADEMIC TRAINING

College or University	Degree (rec'd or expected)	Year	Major	Minor

Postgraduate work beyond highest degree in (field) _____ Number of years _____

SPECIALTY CODES

Select those that best describe your ability. Use codes in bold face only when other breakdowns are inadequate.

- | | | | | |
|--|----------------------------------|-------------------------------|--------------------------------|--------------------------------|
| 100. Economic Geology | 224. stable isotopes | 352. statistical geology | 501. exploration | 630. Science Editing |
| 101. coal geology | 225. geochronology | 400. Mineralogy | 502. subsurface | 650. Sedimentology |
| 102. geothermal, etc. | 250. Geomorphology | 401. crystallography | stratigraphy | 651. sedimentary processes |
| 103. metallic deposits | 300. Geophysics | 402. clay mineralogy | 520. Petrology | 652. sedimentary environments |
| 104. nonmetallic deposits | 301. seismic | 410. Museum (curator) | 521. igneous | 720. Stratigraphy |
| 105. mining geology | 302. gravity/magnetics | 420. Oceanography | 522. metamorphic | 750. Structural Geology |
| 120. Engineering Geology | 303. seismicity | 421. marine geology | 523. sedimentary (clastic) | 751. tectonics |
| 150. Environmental Geology | 304. paleomagnetism | 422. coastal geology | 524. sedimentary (carbonate) | 752. tectonophysics |
| 160. Public Education & Communication | 320. Hydrogeology | 450. Paleontology | 525. experimental | 753. rock mechanics |
| | 321. hydrochemistry | 451. invertebrate | 550. Planetology | 800. Volcanology |
| 200. General Geology | 322. ground water | 452. vertebrate | 575. Quaternary Geology | |
| 220. Geochemistry | 323. surface water | 453. micropaleontology | 600. Regional Geology | |
| 221. organic | 330. Library | 454. paleobotany | 620. Remote Sensing | |
| 222. high temperature | 350. Mathematical Geology | 455. paleoecology | 621. photogeology | |
| 223. low temperature | 351. computer science | 500. Petroleum Geology | 622. photogrammetry | |

- * **Résumé must be attached, LIMITED TO TWO PAGES, typewritten on one side only, to be acceptable for reproduction to employers. Include your name, address, and phone number; concise details of work experience; and majors/minors on degrees.**
- * **Fee: \$30 if you are a Member or Student Associate of GSA in good standing (Member # _____) \$60 if you are not a member of GSA. Payment in U.S. funds (check, money order, or charge information MUST ACCOMPANY FORM). MAKE CHECK PAYABLE TO THE GEOLOGICAL SOCIETY OF AMERICA.**

Check or Money Order
 MasterCard VISA
 American Exp. Diners Club
 CHOICE Carte Bleue
 Barclay Card Access
 EuroCard Standard Bank Card

Card Expires Mo Yr _____ Card Number _____

Signature _____ (Required for credit card payment)

I agree to release GSA or their representatives from responsibility for errors that may occur in processing or distributing this data. I understand that GSA makes **no guarantees** of contact by an employer in this service. I agree to notify GSA Employment Service immediately of (1) change of address, (2) acceptance of a position.

I will attend the 19____ GSA Annual Meeting in _____

* **SIGNATURE (required)**

* **THESE ITEMS ARE ABSOLUTELY NECESSARY TO PROCESS THIS APPLICATION**

This application will be active for 1 year



THE GEOLOGICAL SOCIETY OF AMERICA

3300 Penrose Place, P.O. Box 9140
Boulder, Colorado 80301
(303) 447-2020

EMPLOYER'S REQUEST FOR EARTH SCIENCE APPLICANTS

(Please type or print legibly)

Name _____ Date _____

Organization _____

Mailing address _____

City _____ State _____ Zip code _____ Telephone number _____
(Area code) Number

SPECIALTY CODES (see list below)

List the specialty code numbers that you wish to order, or check here if you want entire file of applicants in ALL specialties.

1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____

POSITION DATA: What position(s) do you expect to fill? _____

In what area(s)? _____

Degree requirements _____ Number of positions available _____

SPECIALTY CODES

100. Economic Geology	224. stable isotopes	352. statistical geology	501. exploration	630. Science Editing
101. coal geology	225. geochronology	400. Mineralogy	502. subsurface	650. Sedimentology
102. geothermal, etc.	250. Geomorphology	401. crystallography	stratigraphy	651. sedimentary processes
103. metallic deposits	300. Geophysics	402. clay mineralogy	520. Petrology	652. sedimentary environments
104. nonmetallic deposits	301. seismic	410. Museum (curator)	521. igneous	720. Stratigraphy
105. mining geology	302. gravity/magnetics	420. Oceanography	522. metamorphic	750. Structural Geology
120. Engineering Geology	303. seismicity	421. marine geology	523. sedimentary (clastic)	751. tectonics
150. Environmental Geology	304. paleomagnetism	422. coastal geology	524. sedimentary (carbonate)	752. tectonophysics
160. Public Education & Communication	320. Hydrogeology	450. Paleontology	525. experimental	753. rock mechanics
200. General Geology	321. hydrochemistry	451. invertebrate	550. Planetology	800. Volcanology
220. Geochemistry	322. ground water	452. vertebrate	575. Quaternary Geology	
221. organic	323. surface water	453. micropaleontology	600. Regional Geology	
222. high temperature	330. Library	454. paleobotany	620. Remote Sensing	
223. low temperature	350. Mathematical Geology	455. paleoecology	621. photogeology	
	351. computer science	500. Petroleum Geology	622. photogrammetry	

Applicants seeking employment in:

- Academic
 Government
 Industry
 Other _____

Minimum degree required

- None
 B.A. or B.S.
 M.A. or M.S.
 Ph.D

Minimum professional experience

- None
 1-5 yrs.
 6-plus

Experience desired (yrs.)

	None	1-5	6-plus
Administrative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exploration/Production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Field	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Employment in: U.S. only U.S. with foreign assignments Either

Foreign Languages: French German Russian Other _____ Not required

I am interested in interviewing applicants through the GSA Employment Service at the 19____ Annual Meeting in _____

See attached sheet for current fee schedule.

1. I agree to use this service for valid recruiting purposes.
2. I agree that no placement charges will be assessed to any applicant participating in the GSA Employment Matching Service.

