

GSA NEWS & INFORMATION

Monthly Newsletter of
The Geological Society of America

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VOLUME 12, NUMBER 5, May 1990

Committee Service Provides Way to Affect GSA

The GSA Committee on Committees wants your help. As one of her duties, Vice-President Doris M. Curtis has appointed a group to look for talent to serve GSA as members of our committees and as our representatives to other organizations.

The Committee on Committees will meet in late August or early September and will present at least two nominations for each open position to the Council at its October 31 meeting in Dallas, Texas. During that meeting, individual councilors may add other names to the lists for consideration. The entire Council will then select appointees for all positions, thus completing the process of bringing new expertise into Society affairs.

The Committee on Committees for 1990 consists of the following people: Chairman Haydn H. Murray, Department of Geology, Indiana University, 1005 East Tenth Street, Bloomington, IN 47405, (812) 855-5583; Kevin Burke, National Research Council, 2101 Constitution Avenue, N.W., Washington, DC 20418, (202) 334-3065; Richard A. Davis, Jr., Department of Geology, University of South Florida, Tampa, FL 33620, (813) 974-2759; James D. Lowell, 5836 South Colorow Drive, Morrison, CO 80465, (303) 629-1728; Anthony J. Naldrett, Department of Geology, Earth Sciences Center, University of Toronto, Toronto, Ontario M5S 3B1, (416) 978-3030; Leigh H. Royden, Room 54-1014, Massachusetts Institute of Technology, Cambridge, MA 02139, (617) 253-1292.

This group is broadly based, both geographically and in disciplines, but its members cannot possibly know all the GSA members who are potential candidates for serving the Society. You can help them by volunteering yourself or by suggesting names of others you think should be considered for any of the openings and submitting your nomination on the form on page 123.

In making recommendations, please give serious consideration to the special qualifications of the individual for a particular committee. To assist you in nominating GSA members for these various positions, see the following brief summaries of what each committee does and what qualifications are desirable. Please be sure that your candidates are Members or Fellows of the Society and that they meet fully the requested qualifications.

All nominations received at headquarters on the official one-page form will be forwarded to the committee members. **DEADLINE: JULY 15, 1990.** Information requested on this form will assist the Committee on Committees with their recommendations for the 1991 committee vacancies. Council has determined that "unless the nomination form is complete in every respect, the nomination will not be considered. Complete backup material must be supplied by the volunteer or the nominator." Please use one form

per candidate. (Additional forms may be copied or requested from GSA headquarters.)

Listed below are the committees and the number of vacancies that will occur. Appointments will be made by the GSA Council at its meeting in Dallas in October.

COMMITTEES AND QUALIFICATIONS

Day Medal (2 vacancies)

Selects candidates for the Arthur L. Day Medal.

Committee members should have knowledge of those who have made "distinct contributions to geologic knowledge through the application of physics and chemistry to the solution of geologic problems."

Education (2 vacancies)

Stimulates interest in the importance and acquisition of basic knowledge in the earth sciences at all levels of education.

Committee members work with other interested scientific organizations and science teachers' groups to develop precollege earth-science education objectives and initiatives. The committee also promotes the importance of earth science education to the general public.

Geology & Public Policy (3 vacancies)

Translates knowledge of the earth sciences into forms most useful for public discussion and decision making.

Committee members should have an awareness of public policy and decisions involving the science of geology. They should also be able to develop, disseminate, and translate information from the geologic sciences into useful forms for the general public and for the Society membership; they should be familiar with appropriate techniques for the dissemination of information.

Honorary Fellows (2 vacancies)

Selects candidates for Honorary Fellows, usually non-North Americans.

Committee members should have knowledge of geologists throughout the world who have distinguished themselves through their contributions to the science.

Membership (2 vacancies)

Screens Member and Fellow applications; evaluates membership benefits and makes recommendations to the Council about them.

Committee members must be GSA Fellows and must be able to attend one meeting a year. Previous experience in recruitment

(continued on p. 122)

Committee Service (continued from p. 121)
programs and in the evaluation of professional qualifications is desired.

Nominations (5 vacancies; one position for a member from Canada or Mexico)

Recommends to the Council nominees for the positions of GSA officers and councilors.

Committee members should be familiar with a broad range of well-known and highly respected geological scientists.

Penrose Conferences (1 vacancy)

Accepts or rejects Penrose Conference proposals; recommends and implements guidelines for the success of the conferences.

Committee members must either be past conveners or have attended two or more Penrose Conferences.

Penrose Medal (2 vacancies)

Selects candidates for the Penrose Medal.

Committee members should be familiar with outstanding achievements in the geological community that are worthy of consideration for the honor. Emphasis is placed on "eminent research in pure geology which marks a major advance in the science of geology."

Research Grants (2 vacancies)

Evaluates research grant applications and selects grant recipients.

Committee members must be able to attend the Spring meeting and should have experience in directing research projects and in evaluating research grant applications.

Treatise on Invertebrate Paleontology (1 vacancy)

Advises the *Treatise* editor in all phases of *Treatise* policy including planning of new volumes as well as revisions; also gives

advice on special editorial matters such as acceptance or rejection of contributed manuscripts. Committee members should be familiar with and have a broad understanding of paleontology.

Young Scientist Award (Donath Medal) (2 vacancies)

Selects candidates for the Donath Medal.

Committee to have members covering a broad range of disciplines, i.e., geophysics, economic geology, stratigraphy, etc.

Committee members should have knowledge of young scientists with "outstanding achievement(s) in contributing to geologic knowledge through original research which marks a major advance in the earth sciences."

Joint Technical Program Committee GSA Representatives-at-Large (2 vacancies)

Supervises the review of abstracts for papers to be presented at the GSA annual meeting. Representatives-at-large should have expertise in marine geology or petroleum geology. Subdisciplines not represented by any of the associated societies or GSA divisions are covered by the GSA representatives-at-large.

GSA Representative to the North American Commission on Stratigraphic Nomenclature (1 vacancy)

Must be familiar with and have expertise in stratigraphic nomenclature.

Nomination form on page 123.

Nominations Sought for AWGF Outstanding Educator Award

The Association for Women Geoscientists Foundation wants nominations for its second Outstanding Educator Award. The award honors college and university teachers who have demonstrated support for women students both inside and outside the classroom.

Nominees must teach at institutions that grant undergraduate or advanced degrees in the geological sciences. Support for women students has many different possibilities, including sustaining them while they finish their academic work, nominating them for scholarships and awards, recommending them for employment, encouraging them to explore career options, and helping them attend professional meetings with introductions to professional colleagues.

The deadline for nominations is *June 18, 1990*. Send letters of recommendation and supporting evidence to Judith B. Moody, 3099 Griggsvue Court, Columbus, OH 43221. For more information call Moody at (614) 487-1101 or Laura L. Langer at (412) 553-6585.

The award will be given at the GSA Annual Meeting, on October 30, 1990, in Dallas, Texas.

History Group Dedicates Journal Issue to Albritton

The History of the Earth Sciences Society has published a special issue, on geologic time, of its journal *Earth Sciences History* in memory of Claude C. Albritton, Jr.

Albritton, a Fellow of GSA and winner of the GSA History of Geology Award in 1983 and, with Glen L. Evans, of the 1988 Archaeological Geology Division Award, died in 1988.

All of the articles in *Earth Sciences History* volume 8, no. 2 are about various aspects of geologic time. It can be purchased from the Institute for the Study of Earth and Man, Southern Methodist University, Dallas, TX 75275, for \$25. For more information about the society, write to K. B. Bork, History of Earth Sciences Society, Dept. of Geology and Geography, Denison University, Granville, OH 43023.

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NOMINATION FOR GSA COMMITTEES FOR 1991

(One form per candidate,
please. Additional forms
may be copied.)

(Please Print)

Name of candidate _____
Address _____

Phone () _____

COMMITTEE(S) BEING VOLUNTEERED or NOMINATED FOR (please check):

Committee(s):

Comment on special qualifications:

GSA Fellow Section affiliation:
 GSA Member Division affiliation(s):

Candidate's year of birth:

Brief summary of education:

Brief summary of work experience (include scientific discipline, principal employer—e.g., mining industry, academic, USGS, etc.):

If you are VOLUNTEERING to serve GSA, please give the
name of 2 referees/references (please print):

Name: _____

Phone: () _____

Name: _____

Phone: () _____

If you are NOMINATING SOMEONE other than yourself to serve GSA,
please give your name, address, and phone number (please print):

Name: _____

Address: _____

Phone: () _____

DEADLINE: Please return this form to headquarters by July 15, 1990. To be considered, form must be complete in every respect.

The Eocene Tectonic Transition, Oregon to Alaska

Conveners

R. R. Parrish, *Geological Survey of Canada, Ottawa, Ontario K1A 0E8, Canada*

R. A. Haugerud, *U. S. Geological Survey, Menlo Park, California 94025*

R. A. Price, *Queen's University, Kingston, Ontario K7L 3N6, Canada*

A Penrose conference, The Eocene Tectonic Transition, Oregon to Alaska, was held September 4-10, 1989, in southern British Columbia on the shores of Okanagan Lake, directly on the trace of the Okanagan detachment fault. Our focus was the transition from Late Cretaceous to Paleocene contractional deformation, best exemplified by the Rocky Mountains between lat 47° and 54° N, to the tectonic regime characterized by the Cascade magmatic arc and strike-slip faulting north of 53°N during the past 40 m.y., and the intervening episode of lithospheric extension, dextral strike-slip faulting, and widespread continental magmatism of the Challis event.

The group assembled in Vancouver, British Columbia, and traveled to Penticton, the site of the meeting. Led mainly by R. L. Armstrong, we examined Eocene geology along the way, stopping to observe the distribution of Eocene sedimentary rocks in the Georgia-Whatcom Basin, Eocene conglomerate and deformed metaplutonic rocks within the Fraser River-Straight Creek fault zone, and sedimentary and volcanic rocks of the middle Eocene Princeton and White Lake basins.

D. Engebretson and J. Stock began three days of discussion with lucid reviews of the interaction of oceanic plates with North America; included in this discussion was an evaluation of the uncertainties in the positions, existence, and motions of the plates. We all became aware that although plate-motion changes could have caused the major changes in continental tectonics at the Eocene transition, unresolvable uncertainties in the location of the Kula-Farallon-North America triple junction and differences in opinion as to the age of extinction of the Kula-Farallon spreading center limit our ability to demonstrate a causal relation. Attention must therefore shift to whether plate geometries can be inferred from events on the continent.

F. Cook summarized the geophysical characteristics of the region, outlining gravity and magnetic anomalies, crustal thickness from seismic refraction data, heat flow, electrical conductivity, and seismic reflection characteristics, particularly along recently acquired COCORP and Lithoprobe surveys that cross the Cordillera from subduction zone to Rocky Mountains. We discussed the enigma of a more or less flat Moho under the zone of Eocene stretching in which there is a structural relief of tens of kilometres at the surface. Such a Moho is typical of extended terrains and thus is commonly inferred to be the result of extension, but here (as elsewhere) the age of the Moho cannot be demonstrated; available heat-flow and electrical conductivity data suggest anomalous lower crust and/or upper mantle that is younger than the Eocene.

