GSA news & information

SUPPLEMENT TO GEOLOGY MAGAZINE

1976 dues options approved by Council

At the meeting of the Council in Boulder, May 11 and 12, 1975, formal action was taken on the dues structure of the Society for the year 1976. All five of the options previously announced will be available. In order to give everyone adequate time to make a choice before the dues statement arrives, a brief summary is given below.

In the March issue of the News & Information section, a series of possible dues and publications options for 1976 was outlined. Accompanying was a checklist requesting each member to register a preference for the guidance of the Council at its May meeting. By the time of the meeting, 7 percent of the membership had responded with the following option preferences (AWP means *Abstracts with Programs*):

A ($18)—Basic membership, monthly News 5.5%
B ($28)—News, 2 AWP, & 24 separates 13.5%
C ($34)—News, Geology, 2 AWP, & 36 separates 46.0%
D ($44)—News, 2 AWP, & Bulletin 8.0%
E ($49)—News, Geology, 2 AWP, & Bulletin 27.0%

Student rates for the above options were approved as follows: A—$10; B—$18; C—$22; D—$30; E—$35

Note: All members will, of course, receive ballots, dues statements, membership cards, and any other direct mailings to the membership, regardless of the option selected.

These results suggest that 73 percent of the membership would select an option including *Geology*, 35 percent would receive the *Bulletin*, 59.5 percent would order separates from the *Bulletin*, 94.5 percent would receive 2 *Abstracts with Programs*, and 5.5 percent would receive only the 12 issues of the 16-page News & Information section (which includes briefs of *Bulletin* articles). In addition, 20 percent of those responding indicated that they would take the additional 5 *Abstracts with Programs*, and 31 percent indicated that they would subscribe to the *Yearbook* at $3.

Basic items included in all options are $2 per member dues assessment to AGI; cost of mailing ballots, dues statements, and membership cards; cost of maintaining membership files, a part of committee and Council costs not covered by the endowment income; and a fraction of the remaining headquarters expenses not attributable to publications or meetings. Such items as research grants, subsidy of reduced dues for students, start-up costs of innovative new programs such as the employment service, and amortization of the headquarters building are covered by endowment income and not calculated into the basic dues. Meetings, in general, break even on costs and therefore no subsidy is included in the dues calculation. In fact, a higher percentage of preparation costs of the *Bulletin* and *Geology* will be charged to nonmember subscribers than is included in the member options so that members will continue to get publications below cost.

$20 publication fee approved for 1976 abstracts

In order to offset part of a substantial budget deficit predicted for 1976, the Council, at its spring meeting, adopted several procedures to reduce expenses or increase income. One of the decisions of the Council was to require that a publication fee of $20 accompany each abstract submitted for consideration for presentation at all GSA meetings in 1976 and subsequent years.

Thus, each abstract to be considered for section and annual meetings must be accompanied by a check or money order made payable to the Geological Society of America. Abstracts that are not accompanied with prepayment will not be considered for a meeting. A full refund will be made for an abstract not accepted. If abstracts must be retyped, an additional $15 charge will be made.

Please note that this fee will be required for section and annual meetings in 1976 and subsequent years. There will be no publication fee required for the next GSA meeting, the annual meeting in Salt Lake City October 20-22. Please see p. 256-257 in the News & Information section of the May 1975 issue of *Geology* for abstract deadlines for 1976 section meetings.

PRELIMINARY ANNOUNCEMENT AND CALL FOR PAPERS

SOUTH-CENTRAL SECTION, 10th ANNUAL MEETING Houston, Texas, February 26-27, 1976

RESERVE THESE DATES NOW

The South-Central Section of the Geological Society of America will hold its tenth annual meeting at William Marsh Rice University, Houston, Texas, on February 26 and 27, 1976. The meeting will be cosponsored by the Houston Geological Society, Texas Southern University, University of Houston, and William Marsh Rice University.

TECHNICAL SESSIONS on Thursday and Friday, February 26 and 27, 1976, will include the following: ***Relationship of Plate Tectonics to Hydrocarbon Accumulation in the Gulf of Mexico*** (organized by Houston Geological Society); ***Geology of Alternate Energy Sources in Texas*** (Houston Geological Society); ***Organic Geochemistry*** (D. R. Baker, Rice University; and R. D. McIver, Exxon Production Research Co.); ***Coastal Processes*** (H. S. Chafetz, University of Houston; and J. McGowan, Bureau of Economic Geology, Austin); ***Geology of Trans-Pecos Texas*** (J. C. Butler and M. F. Carman, Jr., University of Houston); ***Approaches to Quantitative Geology*** (Rudy R. Schwarzer, Texas Southern University and Rice University; Joel L. Gevirtz, Rice University; and J. C. Butler, University of Houston); ***Igneous Geology of Oklahoma, Texas, and Arkansas*** (B. N. Powell, Rice University; D. R. Baker, Rice University; and J. F. Fisher, University of Texas at Arlington); ***Geology and Land Use Planning*** (H. C. Clark, Jr., Rice University; Peter G. Rowe, School of Architecture, Rice University; and Joel L. Gevirtz, Rice University); ***Geophysics and Geology of the Gulf of Mexico*** (J. Lamar Worzel, Galveston Geophysical Laboratory, Marine Science Institute, University of Texas; and Davis A. Fahlquist, Texas A&M University, College Station, Texas); ***Marine Geology and Oceanography of the South Texas Outer Continental Shelf*** (R. E. Casey, Rice University; and H. L. Berryhill, Jr., USGS, Corpus Christi, Texas).