Total fee enclosed\$ _____
or invoice requested\$ _____

Signature (required) _____

CALL FOR GEOLOGIC PAPERS FOR THE 1990 GSA SECTION MEETINGS

Northeastern Section

Sheraton University Conference Center
Syracuse, New York
March 4-7, 1990

Abstract Deadline:
November 9, 1989

Submit completed ORAL & POSTER abstracts to
Donald L. Woodrow
Dept. of Geosciences
Hobart & William Smith Colleges
Geneva, NY 14456
(315) 789-5500, Ext. 215

Submit completed SYMPOSIUM abstracts to
Cathryn R. Newton
Heroy Geology Laboratory
Syracuse University
Syracuse, NY 13244-1070
(315) 443-2672

South-Central Section

Oklahoma State University
Stillwater, Oklahoma
March 5-6, 1990

Abstract Deadline:
November 3, 1989

Submit completed abstracts to
Arthur W. Cleaves
School of Geology
Oklahoma State University
Stillwater, OK 74078-0451
(405) 744-6358

Cordilleran Section

University of Arizona
Tucson, Arizona
March 14-16, 1990

Abstract Deadline:
November 14, 1989

Submit completed abstracts to
Roy A. Johnson
Dept. of Geosciences
University of Arizona
Tucson, AZ 85721
(602) 621-4890

Southeastern Section

University of Alabama
Tuscaloosa, Alabama
April 5-6, 1990

Abstract Deadline:
December 15, 1989

Submit completed abstracts to
Charles W. Copeland, Jr.
Geological Survey of Alabama
P.O. Box O
Tuscaloosa, AL 35486-9780
(205) 349-2852

North-Central Section

Western Illinois University
Macomb, Illinois
April 26-27, 1990

Abstract Deadline:
January 5, 1990

Submit completed abstracts to
Richard C. Anderson
Dept. of Geology
Augustana College
Rock Island, IL 61201
(309) 794-7318

Rocky Mountain Section

Snow King Resort
Jackson, Wyoming
May 21-23, 1990

Abstract Deadline:
January 31, 1990

Submit completed abstracts to
Ronald Frost
Dept. of Geology and Geophysics
University of Wyoming
P.O. Box 3006, University Station
Laramie, WY 82071
(307) 766-3386

1990 ABSTRACT FORM REQUEST

To: GSA Abstracts Coordinator
P.O. Box 9140
Boulder, CO 80301

Please send _____ copies of the 1990 GSA abstract form. I understand that the same form may be used for all 1990 GSA meetings—the six Section Meetings and the Annual Meeting.

Name _____

Address _____

Address _____

City _____ State _____ ZIP _____

SPECIAL PAPERS

GEOLOGICAL SOCIETY OF AMERICA • PUBLICATION SALES
P.O. Box 9140, Boulder, CO 80301 • 1-800-GSA-1988
(303) 447-2020 • FAX 303-447-1133

The Geology of Iztaccihuatl Volcano and Adjacent Areas of the Sierra Nevada and Valley of Mexico

by G. Nixon, 1989

Iztaccihuatl (5286 m) is one of the most imposing volcanoes in the predominantly calc-alkaline Trans-Mexican Volcanic Belt. It lies 60 km southeast of Mexico City in the mountains of the Sierra Nevada. Its unique form, described as that of a reclining maiden, was sculpted by lava and glacial ice. In this paper, the author describes the geology and eruptive history of Iztaccihuatl and neighboring volcanoes in the Sierra Nevada and Valley of Mexico. He presents new K-Ar geochronometry, petrographic descriptions, and geochemical analyses of the eruptive products, including the unusual mixed lavas of Iztaccihuatl, and a chronology of late Pleistocene glacial events. Well illustrated, it is accompanied by the first detailed geologic map (scale 1:50,000, in full color) of a major volcano in this part of the Trans-Mexican Volcanic Belt.

SPE219, 45 p., paperback,
ISBN 0-8137-2219-3, \$20.00

Structure across a Mesozoic Ocean-Continent Suture Zone in the Northern Sierra Nevada, California

by S.H. Edelman, H.W. Day, E.M. Moores, S.M. Zigan, T.P. Murphy, and B.R. Hacker, 1989

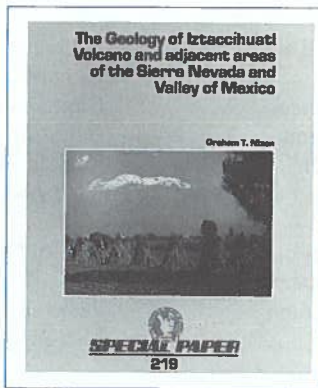
This paper presents descriptions and interpretations of large-scale structural relations and presents evidence for the existence of six terranes separated by early, strongly deformed, low-angle faults, such as the Slate Creek thrust. The authors document the stratigraphy in detail because their choice of units and interpreted structure differ from previous studies.

SPE224, 64 p., paperback,
ISBN 0-8137-2224-1, \$15.00

Terranes in the Circum-Atlantic Paleozoic Orogens

edited by R. D. Dallmeyer, 1989

Not just another "late-tectonic" reconstruction volume, this is a comprehensive geologic summary which enables regional syntheses. The authors describe initial efforts to apply terrane-tectonic concepts to the Paleozoic orogens of the circum-Atlantic region. Although similar studies are well advanced in the younger orogens of the Western American Cordillera, application of these concepts in the older, more deeply eroded Paleozoic orogens is much more complicated and requires consideration of some basic modifications of the terrane concepts as derived in the Cordillera. These modifications are detailed, making this a valuable reference guide for those attempting to carry out tectonic,



stratigraphic, structural, and/or paleontologic correlations in the circum-Atlantic region. Indeed, this is the first truly comprehensive collection of papers treating the entire circum-Atlantic realm, including such previously untreated areas as West Africa, central Europe, and Svalbard. Each paper provides an in-depth summary of pertinent stratigraphic, paleontologic, and/or structural characteristics of each of the terranes described.

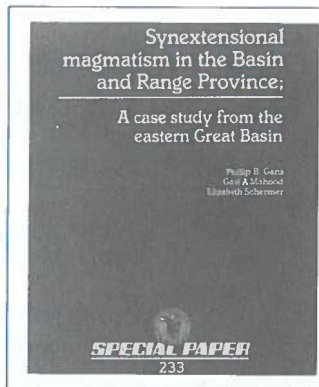
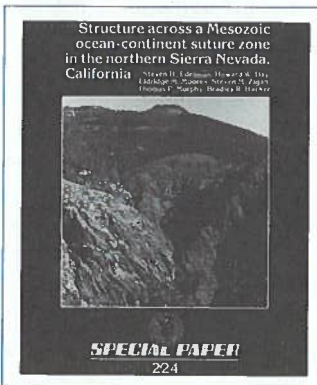
SPE230, 281 p., indexed, paperback,
ISBN 0-8137-2230-6, \$45.00

Ultramafic Rocks of the Appalachian Piedmont

edited by Steven K. Mittwee and Edward F. Stoddard, 1989

The volume provides up-to-date descriptions and interpretations of ultramafic and associated rocks and examines diverse aspects of these rocks, focusing on variability in their nature, origin, and significance. The eight papers in this volume are important for Appalachian regional geology and for general studies of ultramafic rocks, mineral parageneses, geochemistry, effects of metamorphism on ultramafic compositions, emplacement and deformation, and tectonic implications.

SPE231, 110 p., paperback,
ISBN 0-8137-2231-4, \$22.50

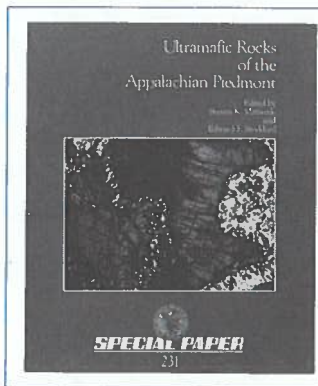


Synextensional Magmatism in the Basin and Range Province; A Case Study from the Eastern Great Basin

by P. B. Gans, G. A. Mahood, and E. Schermer, 1989

In this paper, the authors focus on the relationship between extension and magmatism in the Basin and Range province of the western United States. First, they describe in detail the timing rate(s) and character of volcanism and extensional faulting within a representative part of the province in the eastern Great Basin. They then synthesize the Cenozoic histories of a large number of other areas in the Basin and Range, and point out the striking similarities in their tectonic and magmatic evolution. The close temporal and spatial association of extension and magmatism are explained by an "active rifting" model, wherein asthenospheric upwelling causes partial melting in the upper mantle and thermal weakening of the lithosphere, which then gravitationally collapses and decompresses mid-crustal magma chambers.