R. Wells and M. Brandon addressed the geology and tectonic setting of voluminous lower and middle Eocene basalt in the Washington and Oregon Coast Ranges. Although this block was definitely in place against North America by 42 Ma, its original tectonic setting is unresolved. Most published discussions of the

Coast Ranges suggest that these basaltic piles were erupted on an oceanic plate and then accreted to the continental margin. However, because of the composition of interbedded sedimentary rocks, the chemical character of the basalts, and field relations which suggest that the province was always tied to North America at its southern and northern ends, workers in the Coast Ranges have converged on an Andaman Sea model for generation of the basalts, in which they were erupted within an intra-arc basin spreading obliquely to the continental margin. Tectonic rotations of the basalt postdate any possible accretion, because overlying North American strata are also rotated. One prediction of the marginal-basin model is that part of the continental margin once outboard of the Coast Ranges must have been translated along the margin to the north.

R. Price presented an overview of the Eocene tectonic elements of the inboard part of the Cordillera. Late Cretaceous to Paleocene Rocky Mountain thrusting terminated by early Eocene time. Extension and significant strike-slip faulting within the orogen stopped by the late Eocene. These two events define the Eocene tectonic transition. Late Cretaceous to Paleocene thrusting between about lat 47° and 54°N is driven by transpression associated with an east step at the southern end of the Tintina-Northern Rocky Mountain Trench strike-slip fault system, whereas Eocene extension in the southern Omineca belt may be tectonically linked to a west step to the Fraser River-Straight Creek fault, and thus be transtensive.

J. Monger followed with a review of Eocene strike-slip faulting, introducing more detailed presentations by others. There was much discussion (continuing on into an informal evening session) on the age of Fraser River-Straight Creek faulting. Apparent offset of the Skagit and Bridge River thermal culminations and correlation of the Ross Lake and Marshall Creek faults suggest to several workers that strike slip on the Fraser River-Straight Creek fault did not begin until ~42 Ma (late middle Eocene), significantly later than the onset of extension to the east. Early to early middle Eocene development of the Chuckanut and Swauk strike-slip basins, early middle Eocene folding associated with the southern end of the Straight Creek fault, and apparent continuity of upper middle Eocene strata across the Straight Creek fault indicate to other workers that Fraser River-Straight Creek motion occurred earlier than 42 Ma. (A soccer match to resolve this dispute damaged a few protagonists physically but did not alter anyone's convictions.)

R. Parrish began discussion of Eocene extension north of the Snake River Plain with a summary of timing of extension throughout the northern Cordillera and a comparison with probable ages of strike-slip faults. Subsequent speakers outlined the geochronological evidence for a transition from contraction to extension within the southern Omineca belt at 59-60 Ma, the history implied by the Eocene strata within the Republic graben, and evidence for Challis-age extension south of the Lewis and Clark fault system, but north of the Snake River Plain. Discussion touched on the possibility that the Eocene Lewis and Clark fault was a transform linking extension in Idaho and Montana with extension farther northwest in the southern Omineca belt.

W. H. Mathews and G. Rouse summarized what is known or can be inferred regarding the paleogeomorphology and paleobotany during the Eocene, with discussion of the evidence (or lack thereof) for Eocene mountain ranges and climatic barriers.

A field trip on day 4 took us out into the sunshine, pine woods, vineyards, and orchards of the Okanagan Valley. The Okanagan Valley fault is a low-angle normal fault with several tens of kilometres of Eocene displacement. Ductile structures in the footwall, which involve sills dated at 51 Ma, indicate top-to-the-west displacement. Middle Eocene strata of the White Lake basin, within the hanging wall of the Okanagan fault, record volcanism and sedimentation in this active tectonic setting. The geology of the region is similar to metamorphic core complexes and their upper plates elsewhere in the Pacific Northwest and in the Great Basin.

R. L. Armstrong resumed formal discussions by summarizing the voluminous, relatively short-lived, middle Eocene Challis magmatic episode. He noted that extension occurs in only part of the region of magmatism, supporting the view that extension is not the cause of the magmatic event, and also noted that large-scale extension occurs only in areas of Challis magmatism, supporting the view that magmatism is part of the cause of extension. Since Challis rocks show chemical patterns comparable to subduction-zone arcs elsewhere, and given the lack of other plausible mechanisms for generating such large amounts of magma, he argued that the Challis igneous rocks represent a subduction-zone magmatic arc, and the increase in magma production reflected the inferred speed-up of the Kula plate relative to North America during the middle Eocene. T. Irving described Eocene alkalic rocks from central Montana which he attributed to interaction of a slab-derived component with old subcontinental lithosphere. M. Norman compared Eocene Challis volcanic rocks from southwestern Idaho with Oligocene, presumable arc-related, lavas farther west and argued that the Challis rocks were not related to subduction. W. Leeman concluded the Challis session with a summary and stressed the view that the Challis magmatic event was clearly linked

to the Eocene transition, prior to the initiation of the modern Cascade arc.

P. Molnar outlined how gravitational stress caused by topography, when combined with external horizontal stresses, causes lateral variation in the intracrustal tectonic regime. Rapid uplift of a continental plateau, as would occur if the subcontinental lithosphere became detached, could lead to extension of the plateau even within an overall convergent setting. His review was illustrated with examples from Tibet and the Andes. Other speakers discussed the possible role of delamination of thickened lithosphere in the Omineca belt; a model for weakening of the lithosphere as a function of Moho temperature; and the geometry of subducted slab windows in an oblique subduction setting.

The conference ended in a full circle with reflections by D. Engebretson and J. Stock on the elusive goal of establishing a connection between continental tectonic transitions and changes in relative plate motions. The fact that critical data are permissive (although not compelling) evidence for such a casual relation left most of us with a modest degree of optimism. R. Parrish concluded with a summary of the main features of the Eocene tectonic transition: nested dextral strike-slip faulting, widespread Challis magmatism in a continental-arc setting, lithospheric extension in part congruent with strike-slip faults, and final accretion of the Coast Range basalts.

Casual connections of these features to each other and to possible configurations of oceanic plates remain fruitful avenues of research. Among topics clearly meriting further work are eruptive setting of the Coast Range basalts and the nature of their eastern contact; timing of Fraser River-Straight Creek strike-slip faulting; and the geochemistry of Challis magmas and indications for their source(s).

Participants

R. L. Armstrong	D. Engebretson	W. P. Leeman	W. Phillips	L. C. Struik
D. Archibald	T. E. Ewing	R. Lewis	H. Plint	C. A. Suczek
J. Armentrout	R. Friedman	N. Massey	C. J. Potter	R. W. Tavor
R. S. Babcock	D. R. Gaylord	W. H. Mathews	R. A. Price	R. Thompson
E. H. Bennet	R. J. Goldfarb	B. McClelland	E. Prussen	D. Thorkelson
B. R. Berger	T. A. Harms	R. McWilliams	G. Ross	P. Umhoefer
M. Brandon	R. A. Haugerud	R. B. Miller	G. Rouse	J. A. Vance
R. L. Brown	T. Heah	P. Molnar	J. Sears	J. L. Varsek
A. Calderwood	P. Hooper	J.W.H. Monger	J. Sevigny	R. E. Wells
S. D. Carr	A. J. Irving	M. Norman	D. Silverberg	B. Wernicke
B. N. Church	S. Janecke	A. V. Okulitch	V. B. Sisson	
M. Coleman	S. Y. Johnson	D. Parkinson	J. Stock	
F. A. Cook	J. M. Journeay	R. Parrish		

GSA in Education

by Allison R. (Pete) Palmer

Most new education plans are on hold awaiting the reaction of the Long Range Planning Committee to the detailed 5-year plan for GSA education activities. The plan was prepared for the committee's review at the request of the GSA Council at the November Council meeting in St. Louis. In the meantime, the Section education committees have started to discuss establishing pilot partnerships in a few selected schools across the country in order to provide some experience so that we can focus GSA efforts effectively on this issue in the future.

Several of the teachers who received the GSA Award for Excellence in Earth Science Teaching have received approval from their schools to attend some of the GSA Section meetings this spring. One teacher reports that our letters notifying his school and district supervisors of the award resulted in more attention and action than the President's Award that he received. The prestige of GSA can make a real difference in the reform of pre-college education in the geological sciences!



DNAG NEWS

by Allison R. (Pete) Palmer

DNAG Progress

As of March 9, paging for the Archaeological Geology volume was completed and the pages checked against the changes made on the galley proofs. As soon as the typesetter makes the minor corrections that we found, we will have the camera-ready pages and this will be off to the printer. The preliminary paging has also been completed for both the Arctic Ocean and Surface Water volumes, and the typesetter is now preparing the camera-ready pages from the galleys. These two volumes will be right behind the Archaeological Geology volume. The color separation negatives for Transect H-3, from the Acapulco Trench to the Gulf of Mexico, are finished, and this will go to the printer within the next week or so.

Regarding other action updating the status reported in March, the final revision of the Flores and Cross chapter has been received for the Economic Geology volume and just needs editor approval to move into copy editing; two

chapters in the Quaternary non-glacial volume, one by John Dohrenwend and others and one by Roger Morrison, are in final review; Brian Wernicke has turned in his chapter for the Cordilleran volume, and thus all chapters for this volume except the introduction have now been written; the Case/Shagam chapter for the Caribbean volume has been received and reviewed. As soon as Jim Case completes the minor revisions, the Caribbean volume will be wrapped up.

More Kudos

Now that the DNAG volume on the Arctic Ocean region is fully in hand, the patient authors for that volume should be acknowledged. This volume looks good. Editors Art Grantz, Jack Sweeney, and Leonard Johnson did a good job of quality control, and it should be an outstanding book. This is another volume with considerable international participation. Six countries are represented among the 63 authors. These authors, listed below, bring to 1486 the number of authors in the DNAG volumes completed so far.