Other sessions will be arranged after abstracts have been received by the program committee, Howard R. Gould, chairman.

FIELD TRIPS will be one or two days after the technical sessions. ***Recent Sediments of Coastal Texas*** (organized by Rufus J. LeBlanc, Shell Development Co., Houston, Texas); ***Plutonic Rocks of the Wichita Mountains Magma Province, Oklahoma*** (B. N. Powell, Rice University; and J. F. Fisher, University of Texas at Arlington); ***Subsidence and Faulting in the Houston Area*** (M. M. Sheets, Houston Geological Society); ***Special Visits to the Lyndon B. Johnson Spacecraft Center*** (Dieter Heymann, Rice University); ***Geologic Hazards in the Greater Houston Area*** (H. C. Clark, Jr., Rice University).

SHORT COURSES will be one day before or after the technical sessions. ***Geological Applications of the Electron Microprobe-Scanning Electron Microscope*** (organized by B. N. Powell, G. E. Fryer, and R. E. Casey, Rice University); ***Meteoritics*** (Dieter Heymann, Rice University); ***Remote Sensing*** (J.A.S. Adams and A. Walker).

ABSTRACTS, which are limited to 250 words, must be submitted camera-ready on official abstract forms available from

Howard R. Gould	Abstracts Secretary
Exxon Production Research Co.	Geological Society of America
P.O. Box 2189	3300 Penrose Place
Houston, Texas 77001	Boulder, Colorado 80301
(713) 622-4222, ext. 2796	(303) 447-2020

Abstracts are due by October 10, 1975. Please note that recent Council action requires that $20 accompany each abstract. If the abstract is not accepted, the $20 will be returned.

Acceptance or rejection of abstracts will be based on the abstracts as submitted by the author.

Send one original and two copies to

Howard R. Gould
Exxon Production Research Co.
P.O. Box 2189
Houston, Texas 77001
(713) 622-4222, ext. 2796

PROJECTION EQUIPMENT will be limited to 2"x2" (35-mm) slides.

DETAILED INFORMATION concerning registration, motel accommodations, and other activities will appear in the News & Information section of a later issue of **Geology** and as a part of the **Abstracts with Programs for 1976.**

ADDITIONAL INFORMATION, REQUESTS, or SUGGESTIONS should be directed to

John A. S. Adams, Local Committee Chairman
Department of Geology
Rice University
P.O. Box 1892
Houston, Texas 77001
(713) 528-4141, ext. 443

The Geological Society of America

Annual Report for 1974

Part 3. Reports of the Treasurer and the Committee on Publications

Report of the Treasurer

To the Council and Membership of The Geological Society of America, Inc.:

In 1974 the total operating revenue of the Society was $1,844,499 and total operating expenses were $2,158,163, resulting in a net operating deficit of $313,664. In 1973, the net operating deficit was $227,723. These two large operating deficits in successive years represent a very serious problem; the financial situation of GSA is poor and is forecast to improve only slightly in 1975. The trio of double-digit inflation, the worst recession since 1936-37, and rapidly increasing publication costs have proven to be very hard obstacles to overcome.

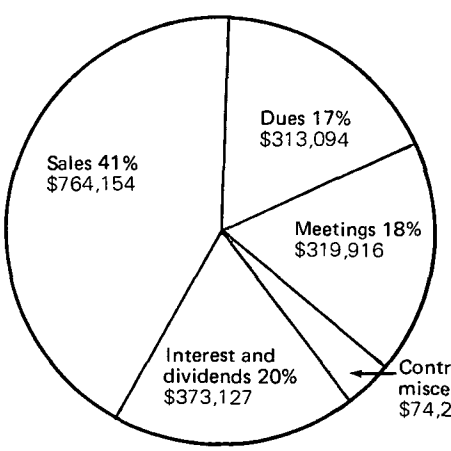
Operating income in 1974 increased by $166,900, but operating expenses increased by $252,841. Increases in revenue were shown by publication sales, meeting, and conference income (a break-even item), dues, and page charges. Increases in expenses were shown by publication costs, meeting and conference costs, research grants, and medals and awards. Dues of members still do not cover the costs of the publications that they receive; we must solve this problem at once.

During 1974, the Society realized net losses of $370,661 on sale of securities, and our investment portfolio declined by year-end to a low of $6,806,230. In the first three months of 1975, the value of our investments has increased considerably from this year-end figure. The most significant figure for 1974 is the *deficiency* of revenue over expenses, including capital losses, which was $684,325 at year-end, compared with an *excess* of revenue over expenses of $15,561 at the end of 1973. This simply cannot be allowed to continue. By any standard, 1974 was GSA's worst year ever insofar as our finances are concerned.

The balance sheet of the Society is still sound and conservative, with total assets of $9,811,676 and total liabilities of $946,859.

Inflation is lessening, and the stock market is recovering, and it is believed that 1975 will be a much better year than 1974. However, we are forecasting a slight deficit, or a break-even situation in 1975 for our statement of revenue, expenses, and changes in fund balances. Any sizeable improvement in our finances will probably not be seen before 1976.