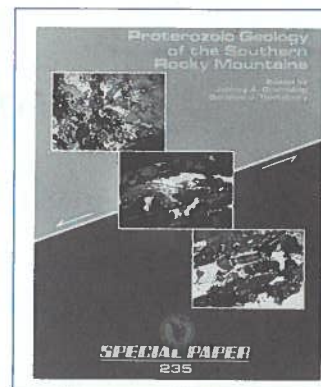
SPE233, 58 p., paperback,
ISBN 0-8137-2233-0, \$16.25



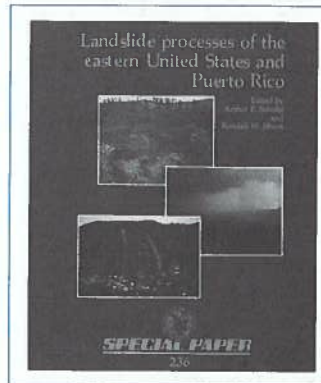
Proterozoic Geology of the Southern Rocky Mountains

edited by Jeffrey A. Grambling and Barbara J. Tewksbury, 1989

This volume considers the ca. 1,500-km-wide Proterozoic orogenic belt that lies south of North America's Archean craton. In Wyoming, Colorado, Utah, New Mexico, and Arizona, the belt exposes metaigneous and metasedimentary rocks that formed between 1800 and 1600 Ma and were intruded by plutons dated at 1500-1300 Ma. The authors provide an overview of the lithology, geochemistry, geochronology, deformation, and petrology of rocks in the belt. Individual papers treat the transition from Archean to Proterozoic rocks in Wyoming; the U-Pb zircon geochronol-



ogy of parts of Wyoming and Colorado; rock types and deformation in the Needle Mountains, Colorado; Middle Proterozoic plutonic rocks of the Needle Mountains, Colorado, and the Sandia Mountains, New Mexico; Proterozoic metamorphism and tectonism in New Mexico; the geology of Cimarron Canyon, New Mexico; geochemistry of the Pecos greenstone belt, New Mexico; and the deformation of Proterozoic rocks in Arizona. SPE235, 176 p., indexed, paperback, ISBN 0-8137-2235-7, \$27.50



Landslide Processes of the Eastern United States and Puerto Rico

edited by A. Schultz and Randall W. Jibson, 1989

Presents the results of recent, detailed field investigations of landslide processes in the eastern United States and Puerto Rico. These studies document the interdependence of topography, climate, and geology and include descriptions of catastrophic slope failures associated with large storms, large prehistoric landslides on dip slopes, and frost-induced rock creep and topple. How bedrock lithology and geologic structure control debris flow distribution and intensity is shown in a variety of geomorphic and climatic settings. Studies of large, ancient landslides in sedimentary rocks are presented, and problems of their recognition, genesis, and distribution are discussed. Quantitative measurements of the effects of cyclic frost wedging on quartzite bedrocks in New England complete the volume. Here is a basis for much continued work on slope evolution and landslide process and the foundation for predictive models of slope failures.

SPE236, 108 p., paperback,
ISBN 0-8137-2236-5, \$18.75

Prepayment Required.
Major Credit Cards Accepted.

GEOLOGY & PUBLIC POLICY QUESTIONNAIRE

1. Identify what you consider to be the geologic issues of *national* and *global* importance during the next ten years.

2. Identify what you consider to be the geologic issues of *regional* importance during the next ten years. Please identify the GSA section to which it pertains.

3. Which national or regional issues should GSA be involved in, as a nonpartisan, nonprofit, professional scientific society? Are there any issues in which GSA should *not* become involved? Please provide your reasons for either situation.

Please fold, staple, and mail your response to GSA by September 15, 1989. The address is on the back of this sheet or you may fax your response to GSA at 303-447-1133. Your response will be compiled and presented at the Committee on Geology & Public Policy booth at the 1989 Annual Meeting, Frontiers in Geoscience, in St. Louis, Missouri.

MEMBER OF THE INTERNATIONAL ASSOCIATION OF GEOLOGICAL SCIENCES

Place
Postage
Here

The Geological Society of America
3300 Penrose Place
P.O. Box 9140
Boulder, CO 80301

SPECIAL PRODUCTS



GSA LAPEL PINS

Wear the GSA seal on your jacket, blouse, or even as a tie-tack! We have two pins to offer. (1) Cloisonne pin is gold plated and dramatically decorated with black,

white, and red enamels. (2) Die-cast brass produces exceptionally fine detail set off beautifully by black lacquer in the indentations. Each pin is 3/4" in diameter and is complete with nail and clutch.

PIN001 Cloisonne pin, \$5.00

PIN002 Brass pin, \$5.00



GSA DESK CLOCK/CALENDAR

A quartz clock/calendar set in an attractive, crystal-like clear plastic desk stand. Set it to display clock only, or to alternate between clock and calendar display. Face plate features GSA seal and the words, "GSA ... Dynamic through time." Stands 2-1/4" high, is 3-1/2" wide, and comes with long-life battery.



CLK001, \$10.00

LEATHER KEY TAG, GSA SEAL

This classic leather key tag, with its beautiful and dramatic GSA seal in die-cast brass, is reminiscent of the fine harness medallions of yesteryear. Leather is dark brown; GSA seal is 1-3/8" diameter, and brass key ring is 1-1/4" diameter.

KEY001, \$7.50



PHOTO/TIME SCALE

This handy field tool combines GSA's popular photo scale and DNAG time scale. On one side is our Author's Photo Scale, calibrated boldly in centimeters (10) and U.S. inches (4). Includes a GSA seal for fine focus and an evaluation scale for granular material from 1 to 5 millimeters diameter. The reverse side includes the complete DNAG Geologic Time Scale, the same size as our wallet-sized version. Sturdy 20-mil x 2-1/2" x 6-1/2" tan vinyl printed in blue.

PTS001, single copy, \$1.50

PTS002, packs of 10, \$6.50



GSA Video Series

PROFESSIONAL VIDEO SERIES: 1

Symposium on Oil and Gas Exploration of the Great Basin

This symposium was presented in Las Vegas, Nevada, at the 1988 meeting of the Cordilleran Section of GSA. It includes eight presentations of about 20 minutes each. Visuals focus on the graphics presented, not on the presenters. VHS tape is edited to remove coffee breaks, etc., and recorded at standard play speed (SP) to permit fast-scanning. Comes with a printed program containing abstracts of each presentation.

PVS001, \$100.00



GSA IRONSTONE MUG

Drink and serve coffee, tea, or milk in style with this popular GSA mug. Hundreds have been awarded as prizes in our membership campaign. Now you can purchase the same fine mug. These 11-ounce English ironstone mugs come in rich cobalt blue with a 2-inch high GSA seal fired in white on one side, and eight smaller GSA seals fired into the blue coating on the other side. Buy one or a sixpack, for your office or home. Packed singly in custom, foam-lined cartons.