S. M. Blasco
J. Brigham-Grette
E. M. Brouwers
L. D. Carter
D. L. Clark
R. L. Coles
D. B. Cook
P. R. Dawes
J. R. Dietrich
D. A. Dinter
J. Dixon
O. Eldholm
D. Engebretson

R. Forsberg
D. A. Forsyth
G. Fortin
L. Frei
K. Fujita
A. Grantz
N. Haimila
P. B. Hale
S. Halgedahl
J. K. Hall
P. E. Hart
W. Harbert
H. Hasegawa

D. B. Hearty
Y. Herman
P. R. Hill
D. M. Hopkins
H. R. Jackson
R. Jarrad
G. L. Johnson
A. M. Karasik
C. E. Kirschner
Y. Kristofferson
K. Kvenvolden
A. H. Lachenbruch
M. G. Langseth

H. C. Larsen
L. A. Lawver
L. Marincovich, Jr.
V. Marshall
S. D. May
M. C. McKenna
A. M. Myhre
W. W. Nassichuck
M. J. O'Connor
A. Overton
R. M. Procter
P. A. Reksnes
E. F. Roots

C. R. Scotese
L. W. Sobczak
J. Skogseid
E. Sundvor
J. F. Sweeney
P. T. Taylor
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GNA-F2, 781 p., 12 plates in slipcase, ISBN 0-8137-5209-4, \$75.00

GEOLOGY OF NORTH AMERICA—AN OVERVIEW

edited by A.W. Bally and A.R. Palmer, 1989
GNA-A, 629 p., 12 plates in slipcase, 2 microfiche cards, ISBN 0-8137-5207-8, \$60.00

QUATERNARY GEOLOGY OF CANADA AND GREENLAND

edited by R. J. Fulton, 1989
GNC-K1, 848 p., 5 plates in slipcase, indexed, ISBN 0-660-13114-5, \$82.50

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edited by N.P. Lasca and J. Donahue, 1990

GSA Bulletin and Geology Contents

May 1990

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The Geological Society of America

BULLETIN

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FOUNDATION NEWS

by Robert L. Fuchs

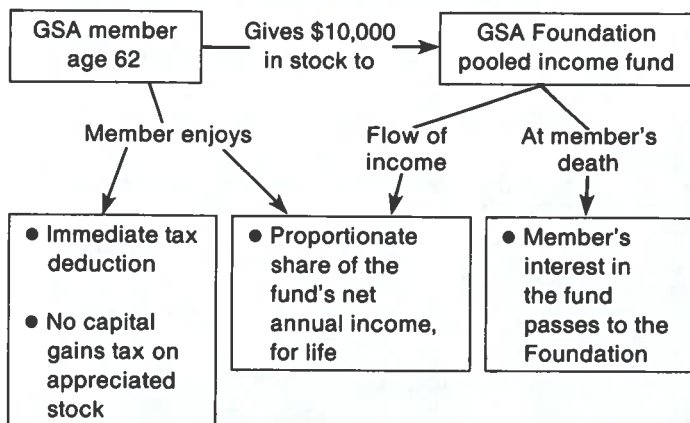


The GSA Pooled Income Fund—The Long and Short of It

A great number of GSA members contribute to the Foundation each year, the amounts of these contributions later becoming deductions on members' annual income tax returns. The tax benefits of direct charitable contributions are well known to all who must suffer through financial agony every April 15. Perhaps less well known is a giving technique involving contributions to a pooled income fund; these contributions give the donor an immediate tax benefit plus a long-term income stream that continues for life.

The pooled income fund is essentially a GSA mutual fund in which contributors own individual shares. The Foundation serves as Trustee of the fund, GSA through its Investment Committee oversees the financial policy of the fund, and the Society's money managers and custodians handle day to day management and investment of the money.

How the Foundation's Pooled Income Fund Works



A principal feature of the pooled income fund is the commingling of gifts from a number of members, in order to minimize investment risk and maximize investment opportunities.

Another important attribute of the fund is the annual income

stream earned by the investments. Net income (after fund expenses are paid) is paid to the contributors in proportion to their respective interests in the fund. This net income will vary each year, because it depends on the earnings of the fund's investments. A contributor may designate someone other than himself or herself as income beneficiary.

Upon the death of the participating member, the remainder interest, that portion of the assets of the fund attributed to that member, pass to the Foundation. Up until then the Foundation does not have title to the member's gift, even though it may have been made many years before.

In spite of this delayed transfer of title, the tax benefit accrues to the donor in the year that the gift is made. The actual amount of the tax deduction generated by the gift is based upon the present share of the remainder interest that will pass to the Foundation at death. This present value is calculated from the fund's historical return. The income beneficiary's age and life expectancy must also be entered into the calculation. As one might expect, IRS regulations provide tables to calculate the present value.

The tax benefit of a gift to the pooled income fund will be less than a direct contribution of cash or securities, but this is compensated for by the lifetime income stream.

The pooled income fund is an excellent way to take present advantage of a tax deduction for a future charitable gift. In the last years prior to retirement, a GSA member may attain peak income levels, with consequent high taxation. The tax benefits are needed in those years, but the asset base is also needed to provide postretirement income. The pooled income fund allows the member to accomplish exactly this timed arrangement of personal finances to meet these needs, resolving the dilemma. An added attraction of the pooled income fund is its appropriateness for gifts in the \$5000-\$50,000 range, a level generally considered too small to create individual remainder trusts.

Should you wish further information about the Foundation's pooled income fund or to discuss its application to your personal financial plans, please call the Foundation office at (303) 447-2020, or mail the accompanying coupon.

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

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Supporting The Advancement of Research

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Donors to the Foundation, February 1990

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CALL FOR APPLICATIONS & NOMINATIONS

FOR GEOLOGY CO-EDITOR

GSA solicits applications and nominations for the position of co-editor of **Geology**, to serve with current Editor H. T. Mullins for a three-year term, beginning in December 1990, as one of a two-editor team. Desirable characteristics for the successful candidate include:

1. Broad interest and experience in geology
2. Iconoclastic
3. International stature
4. Willing to take risks and try innovations
5. Sense of humor
6. Sense of perspective
7. Organized and productive
8. Willing to work closely with GSA headquarters staff.

This is not a salaried position, but GSA pays the expenses for secretarial assistance, mail, telephone, and travel to GSA headquarters.

If you wish to be considered, please submit a resume and a brief letter describing why you should be chosen. If you wish to nominate another, submit a letter of nomination and the individual's written permission and resume. Send nominations and applications to F. Michael Wahl, Executive Director, Geological Society of America, P.O. Box 9140, Boulder, CO 80301, by **July 1, 1990**.

THE GEOLOGICAL SOCIETY OF AMERICA

GSA Annual Meetings

1990

GSA Annual Meeting • Dallas, Texas
October 29–November 1, 1990

Call for papers *Abstracts due* *Program, housing, and registration information*
 April 1 July 11 August 10

Joint Technical Program Committee *Preregistration due*
 August 10–11 September 28

For information: GSA Meetings Department, P. O. Box 9140, Boulder, CO 80301, (303) 447-2020



1991

GSA Annual Meeting • San Diego, California
October 21–24, 1991

Call for field trip proposals

The deadline for submitting a field trip proposal is *June 15, 1990*.

Selection of trips will be made shortly thereafter, leaving 16 months for preparing guidebooks and making arrangements. To submit your proposal or for further information, contact the 1991

Field Trip Chairman:

Michael J. Walawender
 Dept. of Geological Sciences
 San Diego State University
 San Diego, CA 92182
 (619) 594-5586

Call for short course proposals

GSA members and nonmembers are encouraged to submit short course proposals to be reviewed by GSA's Short Course Committee. All proposals are due by *December 1, 1990*. For short course proposal guidelines contact:

Edna Collis
 Short Course Coordinator
 GSA, P.O. Box 9140
 Boulder, CO 80301
 (303) 447-2020

FUTURE

Dallas	October 29–November 1	.....	1990
San Diego	October 21–24	.....	1991
Cincinnati	October 26–29	.....	1992
Boston	October 25–28	.....	1993
Seattle	October 24–27	.....	1994

GSA Section Meetings

1990	<u>Section, Location, Dates</u>	<u>Contact</u>
	Rocky Mountain, Jackson, Wyoming, May 21–23	Ronald W. Marrs, University of Wyoming, Dept. of Geology & Geophysics, P. O. Box 3006 Univ. Station, Laramie, WY 82071, (307) 766-3386
1991	<u>Section, Location, Dates</u>	<u>Contact</u>
	Cordilleran, Cathedral Hill Hotel, San Francisco, California, March 25–27	Raymond Sullivan, Dept. of Geosciences, San Francisco State University, San Francisco, CA 94132, (415) 338-2061
	North-Central, University of Toledo, Toledo, Ohio, April 18–19	Lon Ruedisili or Mark Camp, Dept. of Geology, University of Toledo, Toledo, OH 43606, (419) 537-2009
	Northeastern-Southeastern, Omni International Hotel, Baltimore, Maryland, March 14–16	Emery Cleaves, Maryland Geological Survey, 2300 St. Paul Street, Baltimore, MD 21218, (301) 554-5504 Juergen Reinhardt, U.S. Geological Survey, 926 National Center, Reston, VA 22092, (703) 648-6789
	Rocky Mountain–South-Central, Santa Fe or Albuquerque, New Mexico, April 22–24	G. Randy Keller, Dept. of Geological Sciences, University of Texas at El Paso, El Paso, TX 79968-0555, (915) 747-5501 John Geissman or Wolfgang Elston, Dept. of Geology, University of New Mexico, Albuquerque, NM 87131, (505) 277-4204
1992		
	Cordilleran	Eugene, Oregon
	North-Central	Iowa City, Iowa
	Northeastern	Bethlehem, Pennsylvania
	Rocky Mountain	Ogden, Utah
	South-Central	Houston, Texas
	Southeastern	Winston-Salem, North Carolina

1990 Annual Meeting Short Courses

GSA Short Courses

All courses sponsored by GSA will be held immediately before the GSA Annual Meeting. Increase the benefits of attending the GSA meeting by participating in one of GSA's professional instruction programs. The courses are designed for several different professional levels. We hope you will find one that meets your needs.

Enrollment. Course participation is open to GSA members and nonmembers. Registration for the 1990 Annual Meeting is not required. Registration forms for the short courses and the annual meeting will appear in the August issue of *GSA News & Information*. **HOWEVER, IF YOU WOULD LIKE TO REGISTER NOW, CONTACT THE COURSE REGISTRAR AND RECEIVE A REGISTRATION FORM AND THE GSA SHORT COURSE BROCHURE.** Save significantly by registering in advance. On-site registration will be \$25 additional and based on availability. **PREREGISTRATION DEADLINE IS September 28, 1990.**

New for 1990: A GSA Certificate of Completion will be given to each registrant.

Cancellation. Fees will be refunded if we are notified in writing by October 5. Registration substitutions may be made at any time. For more information, contact Edna Collis, Course Registrar, GSA Headquarters, (303) 447-2020 or 1-(800) 472-1988.

Site Selection for Critical Facilities—The Earth Science Perspective. Saturday, October 27, 10 a.m. to 5 p.m. Sheraton Dallas Hotel. Cosponsor: Engineering Geology Division. (Note: A related GSA field trip, "Geology, Hydrogeology, and Engineering Aspects of the Superconducting Super Collider Site, Ellis County, Texas" is being offered on Sunday, October 28.)