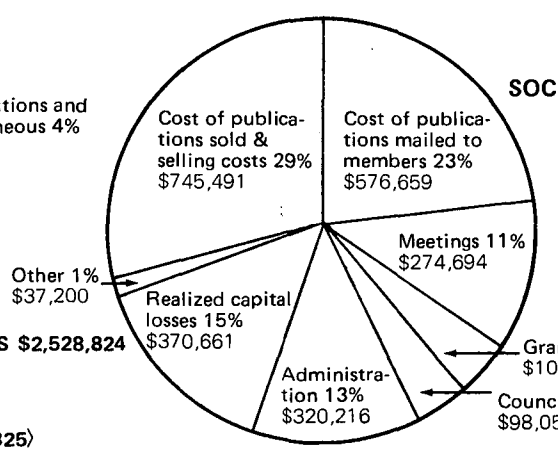
August Goldstein, Jr.



REVENUES $1,844,499

THE GEOLOGICAL SOCIETY OF AMERICA

SOURCE AND APPLICATION OF FUNDS, 1974



EXPENSE AND CAPITAL LOSSES $2,528,824

NET CHANGE IN ALL FUNDS, 1974: $⟨684,325⟩

Report of the Committee on Publications

To the Council and Membership of The Geological Society of America, Inc.:

In 1974 great changes were proposed for 1975 in the publications program of the Society. The changes were made necessary by rapidly rising costs and declining endowment values and income therefrom. However, the committee is pleased to report that the quality and volume of the Society's publications will remain high, and, in fact, the proposed changes will result in better service to the membership and the earth science profession as a whole.

The most significant change recommended by the committee and accepted by the Council after modifications by the Executive Committee was to offer two dues options to the membership:

(1) Members could elect to receive the *Bulletin, Geology,* two *Abstracts with Programs,* and the *Yearbook* for dues of $45 per year, or

(2) elect to receive *Geology,* two *Abstracts with Programs,* the *Yearbook,* and as many as 36 reprints of papers published in the *Bulletin* for dues of $30 per year. *Geology* will have a sixteen-page insert that will carry (a) briefs of all articles in the current issue of the *Bulletin,* (b) a coupon for ordering separates, and (c) material formerly published in *The Geologist,* some material from division newsletters, and other Society information. Members selecting the second option can order separates from each issue of the *Bulletin* as each coupon is received or save coupons and order more than three from any issue of the *Bulletin* up to an annual total of 36. In 1975 slightly more than 50 percent of the membership chose option 1.

Another significant change, which is less obvious to the membership, is a contract entered into by the Society with the American Geological Institute that assures the continuance of AGI's GeoRef system and GSA's *Bibliography and Index of Geology.* Under a five-year contract the Society guarantees the financing of the GeoRef project and assumes marketing responsibility for the *Bibliography* and other products from GeoRef. Although, because of withdrawal of NSF support, this resulted in a considerable increase in the subscription rate for the *Bibliography,* the combined project became financially sound and the Council and the staff deserve great credit for assuring the earth science profession that the valuable computerized earth science information system, GeoRef, and the *Bibliography and Index of Geology* will continue to be available.

Two new publication series were recommended by the committee and approved by the Council. The first is a numbered Map and Chart series. This series, which included seven maps by 1975, provides a means of releasing many maps and charts that formerly would have been published as foldouts in the *Bulletin* or not at all. The second new series is a series of Microform Publications. This provides a rapid and relatively inexpensive publishing medium for peer-reviewed reports that for various reasons, including lack of funds, might not have been published in other series.

Spring meeting

The spring meeting was held in Boulder, April 15-16, 1974. The committee discussed the problems that arose to GeoRef–*Bibliography and Index of Geology* when NSF terminated its financial support at the end of 1974. A new AGI-GeoRef Advisory Committee was formed under the chairmanship of George Becraft. A summary of the report presented by the AGI committee is given below.

(1) The earth science profession must have a computer-based information file and hard copy bibliography, produced in the U.S. (2) GeoRef cannot exist without the *Bibliography* and the *Bibliography* cannot be produced without GeoRef. (3) The *Bibliography* is the basic product of GeoRef and for some time it will be the major source of income for GeoRef. (4) The main, and most reliable, source of adequate revenue will be produced by increasing the subscription price of the *Bibliography.*

The most practical plan for operation of GeoRef and the *Bibliography* for the next few years is as a single unit. AGI will continue to operate GeoRef under contract to GSA. To assure sound financing, the subscription rate for the *Bibliography and Index of Geology* must be increased to $650 per year. The Publications Committee recommended to the Council that the Society enter into the 5-year contract with AGI, and it was signed in July 1974.

The committee discussed the large number of *Abstracts with Programs* for section meetings being distributed free to members. Many members have indicated that they do not want to receive *Abstracts* for all six section meetings. For economic reasons, the committee recommended that free distribution of *Abstracts with Programs* to members be limited to those of the annual meeting and two section meetings of the member's choice. This was later amended by the Council to *Abstracts* for the annual meeting and one section meeting.

The committee formed the ad hoc Subcommittee on Review Articles, Donald B. McIntyre, Chairman, to determine the feasibility of a review article program.