MUG001, one only, \$9.50

MUG006, sixpack, \$50.00



GSA SEAL BELT BUCKLE

Wear the famous GSA Seal! This solid brass belt buckle can be worn in the field, office, classroom - wherever! Deeply etched black background, polished brass highlights, 2-3/4" diameter. Fits any belt up to 1-7/8" wide that has a buckle loop.

BUC001, \$9.75

LIGHTED TELESCOPIC POINTER

Ever wished for a pointer when you're showing slides, charts, or photos to a class or office group, or trying to point to something beyond your reach? Here's one you can keep with you wherever you go. About the size and weight of a quality pen, this telescopic pointer fits handily in pocket or purse but extends to more than 24 inches when you want to make your point! Red light on tip turns on automatically whenever you extend pointer. Complete with two No. 364 watch batteries (replacements readily available). Black barrel, chrome shaft, gold trim, white GSA logo.

POI001, \$9.50



VOLUME BINDERS FOR GEOLOGY AND GSA BULLETIN

Each heavy-duty binder holds 12 issues of each journal. Journal title is gold stamped on the spine of the binder, and spines have clear index label pocket. Extra mounting wires hold loose inserts. **Bulletin** binders are tan; **Geology** binders are maroon. BIN002W is a wider version to accommodate larger **Geology** volumes beginning in 1986. Because of different size and stamping the binders are not interchangeable.

BIN001, **Bulletin**, \$10.00

BIN002 & BIN002W, **Geology**, \$10.00



BINDER FOR CENTENNIAL VOLUME GSA BULLETIN

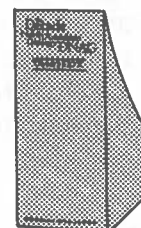
Specially designed to accommodate the larger special Centennial volume, this binder is wider than BIN001 and features the Centennial's blue and silver colors. Spine displays logo, journal title, and a large "1988."

BIN003, \$14.50

DNAG TRANSECT SHELF CASE

Attractive shelf cases specially designed to hold the DNAG Transects and be a handsome addition to the DNAG publication sets. Sturdily made, they are covered with durable royal blue Lexotone and feature gold embossing on both front and back spines. Two cases will hold all 24 transect packets.

TRA-SC, \$11.00 each; \$20.00 per pair



Buy Two
And Save!



ORDER TODAY!

GSA PUBLICATION SALES
P.O. Box 9140, Boulder, CO 80301
(303) 447-2020 or 1/800/GSA-1988

1990 ANNUAL MEETING
October 29–November 1 • Dallas, Texas
CALL FOR SHORT COURSE PROPOSALS

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

Short courses may be conducted in conjunction with all GSA annual or section meetings, but we are particularly interested in identifying short courses to be offered during the 1990 Annual Meeting in Dallas.

Proposals for the Dallas meeting must be received by December 15, 1989. Selection of courses will be made by February 1, 1990, leaving eight months for preparing course manuals and making arrangements.

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

Future GSA Annual Meeting Sites

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

1990 GSA Annual Meeting—Dallas, Texas

*October 29–November 1
 Dallas Convention Center*

General Chairman: David E. Dunn,
University of Texas at Dallas

Field Trips Deadline August 15, 1989

If you would like to lead a trip or have an idea for a trip, please contact one of the chairmen immediately.

By working with a division or associated society, you may be able to focus in depth on a topic by coordinating a technical session or short course and a field trip. Plans must be made early because theme session, symposia, and short course deadlines occur by the end of this year.

Field Trip Chairmen

Robert T. Clarke (Chairman), Mobil Research & Development Corp., DRD—P.O. Box 819047, Dallas, TX 75381, (214) 851-8481

Kent C. Nielsen (Co-Chairman), Program in Geosciences, University of Texas at Dallas, P.O. Box 830688, Richardson, TX 75083-0688, (214) 690-2401 (dept.), (214) 690-2448 (direct)

Theme Session and Symposia Deadline ... January 2, 1990

For 1990 program specifics contact:

Technical Program Chairman

Richard M. Mitterer, Program in Geosciences, University of Texas at Dallas, P.O. Box 830688, Richardson, TX 75083-0688, (214) 690-2401 (dept.), (214) 690-2462 (direct)

For general information on program participation (1990 and future years) contact:

GSA Meetings Manager

Sue Beggs, GSA, P.O. Box 9140, Boulder, CO 80301, (303) 447-2020

NEW FROM GSA ... SPECIAL PAPER 234

Late Cenozoic Paleohydrogeology of the Western San Joaquin Valley, California; Relation to Structural Movements in the Central Coast Ranges

by G.H. Davis and T.B. Coplen, 1989

The origin of uniform quality, fresh ground water in the main confined aquifer of the San Joaquin Valley, California, sandwiched between poor quality ground waters above and below, has long been an enigma. This paper applies isotopic chemistry, conventional chemistry, meteorology, and subsurface stratigraphy to develop a model of mid-Pleistocene paleometeorology of central California consistent with the chemistry of the confined waters and the hydrogeology of the area. The model has profound implications with respect to the isotopic character and amounts of precipitation during the early and mid-Pleistocene over the Sierra Nevada and the Great Basin to the east.

GSA • Publication Sales • P.O. Box 9140 Boulder, CO 80301
 1-800-GSA-1988 • FAX (303) 447-1133 • (303) 447-2020
 Prepayment Required. Major Credit Cards Accepted.

**WHEN YOU
 ADVERTISE IN
 GSA NEWS &
 INFORMATION
 YOUR ADS REACH
 MORE THAN
 25,000
 POTENTIAL
 CLIENTS!
 (303) 447-2020
 1-800-472-1988
 or
 FAX 303-447-1133
 GSA JOURNAL
 ADVERTISING**

First Annual INTERNATIONAL HIGH-LEVEL RADIOACTIVE WASTE MANAGEMENT CONFERENCE

April 8-12, 1990 • Caesar's Palace Hotel • Las Vegas, Nevada USA

CALL FOR PAPERS

(Subject categories listed on reverse side)

Program

The Conference will be an international forum for presentation and discussion of scientific and technical information on management and disposal of high-level radioactive wastes. The program will include technical sessions and substantive plenary sessions which discuss professional discipline applications and issues in natural, engineered, social and integrated systems.

The Conference will stimulate awareness of the relevance of scientific and technical information to achievement of public health and safety objectives. It will also address interaction and integration of HLRW program activities. Papers will be presented in both oral and poster sessions.

Topics

Papers are solicited from all HLRW related activities concerning natural, engineered, and social systems; system integration; and performance requirements and evaluation. Description of the role of the work in meeting HLRW management objectives should be included.

Topics and the respective categories can be found on the reverse side of this page. Authors are to indicate the category and session title in which their paper should be placed.

Important Information

Summaries of all papers will be peer reviewed. *Four copies of extended abstracts (1500 - 2000 words) must be submitted in English by September 1, 1989 to: Scientific Publications Department, American Nuclear Society, 555 N. Kensington Ave., La Grange Park, IL 60525.*

Abstracts, typed double-spaced, should include a cover sheet with the following information:

- name and affiliation of each author
- category and session title
- preference of presentation (oral, poster, or either)
- complete mailing/billing address of designated corresponding author for notification and instructions

Authors of accepted papers will receive notification of acceptance and guidelines for preparation of full papers on camera-ready mats by October 25, 1989.