ATTENTION, STUDENTS: The Engineering Geology Division will **SUBSIDIZE THE FIRST FIVE STUDENTS WHO ARE VALID DIVISION MEMBERS.** Students **MUST PAY THE FULL COURSE FEE** when registering, but will be reimbursed \$50 after the GSA meeting by the Engineering Geology Division.

This course is recommended for those teaching environmental and engineering geology or for the earth scientist in industry. Geologically dependent factors dominate selection criteria for the siting of many large and critical facilities. The increasing involvement of geologists in site selection demands that faculty understand the principles of this activity. Those in industry will benefit from this course because site selection is ever more important in aspects of the extractive as well as construction industries. Topics covered:

- defining the geographic area of interest
- scope of the project
- creating an ideal geotechnical profile for the project
- selecting candidate sites
- investigations to establish confidence
- integration of geotechnical and other siting factors; ranking
- selling the site.

Faculty: Norman R. Tilford, Center for Engineering Geosciences, Texas A&M University; M.A., Arizona State University. Tilford may be the preeminent U.S. practitioner of the science and art of geological aspects of site selection. He brings 30 years of practical consulting engineering industry experience to his professorship of geology in the Center for Engineering Geosciences at Texas A&M University. He was in charge of site selection,

investigation, and proposal aspects of the Geology and Tunneling part of the successful Texas proposal to host the superconducting supercollider.

Limit: 50. Fee: \$110; includes course manual and lunch.

Coastal Land Loss. Saturday, October 27, 8 a.m. to 5 p.m., Sunday, October 28, 8 a.m. to 5 p.m. Houston Airport Marriott, Houston, Texas.

This course is not aimed at experts in the field of coastal geology, but rather at professionals who need to deal with the subject in a classroom, in the field, or, possibly, in a courtroom. Consulting geologists and engineers involved in coastal erosion problems will benefit from an organized, systematic presentation of information relating to the causes and solutions of an almost ubiquitous national problem that grows worse each year. The course will include one day of lecture in Houston and one day in the field in Galveston. Topics covered:

- factors affecting land-loss
- sea-level rise
- responses to the land loss problem
- measuring and predicting land loss
- regional land loss perspective.

Faculty: Joseph T. Kelley, Maine Geological Survey, University of Maine; Ph.D., Lehigh University. Kelley is the architect of Maine's progressive coastal beach regulations. He has written two books on coastal zone management and recently won an award as Maine's environmentalist of the year for his work on the Maine coast. He is the coastal geology editor of the *Journal of Coastal Research*, and regularly contributes technical papers to journals on a variety of aspects of Maine's coastal geology. Robert A. Morton, Bureau of Economic Geology, University of Texas at Austin; Ph.D., West Virginia University. A Senior Research Scientist with the Bureau of Economic Geology at the University of Texas at Austin, Morton has conducted research in coastal and marine geology for the past 17 years. His principal areas of research involve shoreline dynamics and the interactions of storms, beaches, and coastal structures. He has previously offered numerous short courses on land loss and coastal field trips for industry, government, and geological societies. Orrin H. Pilkey, Jr., Dept. of Geology, Duke University; Ph.D., Florida State University. Currently the James B. Duke Professor of Geology at Duke University, Pilkey was the 1987 recipient of the Francis Shepard Medal for Excellence in Marine Geology. He is co-editor and in some cases co-author of the 15-volume, state-by-state book series *Living with the Shore*. His recent research involves the study of the impact of seawalls on beaches and the success of beach replenishment. Shea Penland, Chief Coastal Geologist, Louisiana Geological Survey; Ph.D., Louisiana State University. Penland is responsible for supervising a basic and applied research program on the processes and geologic framework of coastal erosion and wetland loss in the U.S. land loss hot spot, the Mississippi River Delta and Chenier Plains in Louisiana. Penland is the author or co-author of more than 50 publications and has received seven science awards on the topics of coastal geomorphology, marine geology, and coastal land loss in the Gulf of Mexico.

Limit: 30. Fee: \$170; includes course manual, ground transportation to Galveston late Saturday afternoon, lunch on Sunday, and ground transportation to Dallas on Sunday evening.

(continued on p. 134)

Contaminant Hydrogeology: Practical Monitoring, Protection, and Cleanup. Saturday, October 27, 8 a.m. to 5 p.m., Sunday, October 28, 8 a.m. to 5 p.m. Sheraton Dallas Hotel. Cosponsor: Hydrogeology Division.

ATTENTION, STUDENTS: The Hydrogeology Division will **SUBSIDIZE THE FIRST STUDENT WHO IS A VALID DIVISION MEMBER.** The student **MUST PAY THE FULL COURSE FEE** when registering, but will be reimbursed \$50 after the GSA meeting by the Hydrogeology Division.

For newcomers and entry-level professionals who are interested in practical contaminant hydrogeology as it is applied daily to soil and ground-water contamination problems. This course heavily emphasizes the working approach to solving hydrogeologic problems of data collection, interpretation, and remediation as required by regulation. Topics covered:

- theoretical and practical elements of geologic and hydrogeologic investigations
- subsurface drilling procedures and sampling
- monitoring well construction
- water sampling techniques
- contaminant transport and fate—general concepts
- data interpretation
- aquifer analysis
- criteria for selecting monitoring and remediation procedures
- site cleanup
- regulations
- client and budgetary considerations.

Case histories explore the application of techniques in LUST, CERCLA, and RCRA projects, hazardous waste landfill siting, leaking underground tanks, and contaminated properties in several states.

Faculty: Christopher M. Palmer, Senior Geologist, GeoStrategies, Inc., Hayward, California; M.A., California State University. A registered geologist in California, Arkansas, and Florida, Palmer has 12 years of engineering geology and hydrogeology consulting experience for soil and ground-water quality, LUST, RCRA, and landfill siting studies, and teaches contaminant hydrogeology at the University of California, Santa Cruz. Palmer is also a California Registered Environmental Assessor. Jeffrey L. Peterson, Senior Hydrogeologist, GeoStrategies, Inc., Hayward, California; M.S., California State University. A registered geologist and a California Registered Environmental Assessor, Peterson has 11 years of consulting experience in soil and ground-water quality, geology, and contaminant hydrogeology dealing with LUST, RCRA, and CERCLA investigations. He has performed RI/FS investigations for the U.S. Navy and Air Force for Installation Restoration programs. Peterson has conducted hazardous-waste investigation methods seminars and workshops at several university campuses in California, in addition to teaching ground-water hydraulics at the University of California, Santa Cruz.

Limit: 40. Fee: \$195; includes course manual and lunch both days.

Creating Geological Applications with Macintosh HyperCard. Saturday, October 27, 8 a.m. to 5 p.m., Sunday, October 28, 8 a.m. to 5 p.m. Sheraton Dallas Hotel. Cosponsor: National Association of Geology Teachers.

For all academic and industry geoscientists including graduate students. Only limited computer experience is required. This hands-on course introduces the capabilities of HyperCard, Apple Computer's innovative and versatile software for the Macintosh,

demonstrates applications, and provides a foundation for its use. Hundreds of HyperCard stacks have appeared since 1987 and are used increasingly by educators, businesses, and researchers. Topics covered:

- organizing and using information in stacks; stack design guidelines
- developing new stacks; creating backgrounds, incorporating graphics, designing fields and working with buttons; creating new cards and modifying existing cards
- introduction to scripting; programming in HyperTalk, basic commands, card scripting, visual effects, manipulating information in fields
- linking HyperCard to other computer programs, databases, spreadsheets, animation software
- using HyperCard to control videodisc and CD-ROM players, incorporating sound
- examples of stacks used in the geosciences for research, teaching, lectures, and presentations
- creating your own stack.

Faculty: H. Robert Burger, Dept. of Geology, Smith College; Ph.D., Indiana University. Burger has used computers in teaching and research for more than 20 years and teaches computer programming and software development seminars and workshops. Involved with HyperCard since its release, Burger has developed several Macintosh software packages for use in physical geology, structural geology, and exploration geophysics. J. Ritchie Boyd, Dept. of Geology and Geophysics, University of Wyoming; M.A., University of California. At present, Boyd coordinates the development of interactive software for both instructional and research purposes. Boyd has been developing software at the University of Wyoming for the past five years and has been instructing faculty and students in HyperCard for the past year.

The Macintosh computers used in this course are provided by Apple Computer, Inc.

Limit: 40. Fee: \$195; includes course manual, disks containing several stacks, tools, and scanned images to use to prepare your own stacks, and lunch both days.

Metamorphic Pressure-Temperature-Time Paths. Saturday, October 27, 8 a.m. to 5 p.m., Sunday, October 28, 8 a.m. to 5 p.m. Sheraton Dallas Hotel. Cosponsor: Mineralogical Society of America.

Aimed at the first-year graduate student, this introductory course is designed to be practical, using hands-on applications. Both petrologists and structural geologists will be introduced to the techniques used in the determination and interpretation of metamorphic pressure (*P*)-temperature (*T*)-time paths. These techniques require relatively sophisticated mathematics and cannot be accomplished without the use of computer programs. The course will make extensive use of computer applications that have been developed by the authors. In addition to the theoretically oriented course notes, each participant will be supplied with software and

(continued on p. 135)

1989 GSA Short Course Notes For Sale

A limited supply of short course notes is available from some of the courses presented at the St. Louis Annual Meeting. For information, please call:

Edna A. Collis
Meetings Department
1-800-472-1988.

Annual Meeting Short Courses (continued from p. 134)

exercises describing its application. More than half of the course will be spent doing these exercises and examining the results of calculations. Topics covered:

- theoretical description of petrologic systems
- geothermometry and geobarometry: theory and application to *P-T* path calculations
- differential thermodynamics (the Gibbs method): Applications to *P-T-X-M* phase equilibria and *P-T* path calculations
- pitfalls in *P-T* path calculations: diffusion, closure temperature, chemical zoning, garnet consumption, plagioclase textures
- heat flow: theory, analytical solutions, and numerical methods
- thermal aspects of contact metamorphism
- thermal models and *P-T* paths of crustal thickening and thinning
- subduction zone metamorphism.

Faculty: Frank S. Spear, Dept. of Geology, Rensselaer Polytechnic Institute; Ph.D., University of California. A professor of geology at Rensselaer, where he has taught since 1985, Spear's primary research interests include metamorphic phase equilibria and the tectonic evolution of crystalline orogenic belts as found in New England, the Alps, and the Cordillera Darwin, southern Chile. Spear is a Fellow of the Mineralogical Society of America, and a member of the American Geophysical Union and the European Union of Geoscientists. Simon M. Peacock, Dept. of Geology, Arizona State University; Ph.D., University of California. Peacock's research interests focus on heat and mass transfer processes operating at convergent plate margins. His work makes extensive use of numerical heat-transfer models in order to predict metamorphic pressure-temperature-time paths and fluid production in subduction zones and regional metamorphic terranes.

The Macintosh computers used in this course are provided by Apple Computer, Inc.