Other matters discussed by the committee were the status of *Geology,* a possible publication on the first 200 years of geology in the United States, microform publications, geodynamics program, *Bulletin* separates program, and staff reports.

Annual Report for 1974 (continued)

Fall meeting

The fall meeting was held in Boulder, September 16-17, 1974.

Discussion of the publications budget for 1975 revolved mainly around two budgets prepared by the staff at the request of the committee: a "business-as-usual" budget and a "break-even" budget. Because of the large deficit estimated in the "business-as-usual" budget, the following recommendations were made to the Budget Committee and the Executive Committee: (1) that *Geology* continue to all members; (2) a brief of each *Bulletin* article be published in advance in the News & Information section of *Geology*; (3) an order blank be printed in the News & Information section of *Geology* that will entitle the member to two *Bulletin* separates per month, cumulatively; (4) the *Bulletin* no longer be included in members' dues; (5) members to be able to subscribe to the *Bulletin* at $30 per year (half the subscription price); (6) the dues be reduced from $36 per year to $30 per year; (7) the nonmember subscription rate for the *Bulletin* remain at $60 per year; and (8) *The Geologist* newsletter and other material be incorporated in the News & Information section in the center of *Geology*. These recommendations, as modified by the Executive Committee, were approved by the Council.

The committee recommended that 25 offprints of *Bulletin* articles be provided free to all senior authors and 75 additional offprints to senior authors whose institutions pay page charges.

Upon Council request, the matter of publishing memorials was re-evaluated. The committee recommended that the present policy on the annual memorials volume be continued, 50 copies of preprints be provided to memorial authors and 50 to the family of the deceased, and in addition, each preprint be listed in the News & Information section, and one copy be provided to members who request it.

The committee, at Council request, considered the deadline for annual meetings abstracts. The committee concluded that the deadline should be a minimum of 17 weeks before the annual meeting to allow sufficient time for the following:

processing, mailing, review, and return of abstracts	3 weeks
in-house preparation of book	4 weeks
printing	4 weeks
second-class mailing	6 weeks
	17 weeks

Bennie W. Troxel reported that because of the considerable cost of including foldouts in the *Bulletin* (average minimum about $1,500 per foldout), he had to adopt a much more stringent attitude toward foldouts. GSA can publish maps separately, in a Map and Chart series, at less cost to GSA because the authors must supply final copy for such illustrations, there is minimal demand on staff labor, and fewer copies would be printed. The committee recommended and the Council approved that GSA establish a numbered series of maps and charts.

In times of rapidly rising costs, the committee felt that more flexibility in how a manuscript could be published was needed. At present, if a manuscript is only marginally acceptable, the editor has only two options—accept it and pay the high cost of publishing it in the *Bulletin* or the two book series, or reject it. An inexpensive, rapid method of release of such reports could be a service to the author, the profession, and the Society. Producing the manuscript, with the author's concurrence, on microform from author-produced (and peer-reviewed) manuscripts would make the information permanently available to those who might have need for it. Therefore the committee recommended and the Council approved that the Society start a numbered Microform Publication series produced from author-prepared (and peer-reviewed) manuscripts.

The committee concluded that it is too late to publish a bicentennial volume in time for the celebration in 1976, and the Subcommittee on the Bicentennial Volume was dissolved.

McIntyre, as Chairman of the Subcommittee on Review Articles, concluded that quite a few journals contain review articles (e.g., *Earth-Science Reviews,* Comments on Earth Sciences; *Geophysics;* Annual Review, *Earth and Planetary Science Letters,* etc.). The committee decided that a series of review articles was not appropriate at this time but that it might be helpful to let the membership know that we are anxious to accept good review articles and to publish them.

The committee commends the strong staff at Society headquarters in Boulder and expresses its gratitude for all the invaluable help the staff provided throughout a very difficult year. Even though 1974 was truly a "year of crises," the publications program remains a vital and strong program of which the members can be proud.

George E. Becraft (Chairman)
William H. Freeman, David B. MacKenzie, Donald B. McIntyre, Daniel F. Merriam, C. F. Burk, Jr. (Conferee)

The Annual Report for 1974, rather than being printed and distributed separately, will appear this year in the News & Information section in segmented form. This is the third part of the series.

Guidelines for preparing abstracts

Abstracts for GSA meetings serve (1) as a basis for selecting papers for GSA meetings, (2) to aid people in deciding which papers they wish to hear at a meeting, and (3) as a published document for reference. Each abstract should, therefore, not only be well presented but also should be informative. Abstracts that contain statements such as "A new model will be presented," "the problem of . . . will be considered," ". . . will be discussed," or "the . . . is described," are inadequate. Such abstracts outline what papers are about, but do not tell what they contribute. They are not informative.

One dictionary (Webster's unabr. 2nd ed.) defines an abstract as "That which comprises or concentrates in itself the essential qualities of a larger thing. . . ." Our abstracts must contain the *essential information* of our papers, without added commentary or interpretation. An abstract differs from a summary in that the latter is usually a restatement, generally at the end of a paper, only of salient findings and conclusions. The abstract, on the other hand, also includes other vital portions of a paper, such as purpose and methods.