Authors of accepted papers will be allowed 8 camera-ready mats at no charge. Maximum length of papers are not to exceed 15 camera-ready mats. A page charge of **\$100** will be assessed for all papers exceeding the 8 page limit.

Full papers are due at ANS by January 5, 1990. Proceedings will be available at the Conference.

Contact the Scientific Publications Department, American Nuclear Society, 555 N. Kensington Avenue, La Grange Park, IL 60525 USA, 312/352-6611, (Telex 4972673) for further information.

Conference Host: Howard R. Hughes College of Engineering, University of Nevada, Las Vegas.

Sponsors: American Nuclear Society and the American Society of Civil Engineers.

Co-Sponsors: American Geophysical Union, American Institute of Chemical Engineers, American Medical Association, American Society for Testing and Materials, American Society of Mechanical Engineers, Geological Society of America, Health Physics Society, and Society of Mining Engineers.

Cooperating Organizations: U. S. Department of Energy, U. S. Nuclear Regulatory Commission, Edison Electric Institute, State of Nevada, National Conference of State Legislatures, Center for Nuclear Waste Regulatory Analysis, Institute of Nuclear Materials Management, and the University of Nevada Medical School.

(continued on p. 202)

SUBJECT CATEGORIES

Papers are solicited for the following areas:

1. Natural Systems

- 1.1 Seismotectonics and Volcanology
- 1.2 Physical Geology and Resources
- 1.3 Unsaturated Zone Flow
- 1.4 Saturated Zone Flow
- 1.5 Geochemistry of Waste Package Environment
- 1.6 Transport Processes
- 1.7 Climatology Issues and Assessments
- 1.8 Environmental Issues and Assessments

2. Integrated Systems

- 2.1 Transportation
- 2.2 System Performance
- 2.3 System Modeling

- 2.4 System Data Development
- 2.5 System Technology Development and Assessment
- 2.6 System Storage

3. Engineered Systems

- 3.1 Spent Fuel Handling Equipment
- 3.2 Engineered Barriers and Beyond
- 3.3 Transportation
- 3.4 Waste Package Design and Analysis
- 3.5 Waste Package Material Properties
- 3.6 Surface Facilities
- 3.7 Role of the Monitored Retrievable Storage Facility

4. Social Systems

- 4.1 Socioeconomic Impact Assessment
- 4.2 Socioeconomic Impact Management
- 4.3 Institutional Impacts
- 4.4 Public Involvement
- 4.5 Regulations and Regulatory Process
- 4.6 Health Effects Assessment

Authors are to indicate on the cover sheet of their summary, the session title, and category number in which their paper should be placed.

MEETINGS

(Asterisk indicates new or changed information)

1989

IGCP Project 257, Mafic Dyke Swarms, Annual Meeting, July 1, 1989, Santa Fe, New Mexico. Information: John W. Geissman, Dept. of Geology, University of New Mexico, Albuquerque, NM 87131; (505) 277-2644 or (505) 277-0887 (lab).

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.

SIAM 1989 Annual Meeting, July 17-21, 1989, San Diego, California. Information: SIAM Conference Coordinator, 117 S. 17th St., 14th Floor, Philadelphia, PA 19103-5052; (215) 564-2929.

Society for the Preservation of Natural History Collections 4th Annual Meeting, July 23-28, 1989, Drumheller, Alberta. Information: SPNHC Conference Secretary, Tyrrell Museum of Palaeontology, P.O. Box 7500, Drumheller, Alberta T0J 0Y0, Canada; (403) 823-7707.

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: H  l  ne Paquet, Inst. de G  ologie, 1, rue Blessig, 67084 Strasbourg, France.

Montana Geological Society Centennial Field Conference: Geologic Resources of Montana, August 31-September 3, 1989, Bozeman, Montana. Information: MGS Field Symposium, P.O. Box 844, Billings, MT 59103; (406) 256-3034.

New Frontiers for Hazardous Waste Management Third International Conference, September 10-13, 1989, Pittsburgh, Pennsylvania. Information: NUS Corporation, Park West Two, Pittsburgh, PA 15275.

Crustal Geochemical Cycles Symposium, during American Chemical Society National Meeting, September 10-15, 1989, Miami Beach, Florida. Information: James R. Herring, U.S. Geological Survey, M.S. 939, Box 25046, Federal Center, Denver, CO 80225; (303) 236-5559.

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.

(continued on p. 203)

MEETINGS (continued from p. 202)

23rd International Conference of Safety in Mines Research Institutes, September 11-15, 1989, Washington, D.C. Information: John N. Murphy, U.S. Bureau of Mines, Pittsburgh Research Center, P.O. Box 18070, Pittsburgh, PA 15236; (412) 892-6601.

Focus '89, Nuclear Waste Isolation in the Unsaturated Zone, September 18-21, 1989, Las Vegas, Nevada. Information: D. Burton Slemmons, School of Mines, Center for Neotectonic Studies, University of Nevada, LME 400, Reno, NV 89557-0047.

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

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

7th Annual Denver GeoTech, September 23-26, 1989, Denver, Colorado. Information: Denver GeoTech 1989, c/o C. B. & Associates, 13 S. Van Gordon, #200, Lakewood, CO 80228.

Clay Minerals Society, September 23-28, 1989, Sacramento, California. Information: J. L. Past, Dept. of Civil Engineering, California State University, Sacramento, CA 95819; (916) 278-6081.

SIAM Conference on Mathematical and Computational Issues in Geophysical Fluid and Solid Mechanics, September 25-28, 1989, Houston, Texas. Information: SIAM Conference Coordinator, 117 S. 17th St., 14th Floor, Philadelphia, PA 19103-5052; (215) 564-2929.

3rd Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, October 1-4, 1989, St. Petersburg, Florida. Information: 3rd Multidisciplinary Conference, Florida Sinkhole Research Institute, University of Central Florida, Orlando, FL 32816.

Special Sessions on Future of Marine Mining to Highlight 20th Underwater Mining Institute, October 1-4, 1989, Madison, Wisconsin. Information: Allen H. Miller, UW Sea Grant Advisory Services, 1800 University Ave., Madison, WI 53705; (608) 262-0644.

Association of Engineering Geologists 32nd Annual Meeting, October 1-6, 1989, Vail, Colorado. Information: Michael W. West, Michael W. West & Associates, Inc., 290 Bank Western Bldg., 8906 West Bowles Ave., Littleton, CO 80123; (303) 972-1537.

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.

7th 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.

***Canadian Continental Shelf Seabed Symposium**, October 2-7, 1989, Dartmouth, Nova Scotia, Canada. Information: Dr. C. L. Amos, Atlantic Geoscience Centre, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada B2Y 4A2; (902) 426-7739.

American Institute of Professional Geologists 26th Annual Meeting, October 4-7, 1989, Hyatt Crystal City, Virginia. Information: Stan Johnson, 1016 Holmes Ave., Charlottesville, VA 22901; (804) 293-5121.