Limit: 60. Fee: \$225; includes course manual, computer disks, and lunch both days.

Phanerozoic Plate Tectonic Reconstructions. Saturday, October 27, 8 a.m. to 5 p.m., Sunday, October 28, 8 a.m. to 5 p.m. University of Texas, Arlington.

Designed for advanced students, professionals, and anyone interested in Earth's history, this course will review the plate tectonic development of the ocean basins and continents during the past 600 million years. Fifty global plate tectonic reconstructions, based on recent compilations of seafloor linear magnetic anomalies, paleomagnetic poles, satellite altimetry, and paleoclimatic and biogeographic data, will be presented. A "hands-on" laboratory is planned in which participants will be able to build their own plate-tectonic models. The material presented in this course is based on the work that is being carried out by the PALEOMAP Project, a joint IUGG/IUGS Program. Topics covered:

- technical basis of the reconstructions (how we know what we know)
- problematic Precambrian supercontinent
- assembly and breakup of Pangea
- the role of terranes
- plate tectonic events that changed the course of Earth history
- inferences about the driving mechanism of plate tectonics.

Faculty: Christopher R. Scotese, Senior Research Geologist, Shell Development Co., Houston; Ph.D., University of Chicago. Chairman of the PALEOMAP Project and co-editor of the books *Mesozoic and Cenozoic Plate Tectonic Reconstructions*, and *Paleozoic Paleobiogeography and Paleogeography*, Scotese is also

the author of more than 30 papers on plate tectonics and Earth history and is co-author of *Terra Mobilis: A Plate Tectonics Program for the Macintosh*.

Limit: 30. Fee \$195; includes course manual, format atlas of Phanerozoic plate-tectonic reconstructions, computer disk of the program, *Terra Mobilis: A Plate Tectonics Program for the Macintosh*, and lunch both days.

Seismic Expression of Structural Styles. Saturday, October 27, 8 a.m. to 5 p.m., Sunday, October 28, 8 a.m. to 5 p.m. Sheraton Dallas Hotel. Cosponsor: Structural Geology and Tectonics Division.

This course will be of interest to all geoscientists who want to learn about the structural interpretation of seismic data. Participants with little experience in seismic interpretation gain an appreciation for the interpretational process and those with interpretation experience gain insight into the ambiguities and pitfalls in the structural analysis of seismic data. Topics covered:

- basic acquisition and processing procedures for seismic data
- seismic distortions and pitfalls
- interpretation approaches
- seismic characteristics of structural styles
- seismic modeling.

Faculty: Albert W. Bally, Dept. of Geology, Rice University; Ph.D., University of Zurich. Bally is chairman of the Department of Geology and Geophysics at Rice University. He has been involved in academia and the oil industry for more than 35 years. He has worked in both onshore and offshore exploration in Canada and the United States. Bally has long been concerned with geology on a global scale, and his current research focus is on structural interpretation based on seismic reflection profiles. He hopes this work will enable geologists to better reconcile the complex structure of the upper crust with the presumably less complex lower crust and mantle. With his students, he is involved in interpretation projects around the world, including Italy, the Arctic, Central America, Indonesia, and Hungary. Martha Oliver Withjack, Research Associate, Mobil Research and Development Corp., Dallas; Ph.D., Brown University. An AAPG Distinguished Lecturer in 1984 and 1985, Withjack received the "Cam" Sproule Memorial Award for her article in the AAPG Bulletin, "Seismic-reflection Models of Rift-Related Structures" in 1986. Withjack's current research interests at Mobil include the study of extensional structures, analytical and experimental modeling of structures, and the structural interpretation of seismic data. Kristian E. Meisling, Principal Research Geologist, ARCO Oil and Gas Co., Plano, Texas; Ph.D., California Institute of Technology. Meisling conducted his thesis research at Caltech on neotectonic and earthquake hazards in southern California, resulting in the 1989 GSA *Bulletin* paper, "Late Cenozoic Tectonics of the Northwestern San Bernardino Mountains, Southern California." Meisling's current research at ARCO involves the integration of multidisciplinary data to address problems of regional structural and tectonic evolution in Arctic Alaska. Meisling is an associate editor of the GSA *Bulletin*. David A. Fisher, Senior Research Geophysicist, ARCO Oil and Gas Co., Plano, TX; M.S., University of Houston. Fisher's thesis work involved physical and numerical modeling of seismic data. He has published four papers and given numerous presentations on seismic interpretation. Fisher's current research interests include three-dimensional seismology for reservoir characterization and interactive computer techniques.

Limit: 50. Fee: \$145; includes course manual and lunch both days.

(continued on p. 136)

Annual Meeting Short Courses (continued from p. 135)

Computer Modeling of Cyclic Carbonate Sequences. Sunday, October 28, 8 a.m. to 5 p.m. Hyatt Regency Hotel.

Of interest to stratigraphers and sedimentologists in both academia and industry, this course will discuss the facies architecture of small-scale (1 to 30 m) carbonate sedimentary cycles, how these are packaged into third-order Vail sequences (1-10 Ma duration), techniques for quantitatively defining various controls on cycle formation using field data, and one- and two-dimensional modeling approaches used to generate stratigraphic sections and cross sections of carbonate platforms. Topics covered:

- types of carbonate cycles
- subsidence vs. sea-level components
- sedimentation rates, water depths, lag
- platform slopes and antecedent topography
- one-dimensional modeling of stratigraphic sequences
- two-dimensional modeling of carbonate platforms.

Faculty: J. Fred Read, Dept. of Geological Sciences, Virginia Polytechnic Institute and State University; Ph.D., University of Western Australia. An AAPG Distinguished Lecturer (1989-1990) and Past Lecturer for AAPG's Continuing Education Program, Carbonate School, Read is co-editor of SEPM Special Publication 44, *Controls of Carbonate Platform and Basin Development*. Read did research for his Ph.D. in Shark Bay and postdoctoral work in the Devonian reefs of the Canning Basin. His current interests are diagenesis and field and numerical modeling studies of carbonate platforms. Maya Elrick, Dept. of Geological Sciences, Virginia Polytechnic Institute and State University; M.S., Oregon State University. Elrick's current research interests include development of shallow platform to basinal cycles in the Early Mississippian of Wyoming and Montana. David A. Osleger, Dept. of Geological Sciences, Virginia Polytechnic Institute and State University; M.S., University of Texas at El Paso. Osleger's current research interests include cycle stratigraphy of Late Cambrian pericratonic carbonate platforms, superimposed scales of cyclicity, and cycle stacking patterns.

Limit: 75. Fee: \$140; includes course manual, precourse reception on Saturday evening, and lunch on Sunday.

Practical Tracing of Ground Water, with Emphasis on Karst Terranes. Sunday, October 28, 8 a.m. to 5 p.m. Hyatt Regency Hotel. Cosponsor: Hydrogeology Division.

ATTENTION, STUDENTS: The Hydrogeology Division will SUBSIDIZE THE FIRST STUDENT WHO IS A VALID DIVISION MEMBER. The student MUST PAY THE FULL COURSE FEE when registering, but will be reimbursed \$50 after the GSA meeting by the Hydrogeology Division.

Aimed at the professional geologist or hydrologist, this course will introduce participants to applications of tracer tests and practical mechanics of how to conduct ground-water tracing in karst terranes, granular aquifers, and fractured rocks, as well as how to select the most appropriate tracer, how to interpret tracer tests that are positive, and how to interpret those that are negative.

Topics covered:

- principles of tracing
- toxicity of tracers
- cost of tracer investigations
- simultaneous use of several tracers
- interpretation of tests in which tracer is recovered
- sources of tracers
- introduction to fluorescent dyes
- introduction to other tracers

- applications of tracing to ground-water monitoring
- case studies.

Faculty: James F. Quinlan, Senior Hydrogeologist, ATEC Environmental Consultants, Nashville; Ph.D., University of Texas. Quinlan has worked in karst terranes of more than 25 states, Puerto Rico, and 20 foreign countries, and he is author or co-author of more than 140 publications on karst-related topics and tracing. He and co-author Ralph Ewers received the GSA Burwell Award in 1986 for a paper on the principles of ground-water monitoring in karst terranes. A GSA Fellow and member of the Board of Directors of the Association of Ground Water Scientists and Engineers, Quinlan has specialized in environmental applications of dye tests, evaluation of waste-disposal sites in limestone terranes, and sinkhole development and remediation. E. Calvin Alexander, Jr., Dept. of Geology and Geophysics, University of Minnesota; Ph.D., University of Missouri. A professor at the University of Minnesota since 1973, Alexander is author or co-author of more than 100 publications on isotopic investigations, ground-water studies, and environmental geology. His research includes isotopic studies of ground-water age or residence times and tracing in a variety of aquifers and hydrogeological settings.

Limit: 60. Fee: \$130; includes course manual and lunch.

Recent Sediments of the Northwest Gulf Coast Region. Sunday, October 28, 8 a.m. to 5 p.m. Sheraton Dallas Hotel.

Over the past three decades, thousands of geologists have benefited from the courses taught by Rufus J. LeBlanc, whose vast knowledge, humor, and colorful personality speak for themselves. This well-known basic course will appeal to sedimentologists, petroleum geologists, environmentalists, and coastal zone managers. The accompanying course manual includes 430 references and is based upon the original research results by the original researchers. Topics covered:

- Recent meander belt and floodplain sediments of the Mississippi River Alluvial Valley
 - the Mississippi River deltaic plain complex
 - transgressive marine sedimentation
 - the Recent Cheniers and Chenier Plain of southwest Louisiana
 - Recent sediments of the Texas coast
 - barrier island complexes
- (The above systems will be demonstrated with SP log shapes.)
- late Quaternary Geological History of the northwest Gulf Coast region
 - literature summary—selected references on Recent clastic sediments of the northwest Gulf Coast region.

Faculty: Rufus J. LeBlanc, Sr., The Rufe LeBlanc School of Clastic Sediments, Houston. Well-known for his research, writing, and teaching on Recent sediments conducted during his 38 years with Shell Oil, LeBlanc received AAPG's Sidney Powers Memorial Award in 1988. Over the past 45 years, LeBlanc and his colleagues have developed and refined the concepts and principles of sedimentology that he continues to teach today. LeBlanc has been a Fellow of GSA since 1957 and a Senior Fellow since 1988.

Limit: 100. Fee: \$80; includes course manual and lunch.



1990 Annual Meeting Theme Sessions and Symposia

Technical sessions consist of both invited and volunteered papers organized in one of three presentation formats: symposia, theme sessions, and discipline sessions. All abstracts are due for review by *July 11, 1990*. Abstracts must be submitted on the 1990 Abstract Form, available from the Abstracts Coordinator at GSA headquarters.