The importance of the abstract is stated by K. K. Landes in "The Scrutiny of the Abstract, II" (in Cochran, W., and others, eds., 1973, Geowriting: Washington, D.C., Am. Geol. Inst., 80 p.):

"To many writers the preparation of an abstract is an unwanted chore required at the last minute by an editor or insisted upon even before the paper has been written by a deadline-bedeviled program chairman. However, in terms of market reached, the abstract is *the most important part of the paper.* For every individual who reads or listens to your entire paper, from 10 to 500 will read the abstract.

"If you are presenting a paper before a learned society, the abstract alone may appear in a preconvention issue of the society journal as well as in the convention program; it may also be run by trade journals. The abstract which accompanies a published paper will most certainly reappear in abstract journals in various languages, and perhaps in company internal circulars as well. It is much better to please than to antagonize this great audience. Papers written for oral presentation should be *completed prior to the deadline for the abstract,* so that the abstract can be prepared from the written paper and not from raw ideas gestating in the writer's mind." [*p. 34*]

B. H. Weil, in "Standards for Writing Abstracts" (ibid.), noted the following on the purpose and importance of abstracts:

"A well-prepared abstract enables readers to identify the basic content of a document quickly and accurately, to determine its relevance to their interests, and thus to decide whether they need to read the document in its entirety. Readers for whom the document is of fringe interest often obtain enough information from the abstract to make their reading of the whole document unnecessary. Therefore, every primary document should include a good abstract. Secondary publications and services that provide bibliographic citations of pertinent documents should also include good abstracts if at all possible." [*p. 36*]

"For various reasons, it is desirable that the author write an abstract that the secondary services can reproduce with little or no change. These reasons include the economic pressures on the secondary services caused by continuing increases in the volume of scholarly publication; the need for greater promptness on the part of the secondary services in publishing information about the primary literature; and the growing value of good authors' abstracts in computerized full-text searching for alerting and information retrieval." [*p. 35*]

Weil (ibid.) offers the following recommendations for writing good abstracts:

"Make the abstract as informative as the document will permit, so that readers may decide whether they need to read the entire document. State the purpose, methods, results, and conclusions presented in the document, either in that order or with initial emphasis on findings." [*p. 35*]

"For most papers and portions of monographs, an abstract of fewer than 250 words will be adequate. For notes and short communications, fewer than 100 words should suffice. Editorials and Letters to the Editor often will require only a single-sentence abstract. For long documents such as reports and theses, an abstract generally should not exceed 500 words and preferably should appear on a single page.

"Begin the abstract with a topic sentence that is a central statement of the document's major thesis, but avoid repeating the words of the document's title if that is nearby. . . .

"Write a short abstract as a single, unified paragraph, but use more than one paragraph for long abstracts, e.g., those in reports and theses. Write the abstract in complete sentences, and use transitional words and phrases for coherence.

"Use verbs in the active voice whenever possible; they contribute to clear, brief, forceful writing. The passive voice, however, may be used for indicative statements and even for informative statements in which the receiver of the action should be stressed.

"Avoid unfamiliar terms, acronyms, abbreviations, or symbols; or define them the first time they occur in the abstract.

"Include short tables, equations, structural formulas, and diagrams only when necessary for brevity and clarity." [*p. 37*]

Whereas an abstract should present the quantitative and (or) qualitative information in a paper, Weil (ibid.) points out that this is sometimes impracticable:

"However, some discursive or lengthy texts, such as broad overviews, review papers, and entire monographs, may permit the preparation of an abstract that is only an *indicative* or descriptive guide to the type of document and what it is about. A combined *informative-indicative* abstract must often be prepared when limitations on the length of the abstract or the type and style of the document make it necessary to confine informative statements to the primary elements of the document and to relegate other aspects to indicative statements." [*p. 35*]

Selection of annual meeting sites explained

GSA members have recently voiced some complaints about the number of future annual meetings scheduled in western states. The following information on method of selection of annual meeting sites may help to explain choice of a city.

Before any city can be considered as the site of an annual meeting, the GSA Council must receive an invitation from local members representing hosting groups, such as university geology departments, state surveys, and so on. A local committee composed of many member volunteers is required to host and plan the meetings.

When an invitation is received from a local group, the Council instructs the annual meeting manager to investigate the city's facilities. To stage an annual meeting, at least 35 large meeting rooms are needed, with space for 100 exhibit booths, 50 poster session booths, and about 40 employment interview booths. Also, approximately 1,500 sleeping rooms are needed, as well as the facilities to handle the many business meetings, food functions, and cocktail parties sponsored by the divisions, alumni groups, and associated societies meeting with us. Local union regulations must also be considered, for these can increase costs considerably.

When selecting any city, hotel, or convention complex to house GSA's annual meeting, the annual meeting manager must consider total costs for all those attending. Based on the price of an average hotel room and three meals a day, the following are some sample figures of daily costs from a recent sales management survey:

Dallas	$34.15	Boston	$41.45
Denver	$37.15	Chicago	$43.55
Seattle	$37.00	New York City	$53.55
Atlanta	$35.15	Washington, D.C.	$46.40

The popularity of city, geographic location, climate, and potential for good field trips are also taken into consideration in site selection.

If results of this investigation indicate that a city is physically capable of adequately handling a GSA meeting, formal acceptance of the invitation from the local group is made by the Society's Council.