18th Geochautauqua: Mineral-Resource Assessment, October 13-14, 1989, Newark, Delaware. Information: J. H. Schuenemeyer, Dept. of Mathematical Sciences, University of Delaware, Newark, DE 19716; (302) 451-1883.

Institute for Tertiary-Quaternary Studies Annual Meeting, October 13-15, 1989, Fort Collins, Colorado. Information: Frank G. Ethridge, Dept. of Earth Resources, Colorado State University, Fort Collins, CO 80523; (303) 491-6195.

New York State Geological Association 61st Annual Meeting and Field Trips, October 13-15, 1989, Middletown, New York. Information: Lawrence E. O'Brien, Orange County Community College, Middletown, NY 10940; (914) 343-6222, ext. 2570.

***Conference of Sedimentary Modeling: Computer Simulation of Depositional Sequences**, October 13-15, 1989, Lawrence, Kansas. Information: Lynn Watney or Evan Franseen, Kansas Geological Survey, 1930 Constant Ave.-Campus West, University of Kansas, Lawrence, KS 66046-2598; (913) 864-3965.

***Conference on Ground Water in the Piedmont of the Eastern United States**, October 16-18, 1989, Charlotte, North Carolina. Information: Richard K. White, General Chairman, Dept. of Agricultural Engineering, 113 McAdams Hall, Clemson University, Clemson, SC 29634-0357; (803) 656-3250.

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.

Late Cambrian-Ordovician Geology of the Southern Mid-continent Symposium, October 18-19, 1989, Norman, Oklahoma. Information: Kenneth S. Johnson, Oklahoma Geological Survey, University of Oklahoma, Norman, OK 73019; (405) 325-3031.

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.

***34th Annual Midwest Ground Water Conference**, October 18-20, 1989, Western Michigan University, Kalamazoo, Michigan. Information: Alan E. Kehew, Dept. of Geology, Western Michigan University, Kalamazoo, MI 49008; (616) 387-5495.

20th Annual Geomorphology Symposium: Geomorphic Evolution of the Appalachians, October 20-22, 1989, Dickinson College, Carlisle, Pennsylvania. Information: W. D. Sevon, Pennsylvania Geological Survey, P.O. Box 2357, Harrisburg, PA 17120; (717) 787-6029.

***6th Annual Meeting and Field Trip, Geological Association of New Jersey**, October 20-22, 1989, Easton, Pennsylvania/Philipsburg, New Jersey. Topic: Lower Paleozoic carbonates of New Jersey and eastern Pennsylvania. Information: Michael J. Hozik, Stockton State College, Pomona, NJ 08240; (609) 652-4277.

1989 Joint International Waste Management Conference, October 22-28, 1989, Kyoto, Japan. Information: Leslie Friedman, ASME Meetings Dept., 345 E. 47th St., New York, NY 10017; (212) 705-7795.

MAPFRE International Meeting on Catastrophes and Society, October 24-26, 1989, Madrid, Spain. Information: Ignacio G. Peso, Paseo de Recoletos, 25. 28004, Madrid, Spain; phone (1) 581 11 00; telex 48902 MAPFRE; fax (1) 419 91 95.

(continued on p. 204)

MEETINGS (continued from p. 203)

Society for Organic Petrology Annual Meeting, October 29-31, 1989, Urbana, Illinois; and **Workshop on Fluorescence Microscopy**, November 1-2, 1989, Carbondale, Illinois. Information: Richard Harvey, Illinois State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820; (217) 244-0836.

Annual Meeting of the Association of Ground Water Scientists and Engineers, October 31-November 1, 1989, Houston, Texas. Information: Susan Crites, National Program, AGWSE/NWWA, 6375 Riverside Dr., Dublin, OH 43017; (614) 761-1711; telex 241302.

Sociedad Española de Paleontología 5th Annual Meeting, November 2-3, 1989, Valencia, Spain. Information: Ana Márquez-Aliaga, Depto. Geología, Facultad de Ciencias Biológicas, 46100 Burjassot, Valencia, Spain.

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

Geological Society of America Annual Meeting, November 6-9, 1989, St. Louis, Missouri. Information: Meetings Department, GSA, P.O. Box 9140, Boulder, CO 80301; (303) 447-2020.

1989 Eastern Oil Shale Symposium, November 15-17, 1989, Lexington, Kentucky. Information: Geaunita H. Caylor, 201 Porter Building, Lexington, KY 40506-0205; (606) 257-2847.

1989 Petroleum Hydrocarbons Conference, co-sponsored by the Association of Ground Water Scientists and Engineers and the American Petroleum Institute, November 15-17, 1989, Houston,

Texas. Information: National Water Well Association, P.O. Box 182039, Dept. #017, Columbus, OH 43218; (614) 761-1171; telex 241302.

American Society of Mechanical Engineers Winter Annual Meeting, December 10-15, 1989, San Francisco, California. Information: ASME Meetings Dept., 345 E. 47th St., New York, NY 10017; (212) 705-7795.

Penrose Conferences 1989

Late Eocene-Oligocene Climatic and Biotic Evolution, July 31-August 6, 1989, Rapid City, South Dakota. Information: Donald R. Prothero, Dept. of Geology, Occidental College, Los Angeles, CA 90041; (213) 259-2823; Philip R. Bjork, Museum of Geology, South Dakota School of Mines, Rapid City, SD 57701; (605) 394-2461.

The Eocene Tectonic Transition: Oregon to Alaska, September 4-10, 1989, Penticton, British Columbia. Information: Ralph A. Haugerud, U.S. Geological Survey, MS 975, 345 Middlefield Rd., Menlo Park, CA 94025; (415) 329-4910.

1990

Workshop on Tertiary Stratigraphy of Highly Extended Terranes, Southern Basin and Range Province, February 9-12, 1990, Zzyzxx Springs, California. Information: Rick Hazlett, Dept. of Geology, Pomona College, 609 N. College Ave., Claremont, CA 91711-6339; (714) 621-8000, ext. 2952.

(continued on p. 205)

"...an excellent resource for introducing the concept of geologic time; an opportunity for a super field trip without the hassle."

Betty Wade Jones, Presidential Award Winning Earth Science Teacher, Clements Jr. High, Prince George, Virginia

THE EARTH HAS A HISTORY

GSA Educational Video/Film Series 1 • 1989

In this study-module, A.R. Palmer demonstrates the simple principles that form the basis for understanding geologic time, literally "walking the viewer through time" in the colorful Flatirons area of the Rocky Mountain Front Range near Boulder, Colorado. Geologic time — or "deep time" — and the changes to the Earth's surface over time are mind-boggling ideas, beyond the human scale of perception and thus difficult for students to comprehend. Yet, understanding these ideas is essential to an education in the sciences, and *should* be part of the curriculum of *all* students.

Educators can now help their students grasp these ideas in one class period with this 20-minute presentation, and give them a powerful and lasting perception of deep time and an introduction to the processes at work in our ever-changing Earth.

Recommended as an opening module for the geology section of earth science courses or for a biology section on the record of life on Earth.

*Best for grades 7 and above.
Available in VHS video or 16mm film.*

EVS001, VHS cassette (1/2"), 20 min., \$25.00
EFS001, 16mm film, 20 min., \$200.00

Educational Institutions: Receive a 15% discount for prepaid orders on your letterhead or purchase order. *Pro forma* invoice sent upon request.