1990 Technical Program Chairmen

Richard M. Mitterer Geosciences, MS FO 2.1 University of Texas at Dallas P.O. Box 830688 Richardson, TX 75083-0688 (214) 690-2401 (dept.) (214) 690-2462 (office direct)	Rodger E. (Tim) Denison Mobil Research and Development Corp. P.O. Box 819047 Dallas, TX 75381-9047 (214) 851-8172
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Volunteered Papers

This format includes all abstracts that are not specifically invited for a symposium. Two types of sessions are available:

1. **Discipline Sessions**—Papers are submitted to one scientific category (discipline). The Joint Technical Program Committee (JTPC) representatives select and schedule the papers in sessions focused on this one discipline, e.g., hydrogeology, geochemistry.

2. **Theme Sessions**—Papers are submitted to a specific pre-announced title AND to ONE scientific category. Theme sessions are interdisciplinary; each theme may have as many as three categories from which authors may choose. After each theme description below, the categories are identified by name and number as they appear on the 1990 Abstract Form. The full theme descriptions appear in April 1990 *GSA News & Information* and were distributed with the 1990 Abstract Forms in March. Schedules for theme sessions will be available immediately after the JTPC meeting in August and will appear in the September issue of *GSA News & Information*.

- T1. **Strontium Isotopes and Sedimentary Geology.** Geochemistry (7), Global Geoscience (12), Paleoceanography/Paleoclimatology (18)
- T2. **Mesozoic Tectonic Evolution of Mexico and the Gulf of Mexico.** Geophysics (10), Stratigraphy (30), Tectonics (32)
- T3. **Problems and Solutions to Monitoring Ground Water in Karst Terranes.** Environmental Geology (6), Hydrogeology (14), Petrology, Sedimentary (24)
- T4. **Cretaceous/Tertiary Boundary Sections in the Southern United States.** Geochemistry (7), Global Geoscience (12), Paleontology (19)
- T5. **Hydrogeology of Arid Regions.** Hydrogeology (14)
- T6. **Erosional Landscapes of the South-Central United States.** Geomorphology (9), Paleoclimatology (18), Remote Sensing (28)
- T7. **Oxygen and Carbon Isotopes in Paleozoic and Early Mesozoic Marine Sediments: Toward a Global Isotope Stratigraphy.** Geochemistry (7), Global Geoscience (12), Stratigraphy (30)
- T8. **Geologic Effects of Hurricane Hugo.** Environmental Geology (6), Remote Sensing (28), Sedimentology (29)
- T9. **Environmental and Engineering Studies for Radioactive**

Waste Isolation: Experience Based on the Waste Isolation Pilot Plant (WIPP) Project, Southeastern New Mexico. Engineering Geology (5), Environmental Geology (6), Hydrogeology (14)

- T10. **Effects of the Loma Prieta Earthquake.** Engineering Geology (5), Environmental Geology (6), Geophysics (10)
- T11. **Amino Acid Geochemistry: Applications in Stratigraphy and Geochronology.** Geochemistry (7), Quaternary Geology (27), Stratigraphy (30)
- T12. **Metageology: Expanding Geologic Awareness.** Environmental Geology (6), Geology Education (8), Other (34)
- T13. **Late Proterozoic Evolution of Organisms and Environments.** Global Geoscience (12), Paleontology (19), Precambrian Geology (26)
- T14. **Regulatory Geology: Site and Performance Evaluations in the Face of Geological Uncertainty.** Engineering Geology (5), Environmental Geology (6), Hydrogeology (14)
- T15. **Salt Domes: Geotechnology, Energy, and Economic Significance.** Economic Geology (4), Engineering Geology (5), Environmental Geology (6)
- T16. **Paleosols and Subaerial Exposure Surfaces in Carbonate Sequences.** Geochemistry (7), Petrology, Sedimentary (24), Stratigraphy (30)
- T17. **Upper Cretaceous Stratigraphy and Paleontology, U.S. Gulf Coastal Plain and Adjacent Regions.** Paleontology/Paleobotany (19), Sedimentology (29), Stratigraphy (30)
- T18. **Isotope Fractionations in Organic Matter: Biosynthetic and Diagenetic Processes.** Geochemistry (7), Paleoceanography (18), Sedimentology (29)
- T19. **Calibration of Controls on Stratigraphic Sequences.** Global Geoscience (12), Sedimentology (29), Stratigraphy (30)
- T20. **Geoscience Transects (Poster Mode Only).** Geophysics (10), Structural Geology (31), Tectonics (32)
- T21. **Applications of Organic Matter Biomarkers in Sedimentary Geology.** Geochemistry (7), Paleoceanography (18), Sedimentology (29)
- T22. **Salt Tectonics.** Structural Geology (31), Tectonics (32)
- T23. **Tectonostratigraphic Correlation of Late Cretaceous-Early Tertiary Island-Arc Rocks in the Caribbean Region.** Geochemistry (7), Structural Geology (31), Tectonics (32)
- T24. **Geological Resources, Hazards, and Population.** Engineering Geology (5), Environmental Geology (6), Geomorphology (9)
- T25. **Friction Melting Processes and Products in Geologic Materials.** Engineering Geology (5), Petrology, Igneous (22), Structural Geology (31)
- T26. **Writing Assignments: A Tool for Teaching and Learning Geology.** Geology Education (8)
- T27. **Geochemistry and Global Change.** Geochemistry (7), Global Geoscience (12), Paleoceanography/Paleoclimatology (18)
- T28. **Microcomputer Management of Databases in Petrology and Geochemistry.** Computers (3), Geochemistry (7), Petrology, Igneous (22)
- T29. **Practical Applications of Coal Geology.** Coal Geology (2), Environmental Geology (6), Hydrogeology (14)

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Annual Meeting (continued from p. 137)

T30. Granites/Rhyolites: Interrelations, Processes, Geometries, Geochemistries. Geochemistry (7), Petrology, Experimental (21), Petrology, Igneous (22)

T31. Water and Volcanoes (Both Poster and Oral Mode). Geochemistry (7), Hydrogeology (4), Volcanology (33)

T32. Transient Responses to Global Change: The Geomorphic and Hydrologic Record (Poster Mode Only). Environmental Geology (6), Geomorphology (9), Hydrogeology (14)

T33. Opportunities for Scientific Drilling in the Continental Crust: Shallow- to Intermediate-Depth Projects. Geochemistry (7), Geophysics (10), Sedimentology (29)

Invited Papers (Symposia)

This format includes only abstracts that have been invited by the convener of a symposium. Abstracts are sent directly to the convener by July 11.

S1. Seafloor Hydrothermal Mineralization: New Developments. Society of Economic Geologists. Peter Rona, NOAA, Miami; Steven D. Scott, University of Toronto.

Continuing investigations of the geologic settings and processes of seafloor hydrothermal mineralizing activity further our understanding of the mechanisms of formation of these deposits and guide future exploration strategies. This symposium will address mineralization in specific settings such as back-arc basins, a continental rift system, and along the Juan de Fuca spreading system, and will present new information on various aspects of hydrothermal activity.

S2. Geologic Setting and Generation of Very Large Volcanic-Hosted Massive Sulfide Deposits. Society of Economic Geologists. Frederick J. Sawkins, University of Minnesota.

Some controversy surrounds the genesis of these deposits as a group. Data obtained from black smoker sites at mid-ocean ridge systems cannot be applied in an uncritical way to formation of these massive sulfide deposits. Speakers will present current information and results from a series of major base-metal deposits of various ages from Archean to Phanerozoic that formed in submarine environments.

S3. The Origin of Animals. Paleontological Society. Philip W. Signor, University of California—Davis; Stanley M. Awramik, University of California—Santa Barbara.

The events or processes that triggered the radiation of animals in the Late Proterozoic and Early Cambrian remain one of the great questions in evolutionary paleontology. In this limited interval of time, perhaps a few tens of millions of years, most of the major invertebrate clades appeared in the fossil record. Speakers will present new information on this critical time in the history of life.

S4. Active Tectonics in the Mid-Continent. Engineering Geology Division. Norman R. Tilford, Texas A&M University.

During the past decade, investigations in several parts of the U.S. mid-continent have advanced our understanding of style, process, and rate in the active tectonics of the region. Studies in such diverse disciplines as geochronology, geomorphology, geophysics, and geodesy are helping to develop the snapshot of progress to be presented in this symposium. Emphasis will be on the evolution of recognition criteria for distinguishing differing styles and rates of deformation.

S5. Extinction and Recovery of Plankton from the K/T Boundary Event. Cushman Foundation for Foraminiferal Research and North American Micropaleontological Section

of SEPM. Richard K. Olsson, Rutgers University; William A. Berggren, Woods Hole Oceanographic Institution.

Did the K/T boundary event(s) represent a minor perturbation in the evolutionary progression among oceanic plankton or did it require a major resetting of the "evolutionary clock"? Cause-and-effect relations at this boundary remain controversial, not the least with regard to the stratigraphic record of planktonic organisms. Speakers will explore the effects of the K/T boundary event(s) on different microplankton groups, the postevent recovery and adaptive radiation, microevolutionary and macroevolutionary trends in certain groups, and problems in taxonomy and classification resulting from this event.

S6. Thermodynamic Mixing Properties of Petrologically Important Minerals. Mineralogical Society of America. Mark S. Ghiorso, University of Washington; Robert C. Newton, University of Chicago.

This symposium will focus upon new developments in solid-solution theory and new measurements on the solution properties of minerals. Emphasis will be placed upon the connection between microscopic solid-state physics and our understanding of the macroscopic thermodynamics of mineral solid solutions. Applications will focus upon the impact of recent formulations on petrological reasoning, including geothermometry and geobarometry.

S7. Geoscience Organizations: Their Efforts and Impact on Geoscience Education. National Association of Geology Teachers. Dorothy L. Stout, Cypress College, California.

The trends in declining student enrollments in geology and in shifting employment patterns away from the oil and gas industry and toward environmental positions have created serious problems in geological education. Representatives from various geological societies will address their societies' concerns and activities in earth science and geological education.

S8. Geochemistry of Metalliferous Black Shales. Organic Geochemistry Division of the Geochemical Society and IGCP Working Group 254. Philip A. Meyers, University of Michigan; Lisa M. Pratt, Indiana University.

The unusual enrichments of metals in some black shales reflect combinations of sediment provenance, depositional environments, diagenesis, and pore-water-rock interactions during later burial. This symposium will focus on recent developments in understanding these processes, including the depositional environments, the stratigraphic settings, and the organic and inorganic geochemistries of metal-rich black shales present on land and in the seafloor.

S9. Transient Responses to Global Change: The Geomorphic and Hydrologic Record. Hydrogeology Division and Quaternary Geology and Geomorphology Division. Steven Wells, University of New Mexico; Jack Hess, Desert Research Institute; Richard Craig, Kent State University.