Listed below are dates and locations of GSA annual meetings through 1980:

1975	Salt Lake City, Utah	October 20-22
1976	Denver, Colorado	November 8-10
1977	Seattle, Washington	November 7-9
1978	Toronto, Ontario	October 23-25
1979	San Diego, California	November 5-7
1980	Atlanta, Georgia	(dates not selected)

This schedule *does* show a concentration of meetings in the west; however, it should be pointed out that only one invitation has been received from a group in an eastern city. Because of the rapid growth of the Society's annual meetings and competition for space, it is necessary to schedule them at least 5 to 8 years in advance, and it is often difficult for local groups to plan this far ahead in issuing an invitation.

Members are reminded that *section* meetings, held in many different geographical locations across the country, offer an opportunity to attend a GSA meeting in their local area.

We hope this explanation of annual meeting site selection will answer any questions members may have. If you have other questions, or if your local group is interested in extending an invitation for an annual meeting, please write to the executive director or the annual meeting manager at headquarters. We are always interested in improving our annual meetings, and we welcome any suggestions and constructive comments.

□□□□□□□□□□

Employment Interview Service

The Employment Interview Service will be held at the Society's 1975 Annual Meeting in Salt Lake City, October 20-22, 1975, in the Salt Palace. Employers participating in this service may request computer printouts of applicant listings by mail before *September 19*, or at the time of the meeting. Interview space will be available during the meeting to assist employers in making personal contact with attending applicants. The minimum fee for employer recruiters is $30, which includes three specialty listings of applicants. Interview booth space fees are $5 for each half day of use. Requisite forms may be obtained from the GSA News & Information section of the June issue of *Geology* or by writing to Joan Heckman, Membership Coordinator, Geological Society of America, 3300 Penrose Place, Boulder, Colorado 80301.

Necrology

Wilbur S. Burbank, Exeter, New Hampshire; Albert J. Frank, St. Louis, Missouri; William K. Gregory, Kingston, New York; Frank C. Greene, Kansas City, Missouri; Charles M. Nevin, Ithaca, New York; Rodney C. Rhodes, Albuquerque, New Mexico; Hans E. Thalmann, Stanford, California; and Max G. White, Arlington, Virginia.

DAMAGED BULLETINS?

We are receiving some complaints from members about postal service damage to copies of the *Bulletin*. Please let us know if you are having this problem and we will gladly replace the damaged issue. Be sure to indicate which issue was damaged when you request a replacement and include your name and address.

Letters from members

More discussion of role of national and section meetings

Geopersons:

We would like to reply, in part, to a recent letter (April 1975) which appeared in *Geology* concerning the role of national and sectional meetings of the GSA. The letter, by Dr. R. J. Cuffey, advocated expanding national meetings, essentially eliminating editorial review of submitted abstracts, opening sectional meetings to any topic, and resuming dissemination of all copies of *Abstracts* to members. All in all, Dr. Cuffey's intent to stimulate communication among geoscientists is indeed a noble one; however, we do have some doubts concerning his methods to achieve this end.

The first question we must raise is whether mammoth meetings really nurture a spirit of true communication. Granted, the more sessions there are, the more podium space there is for speakers, but do the attendees truly benefit? As graduate students, we have attended the last two national meetings, and our impressions were not always favorable. First of all, with about a dozen sessions running concurrently at any given time, it is virtually impossible for a geoscientist of reasonably broad interests to attend all of the papers of pertinence to him. We found ourselves dividing up the sessions by listening to a talk or two here, then dashing off to another symposium in a far distant corner of the meeting hall. Such exercises may do wonders for physical fitness, but do they really foster intellectual development? Such hectic activity limits the time the participants can spend discussing the paper being presented.

Secondly, the time available for oral presentation very often throttles communication. Naturally, any reasonably skilled orator can present his/her ideas in fifteen minutes, but often there is almost no time allowed for discussion (except in symposia). Can we really exchange ideas effectively under such strictures? In addition, the very nature of the oral presentation, given a large room filled with people, tends to make questioners self-conscious and sometimes unwilling "to delay the proceedings" with queries.

Such concerns, we believe, argue against any expansion of the national meeting in its current format. These last four words are important because we do think that alternatives are available which would enable the meeting to be maintained at its present large size and still make it a more effective forum for discussion. These are outlined below:

¶ Allow five minutes of discussion time after each paper. This can be achieved by reducing the time allotted for each speaker to ten minutes or (more preferably) decreasing the number of papers per session from fourteen to ten.

¶ Where possible, group concurrent sessions where interest may overlap into nearby localities, an efficiency measure which apparently has been overlooked. At the Miami Beach meeting, for example, concurrent sessions on "Marine Geology: Sedimentary Processes" and "Sedimentology" were in two different hotels.

¶ Increase the number of poster session papers at the expense of oral presentations. We found these sessions to be truly stimulating to discussion, and attendees can choose their papers in a more leisurely fashion. Although this does put an increased burden on the speaker, we think most people will accept this.

¶ Finally, a program of voluntary non-presentation of papers could be introduced. The abstracts of these should be published in the normal fashion, but annotated to indicate that they will not be presented. In the program, non-presented papers should be listed in the appropriate session along with a place where the author may be contacted for further enquiry.