ORDER YOUR COPY TODAY!

GSA Publication Sales, P.O. Box 9140, Boulder, CO 80301
(303) 447-2020 • 1-800-GSA-1988

MEETINGS (continued from p. 204)

First PNG Petroleum Convention, February 12-14, 1990, Port Moresby, Papua New Guinea. Information: Mick McWalter, First PNG Petroleum Convention, c/o PNG Chamber of Mines and Petroleum, P.O. Box 7059, Boroko, Port Moresby, Papua New Guinea; phone 675-25-2836; fax 675-21-7107; telex NE 23482.

***National Water Well Association/Association of Ground Water Scientists and Engineers Cluster of Conferences**, "Agricultural Impacts on Ground Water Quality," "Ground Water Geochemistry," "Ground Water Management and Wellhead Protection," and "Environmental Site Assessments: Case Studies and Strategies," February 20-22, 1990, Kansas City, Missouri. Information: NWWA/AGWSE, P.O. Box 182039, Dept. #017, Columbus, OH 43218; (614) 761-1711.

Society of Mining Engineers Annual Meeting, February 26-March 1, 1990, Salt Lake City, Utah. Information: Meetings Department, Society of Mining Engineers, P.O. Box 625002, Littleton, CO 80162; (303) 973-9550; fax 303-973-3845; telex 881988.

***AAPG Southwest Section Convention**, March 11-13, 1990, Wichita Falls, Texas. Information: Mr. Will Tucker, Technical Program Co-Chairman, 825 MBank Building, Wichita Falls, TX 76301. (Abstracts deadline: July 15, 1989.)

Symposium on Geology and Ore Deposits of the Great Basin, April 1-5, 1990, Reno, Nevada. Information: Geological Society of Nevada, P.O. Box 12021, Reno, NV 89510.

International Conference on Mechanics of Jointed and Faulted Rock, April 18-20, 1990, Vienna University of Technology,

Vienna, Austria. Information: H. P. Rossmanith, Wiedner, Jaupstrasse 8—10/325, A-1040 Wien, Austria; phone 0222-588-01.

Orogenesis in Action: Tectonics and Processes in the West Equatorial Pacific Margin, April 18-20, 1990, London, England. Information: Robert Hall, Department of Geological Sciences, University College, Gower St., London, WC1E 6BT, England.

European Geophysical Society XV General Assembly, April 23-27, 1990, Copenhagen, Denmark. Information: EGS Office, Postfach 49, D-3411 Katlenburg-Lindau, Federal Republic of Germany; phone 49-5556-1140; fax 49-5556-4709; telex 965564 zil d. (Abstracts deadline: January 31, 1990.)

Geological Association of Canada—Mineralogical Association of Canada Joint Annual Meeting, May 16-18, 1990, Vancouver, British Columbia. Information: R. I. Thompson, c/o GAC-MAC '90 Secretariat, 801-750 Jervis St., Vancouver, B.C. V6E 2A9, Canada; (604) 681-5226; fax 604-681-2503; telex 04-352848 VCR.

***USA/USSR Joint Conference on Global Environmental Hydrology and Hydrogeology**, Leningrad, USSR, June 18-21, 1990. Information: Helen Klose, American Institute of Hydrology, 3416 University Ave., S.E., Minneapolis, MN 55414; (612) 379-1030.

4th International Conference on Geoscience Information (GeoInfo IV), June 24-29, 1990, Ottawa, Canada. Information: David Reade, Conference Secretary-Treasurer, GEOSCAN Centre, Geological Survey of Canada, 601 Booth St., Ottawa, Ontario K1A 0E8, Canada; (613) 992-9550; fax 613-996-9990; telex 0533117 EMAR-OTT.

(continued on p. 206)

MEMBERS!

You can help give young people a grasp of geologic time ... by donating a copy of

THE EARTH HAS A HISTORY

... to a local school or college. Although recommended especially for geology and biology courses, this video (or 16mm film) will be a welcome study module for any science class in middle-school or above. In fact the AAAS has identified the concept of geologic time—or "deep time"—as one which should be included in the education of *all* students.

"... an excellent resource for introducing the concept of geologic time; an opportunity for a super field trip without the hassle ..."

Betty Wade Jones, Presidential Award Winning Science Teacher
Clements Jr. High, Prince George, Virginia

The copy you donate may encourage an interest in science in a young person who, in turn, may someday make a significant contribution to the sciences and to society.

GSA Educational Video / Film Series 1, 1989
Prepayment required. Major credit cards accepted.

EVS001, VHS cassette (1/2"), 20 min., \$25.00
EFS001, 16mm film, 20 min., \$200.00

CLIP AND MAIL

THE EARTH HAS A HISTORY

QTY		PRICE EA.	TOTAL
	EVS001 (video)	\$25.00	
	EFS001 (16mm film)	\$200.00	

Member No. for 20% Discount _____ Subtotal _____
 _____ Discount _____
PAYMENT (prepayment required) Colo Res Tax _____
 ___ Check _____ TOTAL _____
 ___ Credit Card _____

CARD NAME / NUMBER _____

EXP. DATE / SIGNATURE _____

SHIP TO

Name _____

Address _____

City _____

State / ZIP _____

Phone _____

EDUCATIONAL INSTITUTIONS: Receive a 15% discount for prepaid orders on your letterhead or purchase order. *Pro forma* invoice sent upon request.

MEETINGS (continued from p.205)

1990 Watershed Management Symposium, July 9-11, 1990, Durango, Colorado. Information: Robert Riggins, USACERL, P.O. Box 4005, Champaign, IL 61824-4005. (Abstracts deadline: August 1, 1989.)

International Association on the Genesis of Ore Deposits 8th Symposium, August 12-18, 1990, Ottawa, Ontario. Information: L. M. Cumming, 8th IAGOD Symposium, Geological Survey of Canada, 601 Booth St., Ottawa, Ontario K1A 0E8, Canada.

International Conference on Water Resources in Mountainous Regions, August 27-September 1, 1990, Lausanne, Switzerland. Information: Aurèle Parriaux, Laboratory of Geology EPFL, 1015 Lausanne, Switzerland; phone 021-47-23-55; telex 454478 EPFV CH.

Geological Association of Canada Nuna Research Conference, Late Proterozoic Rifting, Glaciation and Eustasy, as Illustrated by the Windermere Supergroup, September 8-14, 1990, Windermere and Valemount, British Columbia. Information: J. D. Aitken, Geological Survey of Canada, 3303 33rd St. NW, Calgary, Alberta T2L 2A7, Canada.

3rd International Archaeological Symposium, September 17-21, 1990, Perth, Western Australia. Information: Susan E. Ho, P.O. Box 435, Nedlands, Western Australia 6009, Australia. (Abstracts deadline: December 31, 1989.)

7th International Conference on Geochronology, Cosmochronology and Isotope Geology, September 24-29, 1990, Canberra, Australia. Information: Organizing Committee, ICOG 7, Research School of Earth Sciences, Australian National University, G.P.O. Box 4, Canberra, A.C.T. 2601, Australia; phone 062-49-3406; fax 062-47-4639; telex 62693.