While the topic of global change and the concomitant responses at the regional and local levels are important today, it is generally recognized that many of these changes will be transient. Earth systems do not always adjust immediately and completely to external forcings. In light of the current concern with the prospect of global climate change, this symposium will focus attention on the potential for time-dependent changes that can be expected in the hydrologic and geomorphic systems.

S10. Oxygen and Carbon Isotopes in Paleozoic and Early Mesozoic Marine Sediments: Toward a Global Isotope Stratigraphy. Geochemical Society. Ethan L. Grossman, Texas A&M University.

The objectives of this symposium are twofold. The first is to test the validity, timing, and cause of proposed global isotopic events

(continued on p. 139)

such as a Late Devonian-early Carboniferous oxygen isotope shift, a middle Carboniferous carbon isotope shift, and a Late Permian-Early Triassic carbon isotope shift. These events provide time-stratigraphic markers for correlation and may signify changes in ocean chemistry and global climate. The second objective is to evaluate the methods used to identify unaltered samples, including cathodoluminescence, whole-rock trace element analysis, and electron microprobe analysis.

S11. Geology of Venus. Planetary Geology Division. Ted A. Maxwell, NASA, Washington; Baerbel K. Lucchitta, USGS, Flagstaff.

This session focuses on our current understanding of Venus geology from Earth-based radar observations and results from the U.S. Pioneer Venus and Soviet Venera missions. Presentations will include impact structures, volcanism, gravity, and tectonics of Venus. Early results from the Magellan mission will be given special attention.

S12. Effects of Scale on Archaeological and Geological Perspectives. Archaeological Geology Division. Julie K. Stein and Angela R. Linse, University of Washington.

Archaeological geology is an interdisciplinary field in which paradigms of both disciplines are used to address single research questions. Yet each discipline has an informal appropriate "scale" at which research is conducted. The informal scale in geology depends on many factors, but is often continental in scale. In archaeology the informal scale is related to the size of a site. Scale differences are responsible for the varied approaches of each discipline to stratigraphy, dating methods, provenance studies, evolutionary theory, geomorphic reconstructions, taphonomy, and fossilization. This symposium examines how scale perspectives in the two disciplines affect research questions, analysis, and interpretation.

S13. Geological Societies and Information Transfer in the Electronic Age. Geoscience Information Society. Marie Dvorzak, University of Wisconsin—Madison.

Historically, geosciences societies have been major contributors to the transfer of information. New technologies exist or are rapidly being developed that will facilitate information transfer. This symposium will consider how these technologies affect the societies' methods of generation, production, and delivery of geological information. Topics to be covered include developments in formats and methods of production, evolving systems of communication, and digitization of data.

S14. Salt Tectonics. Structural Geology and Tectonics Division. Mark Cloos and Martin Jackson, University of Texas at Austin.

This symposium will cover recent advances in understanding of the role of salt in development of structures in the Gulf Coast region and elsewhere, together with results of experimental and numerical studies. Salt behavior will be treated from the microscopic to crustal scales.

S15. Effects of Past Global Change on Life. 1990 Annual Meeting Committee and National Academy of Sciences—National Research Council. Thomas M. Usselman, NAS-NRC.

Major transitions from one set of environmental conditions to another have had important impacts on the biosphere. These changes have entailed not only extinction but also shifts in the distribution and abundance of species and origins of new species in response to opening of new environmental opportunities. Topics will range from the build-up of atmospheric oxygen and biotic diversity in the latest Precambrian to the impact of the last Ice Age on human evolution.

S16. Eustasy: The Ups and Downs of a Major Concept. History of Geology Division. Robert H. Dott, Jr., University of Wisconsin—Madison.

As with so many major concepts, there is a tendency to assume that the idea of eustasy is new. In reality, it is an old concept with a complex and fascinating history that has shown about as many ups and downs as the concept itself postulates for sea level through time. As one of the most important of a group of concepts involving global synchrony, eustasy is particularly ripe for a historical review.

S17. Practical Applications of Coal Geology. Coal Geology Division. Robert B. Finkelman, USGS, Reston; Douglas Peters, U.S. Bureau of Mines, Denver.

Coal geology has made important and practical contributions to the energy industry. Geological concepts and research have been used to make coal utilization more economical, efficient, and environmentally acceptable. This symposium will highlight these practical applications.

S18. Structure, Tectonics, and Geophysics of the Southern Margin of North America. Geophysics Division. G. Randy Keller, University of Texas at El Paso; Richard T. Buffler, University of Texas at Austin.

The purpose of this symposium is to bring together the broad range of geoscientists who are working on the Proterozoic and Phanerozoic evolution of the southern margin of North America. Recent geophysical and drilling results provide valuable constraints on deep structures, and structural studies in the area usually include seismic-reflection and drill-hole data as constraints. Research in this region addresses such diverse topics as the Precambrian evolution of the craton to the opening of the Gulf of Mexico.



**Remember,
the 1990 abstracts deadline
is JULY 11**

In Memoriam

Eugene Callaghan
Salt Lake City, Utah
January 8, 1990

Edward A. Flinn III
Alexandria, Virginia
August 13, 1989

George V. Cohee
Bethesda, Maryland
January 29, 1990

Waldo S. Glock, Sr.
Las Cruces, New Mexico
January 7, 1990

MEETINGS

(Asterisk indicates new or changed information)

1990

V. M. Goldschmidt Conference (international conference for the advancement of geochemistry), May 2-4, 1990, Baltimore, Maryland. Information: Donna Ricketts, 409 Keller Conference Center, Pennsylvania State University, University Park, PA 16802.

Pacific Rim Congress, May 6-12, 1990, Gold Coast, Queensland, Australia. Information: AusIMM PACRIM 90, P.O. Box 731, Toowong, Queensland 4066, Australia; 61-7-371-7900.

SIAM Conference on Applications of Dynamical Systems, May 7-10, 1990, Orlando, Florida. Information: SIAM Conference Coordinator, 3600 University City Science Center, Philadelphia, PA 19104-2688; (215) 382-9800; fax 215-386-7999.

West Texas Geological Society and Permian Basin Section of SEPM Field Seminar to the Marathon Area, Brewster County, Texas, May 10-12, 1990. Information: WTGS/PBS-SEPM, P.O. Box 1595, Midland, TX 79702; (915) 683-1573.

Midwest Friends of the Pleistocene Field Trip, May 11-13, 1990, Council Bluffs, Iowa. Information: Art Bettis, Iowa Dept. of Natural Resources-Geological Survey Bureau, 123 N. Capitol St., Iowa City, IA 52242; (319) 335-1578.

13th Annual Spring Systematics Symposium: Evolutionary Ethics, May 12, 1990, Chicago, Illinois. Information: Symposium Coordinator, Dept. of Geology, Field Museum of Natural History, Roosevelt Rd. at Lakeshore Dr., Chicago, IL 60605-2496; (312) 922-9410, ext. 298.

Fourth National Outdoor Action Conference on Aquifer Restoration, Ground Water Monitoring and Geophysical Methods, May 14-17, 1990, Las Vegas, Nevada. Information: Outdoor Action/National Water Well Association, P.O. Box 182039, Dept. 017, Columbus, OH 43218, (614) 761-1711.

Andean Geodynamics Symposium, May 15-17, 1990, Grenoble, France. Information: R. A. Oliver, Inst. Laue-Langevin, 156X, Centre de Tri, 38042 Grenoble Cedex, France.

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.

GSA Rocky Mountain Section, May 21-23, 1990, Jackson, Wyoming. Information: Ronald W. Marrs, Dept. of Geology & Geophysics, University of Wyoming, Laramie, WY 82071; (307) 766-3386.

Geological Association of Canada Nuna-SEG Field Research Conference on Greenstone Gold and Crustal Evolution, May 24-27, 1990, Val d'Or, Quebec. Information: Francois Robert, Geological Survey of Canada, 601 Booth St., Ottawa, Ontario K1A 0E8, Canada; fax 613-996-9990.

American Geophysical Union-Mineralogical Society of America Spring Meeting, May 29-June 1, 1990, Baltimore, Maryland. Information: 1990 Spring Meeting, American Geophysical Union, 2000 Florida Ave. N.W., Washington, DC 20009; (202) 462-6900; fax 202-328-0566.

Symposium on Naturally Occurring Radionuclides in Agricultural Products, May 29-June 1, 1990, Orlando, Florida. Information: IFAS Office of Conferences, University of Florida, 551 IFAS, Gainesville, FL 32611; (904) 392-5930.

American Association of Petroleum Geologists Annual Convention, June 3-6, 1990, San Francisco, California. Information: Jim Baroffio, Chevron Canada Resources Ltd., 500 5th Ave., SW, Calgary, Alberta T2P 0L7, Canada.

1st Joint Meeting of the Canadian Quaternary Association and American Quaternary Association, June 4-6, 1990, Waterloo, Ontario, Canada. Information: Alan V. Morgan, Quaternary Sciences Institute, Dept. of Earth Sciences, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada.

***Dinosaur Quarry Field Trip**, June 7-9, 1990, Colorado and Utah. Information: Museum of Western Colorado, P. O. Box 2000-5020, Grand Junction, CO 81502; (303) 242-0971.

5th Symposium on the Geology of the Bahamas, June 15-19,

(continued on p. 141)



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MEETINGS (continued from p. 140)

1990. Information: R. J. Bain, Dept. of Geology, University of Akron, Akron, OH 44325-4101; (216) 375-7659.

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

International Symposium on Mapping and Geographic Information Systems, June 21-22, 1990, San Francisco, California. Information: Ivan Johnson, A. Ivan Johnson, Inc., 7474 Upham Ct., Arvada, CO 80003; (303) 425-5610.

National Environmental Health Association Education Conference, June 23-28, 1990, Charlotte, North Carolina. Information: NEHA, 720 S. Colorado Blvd., South Tower, #970, Denver, CO 80222; (303) 756-9090.

4th International Conference on Geoscience Information (GeoInfo IV), June 24-29, 1990, Ottawa, Ontario. 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.

9th International Conference on Basement Tectonics, July 2-6, 1990, Canberra, Australia. Information: IBT9 ACTS, GPO Box 2200, Canberra, A.C.T. 2601, Australia; phone 062-49-8015; fax 062-573256.

1990 Watershed Management Symposium, July 9-11, 1990, Durango, Colorado. Information: Robert Riggins, USACERL, P.O. Box 4005, Champaign, IL 61824-4005.

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.

***Rocky Mountain Friends of the Pleistocene Field Trip**, August 16-19, 1990, southwestern Montana. Information: Robert D. Hall, Dept. of Geology, Indiana University-Indianapolis, 425 University Blvd., Indianapolis, IN 46202-5140; (317) 274-3795 (direct), (317) 274-7484 (dept.).

Wyoming Geological Association 41st Annual Field Conference, August 17-23, 1990, Casper, Sheridan, Cody, Jackson, and Riverton, Wyoming. Information: Kent A. Sundell, P.O. Box 1543, Casper, WY 82602; (307) 266-4760.