By and large, we believe that the above measures will help alleviate some of the present problems with the national meeting without making it into an unmanageable behemoth. We also think that abstracts should continue to be subject to editorial review. It does little good to listen to a paper at the meeting that one has just read in the *Bulletin* the preceding month!

We do agree with Dr. Cuffey's other concerns, namely that sectional meetings be open to general topics, and copies of these abstracts sent to all members. Such a program may indeed take a good deal of the "growth pressure" off the national meeting. In general, then, we do not feel that bigger is necessarily better, but rather that GSA meetings can be made more efficient and effective by re-evaluating the format and policies.

Sincerely,

Richard F. Yuretich
Michael A. Arthur
Princeton University, Princeton, N.J. 08540

One of the functions of the News & Information section is to stimulate discussion among members about the operation of the Society. As space permits, we will publish letters from the membership that reveal problem areas and suggest corrective changes in policies and procedures. Obviously, not all letters that come to headquarters can be published. Our hope is that we will be able to select a few on a wide range of subjects and, on occasion, to publish letters responding to previously published letters. No letter will be published without the specific permission of the writer.

Presidential addresses: Sacred cows of geology?

DISCUSSION

Controversy serves science by stimulating critical thought and research. Yet officially, the Geological Society of America "muffles" controversy by rejecting discussions of presidential addresses.* I believe that this type of censorship is both contrary to the nature of science and a violation of Article II of the GSA constitution, which states: "The purpose of the Society is the promotion of the science of geology . . . ."

The presidential address has two forms. It is presented orally at the annual meeting, and it is later published in the *Bulletin*. At the annual meeting, out of respect to the retiring president, we do not allow official discussion of the presidential address. This is as it should be. Further, because of demands on the president's time while he is in office, prepresentation review of his remarks is impractical.

Presidential addresses may range from summaries to provocative, controversial presentations of new data and interpretations. In either case, if the ideas presented are to become a part of the literature, I believe that they should be reviewed, just as any new ideas or data are reviewed, prior to publication. In the absence of prepublication review, I believe postpublication discussion must be allowed.

The following arguments have been presented, in support of the view that presidential addresses should not be discussed, by geologists with whom I have discussed this subject.

1. The president should be allowed to have his say, at least once, without being questioned (executive privilege).

2. The absolute freedom of the president in choosing the topic of his address may be threatened by the specter of discussions and replies. Thus, future presidents may choose conservative topics, depriving the membership of the opportunity to hear information and ideas it should hear.

3. Presidential addresses do not have peer review, in contrast to regular articles published in the *Bulletin*; therefore they should not be discussed after publication.

4. The GSA is "fortunate" to have "a high proportion of members" who prefer to permit presidential addresses to remain unchallenged.

Reasons 1 and 2 are basically political in nature. As such, they have no place in science. In addition, with regard to reason 2, if the remarks of the president are worth hearing, and if they have scientific rather than political value, then they should be exposed to the same scrutiny to which other scientific contributions are subjected. Further, in no way should the threat of discussion deter a scientist from choosing a worthy topic for a presidential address. If critical evaluation is a deterrent, I doubt such a scientist should be our leader.

Reason 3, it seems to me, is an argument *for* discussions. Because the president's remarks do not get prepublication review, it is more important for them to receive postpublication review.

Is the Society "fortunate" to have "a high proportion of members" who would rather let scientific ideas remain undisputed? I doubt it. I believe it is *unfortunate*.

Loren A. Raymond
Department of Geology
Appalachian State University
Boone, North Carolina 28608

REPLY

Dr. Raymond is to be commended for opening discussion of this subject, which, though not the largest problem that confronts geologists, still is of interest to Society members.

To my knowledge, GSA has never had a firm official policy concerning acceptance or rejection ("censorship") of discussions of presidential addresses. Instead, we have tended to follow a long-standing custom that is common to nearly all scientific societies—a presidential address is immune to discussion. Decisions as to acceptance or rejection of specific proposed discussions are actually left to the judgment of the *Bulletin*'s Editor, who may or may not choose to make an exception to the custom. Raymond notes one such exception; while I was GSA's Editor, I also made one. I published a discussion of President Krauskopf's address, but only after I had received the President's permission to do so.

Despite my own lapse from grace, I feel rather strongly that the custom of granting immunity to our presidents should be preserved except in very special circumstances.

First, rather than "executive privilege," I believe immunity is a *courtesy* that we owe our outgoing leader.

Second, since I was elected to GSA, I have observed 36 presidents come and go and have worked directly under several of them. These men differed enormously in many ways, but they were all alike in possessing scientific courage and intellectual honesty. I can't imagine any of these, or any future president, taking a conservative course simply to avoid criticism of his ideas.

Finally, there are other and better ways to set the record straight than by discussion of a presidential

Letters continued on p. 386

* The GSA did publish a discussion of the Vice-Presidential Address of the AAAS; see Emory, K. O., and Natland, M. L., 1953, Our shrinking globe—A discussion: Geol. Soc. America Bull., v. 63, p. 1069-1072.

Letters

Continued from p. 385

address. Such an address may at times be a swan song, a summation of a career, but it is no more the final word on any topic in geology than is any other scientific paper. Anyone who has facts or inferences that differ from those in the published literature, and that can carry the science one step further, has the right and duty to make his own addition to the literature. This method should take care of any needed peer review.