5th Australasian Remote Sensing Conference, October 8-12, 1990, Perth, Western Australia. Information: Golden West Conventions, P.O. Box 411, West Perth, W.A. 6005, Australia; phone 619-4814029; telex AA 95380.

***Conference on Geophysics, Tectonics, Structure and Kinematics of the Arabian Plate and its Margins**, October 20-25, 1990. Information: Waris E.K. Warsi, Dept. of Geology, University of Kuwait, P.O. Box 5969, Safat 13060, Kuwait.

Penrose Conferences 1990

***Correlation of Nonmarine Cretaceous Strata**, May 9-13, 1990, Golden Colorado. Information: Niall J. Mateer, Nonmarine Cretaceous Correlations, 1467 N. 17th, Laramie, WY 82070; (307) 721-4946; or Norman O. Frederiksen, USGS, 970 National Center, Reston, VA 22092; (703) 648-5277.

Large Lake Systems and Their Stratigraphic Record, September 1990, Lake Tahoe area. Information: Andrew S. Cohen, Dept. of Geosciences, University of Arizona, Tucson, AZ 85721; (602) 621-4691 (direct), (602) 621-6024 (dept.).

USE THIS HANDY FORM TO ORDER GSA PUBLICATIONS AND PRODUCTS - SEE CURRENT CATALOG
 PUB. SALES, PO BOX 9140, BOULDER, CO 80301, (303) 447-2020
 TOLL FREE 1-800-GSA-1988 (outside Colorado)

QTY	DESCRIPTION	PRICE EA	TOTAL
		SUBTOTAL	
Member No. for 20% discount		MEM DISCOUNT	
		COLO RES TAX	
		TOTAL	

PAYMENT (circle one)
 CASH CHECK CREDIT CARD

CREDIT CARD NAME & NUMBER _____
 EXP DATE & SIGNATURE _____

SHIP TO:
 NAME _____
 ADDRESS _____
 CITY _____
 STATE/ZIP _____
 TELEPHONE _____

TERMS: Check, money order (in U.S. funds), or most major credit cards accepted for payment. Credit card users provide full name of cardholder, card name, card number, expiration date, and sign on authorization line. Colorado residents add appropriate sales tax. GSA pays surface postage on all prepaid and credit card orders. VISA, MasterCard, American Express, Diners Club, Carte Bleue, Barclay Card, Access, Euro Card, Standard Bank Card.
 PLEASE SEND CURRENT CATALOG

Centennial Edition Publications Catalog

IT'S FREE

THE GEOLOGICAL SOCIETY OF AMERICA

BOOKS ** MAPS ** CHARTS

Geophysics, Hydrogeology, Oceanography, Climatology, Paleontology, Classroom & Research Aids, Planets and Space, Proterozoic Geology, Regional Studies, Sedimentary Geology, Stratigraphy, and more!

REQUEST YOUR COPY FROM
GSA Marketing
P.O. Box 9140, Boulder, CO 80301
(303) 447-2020
1-800-GSA-1988 (outside Colorado)

CLASSIFIED ADVERTISING

Ads (or cancellations) for the September issue must reach the GSA office by July 15. Contact Advertising Department (303) 447-2020.

Per line per issue	1x	3x	6x	12x
Situations Wanted:	\$1.98	\$1.88	\$1.78	\$1.69
Positions Open:	\$4.85	\$4.66	\$4.46	\$4.06
Consultants:	\$5.15	\$4.95	\$4.75	\$4.36
Services & Supplies:	\$4.95	\$4.75	\$4.55	\$4.36

Code number \$2.75 extra.

Agencies and organizations may submit purchase order or payment with copy. Individuals must send prepayment with copy. To determine cost, count 44 characters per line, including all punctuation and blank spaces.

To answer coded ads, use this address: Code #, GSA News, P.O. Box 9140, Boulder, CO 80301.

All coded mail will be forwarded within 24 hours of arrival at GSA News office.

Positions Open

GEOLOGY DEPARTMENT TECHNICIAN MOUNT HOLYOKE COLLEGE

The Department of Geology invites applications for a half-time technician position (9-month salary \$11,169.50) to begin in September, 1989. Candidates should have technical experience in a laboratory of geology or other physical science and have knowledge and skills in setting up, operating and maintaining scientific equipment. Some experience with scanning electron microscopy and thin-sectioning required; knowledge of energy-dispersive spectrometry, x-ray diffraction, and dark room techniques desirable. Applicants should submit a summary of background and relevant work experience, and names and addresses of three persons as references by August 1, 1989 to Mark McMenamin, Department of Geology, Mount Holyoke College, South Hadley, Massachusetts 01075. Mount Holyoke College is an equal opportunity/affirmative action employer.

Consultants

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

Services and Supplies

EARTH SCIENCE FILMS, 2846 Athol St., Regina, SK, CANADA S4S 1Y2. 16mm educational titles. Groundwater—Glacial Geology—Lake Agassiz.

NOTICE!

Economical Advertising And High Visibility

Does your current advertising reach a prime audience of leaders in the earth sciences each month? If you are not advertising in the *GSA News & Information* classified section you are missing a potential market of 25,000 earth scientists.

**NEED A NEW EMPLOYEE?
HAVE SOMETHING TO SELL?
HAVE SERVICES TO OFFER?**

CALL OR WRITE TODAY!

GSA Journal Advertising, P.O. Box 9140, Boulder, CO 80301
1-800-GSA-1988, FAX (303) 447-1133, (303) 447-2020

WHEN YOU
ADVERTISE IN
GSA

NEWS & INFORMATION
YOUR ADS REACH
MORE THAN 25,000
POTENTIAL CLIENTS!

(303) 447-2020

or 1-800-472-1988

GSA JOURNAL ADVERTISING

MOVING?

Don't risk missing a single issue of **GSA News & Information!** If you're planning on changing your address, please give us 8 weeks notice. Simply write in your new address below and mail this coupon — **ALONG WITH YOUR SUBSCRIPTION MAILING LABEL** — to:

The Geological Society of America
Membership Department
P.O. Box 9140
Boulder, Colorado 80301



(please print)

Name

Address

City State Zip

Phone number during business hours ()

If you do not wish to have this number included in the Membership Directory, check here

Please change my voting section to:

**Frontiers in Geoscience . . .
. . . Gateway to the Future**



1989 GSA Annual Meeting

November 6-9, 1989 • St. Louis, Missouri

ABSTRACTS DEADLINE: July 19, 1989

Abstracts must be typed on 1989 abstract forms, available from Abstracts Coordinator, Geological Society of America, P.O. Box 9140, Boulder, CO 80301, or call (303) 447-8850. Abstracts must be mailed to the same address in time to arrive on or before July 19, 1989. NOTE: Abstract forms will not be sent to anyone after July 14, 1989. The absolute deadline for receipt of abstracts is JULY 19. NO ABSTRACTS WILL BE ACCEPTED FOR PROCESSING AFTER THAT DATE.

INSIDE ---

Geology and Public Policy Questionnaire	p. 161, 197
Poster Session Guide	p. 164
Spring 1989 Council Actions	p. 191
Call for Papers for 1990 Section Meetings	p. 195



The Geological Society of America

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

GSA News & Information
ISSN 0164-5854

**SECOND CLASS
Postage Paid
at Boulder, Colorado
and at additional mailing office**