Cretaceous Resources, Events and Rhythms, SEPM Research Conference, August 20-24, 1990, Denver, Colorado. Information: Michael A. Arthur, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI 02882-1197; fax 401-792-6160.

International Symposium on Geothermal Energy, August 20-24, 1990, Kailua-Kona, Hawaii. Information: Geothermal Resources Council, P.O. Box 1350, Davis, CA 95617-1350; (916) 758-2360; fax 916-758-2839.

Western Pacific Geophysics Meeting, August 21-25, 1990, Kanazawa, Japan. Information: Western Pacific Geophysics Meeting, American Geophysical Union, 2000 Florida Ave N.W., Washington, DC 20009; (202) 462-6900; fax 202-328-0566.

International Sedimentological Congress, August 26-31, 1990, Nottingham, England. Information: C. P. Summerhayes, Institute of Oceanographic Sciences Deacon Lab., Brook Rd., Wormley, Godalming, Surrey GU8 5UB, England.

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.

AEG General Meeting and 14th International Geochemical Exploration Symposium, August 29-31, 1990, Prague, Czechoslovakia. Information: Frantisek Mrna, Geological Survey of Prague, 118 21 Praha 1, Malostranske nam. 19, Czechoslovakia.

Conference on Evolution of Upwelling Systems since the Early Miocene, September 3-4, 1990, London, England. Information: C. P. Summerhayes, IOS Deacon Lab., Wormley, Godalming, Surrey GU8 5UB, England; 042-879-4141; fax 042-879-3066.

***IGCP Cretaceous Field Conference**, September 5-15, 1990, Jerusalem, Israel. Information: G. Gvirtzman, Geological Survey of Israel, 30 Malkhe Yisrael St., Jerusalem 95501, Israel; telex 26362 ENERGI; fax 972-2-381444. (Abstracts deadline: May 31, 1990.)

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.

Society for Organic Petrology Annual Meeting, September 9-14, 1990, Calgary, Alberta, Canada. Information: Wolfgang Kalkreuth, Institute of Petroleum and Sedimentary Geology, 3303-33 St., N.W., Calgary, Alberta T2L 2A7, Canada; (403) 292-7119; fax 403-292-5377.

GOLDTech 4, September 10-12, 1990, Reno, Nevada. Information: Meetings Department, Society for Mining, Metallurgy, and Exploration, P.O. Box 625002, Littleton, CO 80162-5002; (303) 973-9550; fax 303-973-3845; telex 881988.

***New Mexico Geological Society Annual Field Conference**, Sept. 12-15, 1990, Red River, New Mexico. Information: Paul Bauer, New Mexico Bureau of Mines, Socorro, NM 87801; (505) 835-5106.

AAPG-SEPM-EMD Rocky Mountain Section Meeting, September 16-19, 1990, Denver, Colorado. Information: Matt Silverman, Gustavson Associates, Inc., 5757 Central Ave., Suite D, Boulder, CO 80301.

3rd International Archaean Symposium, September 17-21, 1990, Perth, Western Australia. Information: Susan E. Ho, P.O. Box 435, Nedlands, Western Australia 6009, Australia.

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 61-62-490 738; telex 62693.

European Geological Societies, September 29-October 7, 1990, Lisbon, Portugal. Information: MEGS 6, Sociedade Geológica de Portugal, Apto. 2361, P1109 Lisboa Codex, Portugal.

Association of Engineering Geologists 33rd Annual Meeting, October 1-5, 1990, Pittsburgh, Pennsylvania. Information: 33rd AEG Meeting, MEMS, One Northgate Sq., Suite 211, P.O. Box 270, Greensburg, PA 15601; (412) 836-6813; fax 412-836-6817.

International Earth Sciences Congress on Aegean Regions, October 1-7, 1990, Izmir, Turkey. Information: IESCA-1990, D.E.

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MEETINGS (continued from p. 141)

University Dept. of Geology, P.K.74 (E.U.-PTT) Bornova, Izmir, Turkey; phone 51-182919 or 180680 or 181088; telex 52407 dbte tr; fax 51-220978.

Soils and Landscape Evolution, Binghamton Symposium in Geomorphology, October 6-7, 1990, Binghamton, New York. Information: Peter L.K. Knuepfer, Dept. of Geological Sciences, SUNY, Binghamton, NY 13901; (607) 777-2389; Leslie D. McFadden, Dept. of Geology, University of New Mexico, Albuquerque, NM 87131; (505) 277-2307. (Abstracts deadline: August 1, 1990.)

Clay Minerals Society 27th Annual Meeting, October 6-11, 1990, Columbia, Missouri. Information: W. D. Johns, Dept. of Geology, University of Missouri, Columbia, MO 65211; (314) 882-3785.

Federation of Analytical Chemistry and Spectroscopy Societies 17th Annual Meeting, October 7-12, 1990, Cleveland, Ohio. Information: Charles J. Belle, Lucas Aerospace, PEC, 4259 W. 192 St., Fairview Park, OH 44126.

***International Symposium on Environmental Studies on Tropical Rain Forests**, October 7-13, 1990, Manaus, Brazil. Information: Organising Committee-Forest '90, P.O. Box 3591, 2001 Rio de Janeiro, RJ, Brasil. Phone 55-21-211-5581; telex 55-21-22395; fax 55-21-252-9269. (Abstracts deadline: May 30, 1990.)

***Petroleum Computing in the '90s Symposium**, October 8-9, 1990, Midland, Texas. Information: Permian Basin Graduate Center, P.O. Box 1518, Midland, TX 79702; (915) 683-2832.

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 619-3227922; telex AA 95380; fax 619-4814029.

American Institute of Professional Geologists Annual Meeting, October 9-12, 1990, Long Beach, California. Information: Stephen M. Testa, 6695 E. Pacific Coast Highway, Long Beach, CA 90803; (213) 430-6500.

Geodynamics of the Arabian Plate, October 20-25, 1990, Kuwait. Information: Waris E.K. Warsi, Dept. of Geology, University of Kuwait, P.O. Box 5969, Safat 13060, Kuwait; or Muawia Barazangi, INSTOC, Snee Hall, Cornell University, Ithaca, NY 14853-1504.

Geological Society of America Annual Meeting, October 29-November 1, 1990, Dallas, Texas. Information: GSA, Meetings Department, P.O. Box 9140, Boulder, CO 80301; (303) 447-2020. (Abstracts deadline: July 11, 1990.)

***Eastern Oil Shale Symposium**, November 6-8, 1990, Lexington, Kentucky. Information: Geaunita H. Caylor, Symposium Coordinator, University of Kentucky/OISTL, 201 Porter Bldg., Lexington, KY 40506-025; (606) 257-2820. (Abstracts deadline: June 8, 1990.)

Supercomputing '90, November 12-16, 1990, New York, New York. Information: Joanne L. Martin, IBM T. J. Watson Research Center, P.O. Box 218, Rte. 134, Yorktown Heights, NY 10598; (914) 945-3285.

Penrose Conferences 1990

Transpressional Tectonics of Convergent Plate Margins, August 25-30, 1990, Bellingham, Washington. Information: Vicki L. Hansen, Dept. of Geological Sciences, Southern Methodist University, Dallas, TX 75275-0395; (214) 692-4179.

Large Lakes and Their Stratigraphic Record, September 9-13, 1990, Lake Tahoe, California. Information: Andrew S. Cohen, Dept. of Geosciences, University of Arizona, Tucson, AZ 85721; (602) 621-4691 (direct), (602) 621-6024 (dept.).

New Methods for Dating of Geomorphic Surfaces, October 12-17, 1990, Mammoth Lakes, California. Information: Fred M. Phillips, Dept. of Geoscience, New Mexico Tech, Socorro, NM 87801; (505) 835-5540 (direct), (505) 835-5634 (dept.).

1991

***International Conference on Environmental Pollution**, April 15-19, Lisbon, Portugal. Information: ICEP Conference Office, ICTR Secretariat, 11-12 Pall Mall, London SW1Y 5LU, England; phone 01-930-6825; telex 925312 REICO G; fax 01-976-1587. (Abstracts deadline: July 15, 1990.)

International Symposium on Geophysical Hazards in Developing Countries and Their Environmental Impacts, April 21-27, 1991, Cairo, Egypt. Information: T. S. Murty, Hazards-91, c/o Institute of Ocean Sciences, P.O. Box 6000, Sidney, B.C. V8L 4B2, Canada; (604) 356-6311; telex 04-97281; fax 604-356-6390; Mohammed I. El-Sabh, Hazards-91, Dept. Océanographie, Université du Québec, 300, Allée des Ursulines, Rimouski, Québec G5L 3A1, Canada; (418) 724-1707; telex 051-31623; fax 418-723-7234.

European Geophysical Society XVI General Assembly, April 22-26, 1991, Wiesbaden, Federal Republic of Germany. Information: EGS Office, Postfach 49, 3411 Katlenburg-Lindau, Federal Republic of Germany; phone 49-5556-1440; fax 49-5556-4709; Telex 965564 zil d.

International Symposium on Land Subsidence, May 12-18, 1991, Houston, Texas. Information: Ivan Johnson, A. Ivan Johnson, Inc., 7474 Upham Ct., Arvada, CO 80003; (303) 425-5610.

SEPM Midyear Meeting—Continental Margins, Tectonics, Eustasy and Climate Change, August 15-18, 1991, Portland, Oregon. Information: Sam Boggs, Jr., Dept. of Geology, University of Oregon, Eugene, OR 97403; (503) 686-4573.

Third U.S. Conference on Lifeline Earthquake Engineering, August 22-23, 1991, Los Angeles, California. Information: American Society of Civil Engineers, Specialty Conference Dept., 345 East 47th St., New York, NY 10017; (212) 705-7139.

International Symposium on Fossil Cnidaria including Archaeocyatha and Porifera, September 9-14, 1991, Münster, Federal Republic of Germany. Information: Fossil VI. Cnidaria, Pferdegasse 3, D-4400 Münster, Federal Republic of Germany.

American Institute of Professional Geologists Annual Meeting, October 16-19, 1991, Gatlinburg, Tennessee. Information: Lawrence I. Benson, ERC/EDGE, P.O. Box 22879, Knoxville, TN 37933-0879; (615) 966-9761; fax 615-966-4155.

Geological Society of America Annual Meeting, October 21-24, 1991, San Diego, California. Information: GSA, Meetings Department, P.O. Box 9140, Boulder, CO 80301; (303) 447-2020.

Mining Indonesia '91, December 4-7, 1991, Jakarta, Indonesia. Information: Eileen M. Lavine, Information Services, Inc., 4733 Bethesda Ave., #735, Bethesda, MD 20814; (301) 656-2942; fax 301-656-3179.

Send notices of meetings of general interest, in format above, to Editor, *GSA News & Information*, P.O. Box 9140, Boulder, CO 80301.

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