Edwin B. Eckel
U.S. Geological Survey
Federal Center, Denver, Colorado 80225

Questions and answers about estimates of page charges

Excerpt from a letter to B. W. Troxel, Science Editor:

At the time that the page charge form is returned to you, my institution requires that a requisition be submitted to our business office. On this requisition I must indicate the total amount of the page charges. The problem is, what is the amount of page charges? How do I equate manuscript pages with journal pages? If I estimate low and the grant expires before the paper is published, GSA is short-changed. If I estimate high and the grant expires I run the risk of losing the unused funds. From my perspective, the way to solve this problem is for GSA to send with the page charge form a statement of estimated page charges. I do recognize that this may create problems for you and your staff.

Sincerely yours,
Paul D. Fullagar, Department of Geology,
University of North Carolina,
Chapel Hill, North Carolina 27514

Dear Mr. Fullagar:

Several times a year we provide estimates of page charges for people with grant problems. We are happy to oblige any requests for estimates, especially to those who have grants that will expire before our usual billing time.

We don't do this for every paper simply because more persons than not do not need the information sooner than we bill them.

As a rough estimate, four typewritten pages equal one *Bulletin* page. To this add the space occupied by figures and captions.

Sincerely,
Bennie W. Troxel, Science Editor

Nomenclature pamphlet reprint available for $2

"Stratigraphic Nomenclature in Reports of the U.S. Geological Survey," an informative pamphlet developed for use within the USGS, has become a standard reference for several organizations. Because it has widespread application and is recommended as a guide by the Geological Society of America, it has been reprinted by the Society and made available as a service to the geologic profession.

Authors of reports for consideration by the GSA will find that this pamphlet is a useful guide, and it is provided as a convenience especially to those authors.

It may be purchased by members and nonmembers for $2 from Publication Sales, The Geological Society of America, 3300 Penrose Place, Boulder, Colorado 80301. (Residents of Colorado please add 3 percent state sales tax. Residents of Denver metro area please add 3½ percent state and local taxes. Residents of Boulder please add 5½ percent state and local taxes.)

Only orders accompanied by full payment will be honored. Discount purchase prices are available for large quantities. Write for prices.

A companion article, "Code of Stratigraphic Nomenclature, American Commission on Stratigraphic Nomenclature," is available for $1.00 from AAPG, Box 979, Tulsa, Oklahoma 74101.

Subject categories in Bulletin?

A common suggestion received from members from time to time is to divide the *Bulletin* into sections based on subject categories, such as is done by AGU. The suggestion has been considered at various meetings of the Committee on Publications and not adopted for two reasons. First, the Society is clearly interested in all aspects of the earth sciences and thus has been reluctant to create a series of compartmentalized journals. Second, it would remain to be seen whether such action would have any financial benefits.

AGI seeks suggestions for film series

We have received from the AGI Director of Education, William H. Matthews III, an invitation for our members to offer suggestions for their Earth Science Film Series.

"As future planning for the series takes place, we would like to provide the members and officers of the GSA an opportunity to submit suggested titles of new films that might be added to the existing series. These need not be in the special interest area of your particular organization; instead, we welcome suggestions for any earth science topic."

Any suggestions you wish to make may be routed through GSA headquarters or sent directly to William H. Matthews III, AGI Director of Education, Box 10031, Lamar University Station, Beaumont, Texas 77710 (Telephone: 713-838-8913).

July BULLETIN briefs

Brief summaries of articles in the July 1975 GSA Bulletin *are provided on the following pages to aid members who selected the lower dues option to select* Bulletin *separates of their choice. The Document Number of each article is repeated on the coupon and mailing label in this section.*

☐ 50701—Middle Cambrian Stratigraphy of the House, Wah Wah, and Adjacent Ranges in Western Utah. *Lehi F. Hintze, Department of Geology, Brigham Young University, Provo, Utah 84602; Richard A. Robison, Department of Geology, University of Kansas, Lawrence, Kansas 66045.* (11 p., 5 figs., 2 tbls.)

The following usage is proposed for the House Range: Lower Cambrian—Prospect Mountain Quartzite and the lower member of the Pioche Formation; Middle Cambrian—Tatow Member of the Pioche Formation, Millard Member and upper members of the Howell Limestone, Chisholm Formation, Dome Limestone, Whirlwind Formation, Swasey Limestone, Wheeler Shale, Marjum Formation, and the lower part of the Weeks Limestone.

New formations defined in the Wah Wah Mountains include the Eye of Needle Limestone (Wheeler Shale equivalent), Pierson Cove Formation (lower Marjum Formation equivalent), and the Wah Wah Summit Formation (Weeks Limestone near equivalent). The Trippe Limestone is extended from the Deep Creek Range into west-central Utah, and a new member, Fish Springs Member, is defined as a thin but widely mappable unit.

The House Range contains the most continuously fossiliferous trilobite sequence, but most ranges in western Utah contain the following faunas: *Albertella, Glossopleura, Ehmaniella, Ptychagnostus gibbus, Bathyuriscus fimbriatus,* and *Eldoradia. Key words: stratigraphic nomenclature, trilobite faunas, carbonate rocks.*

☐ 50702—Geochemistry of Strontium in the Scioto River Drainage Basin, Ohio. *Alan M. Stueber, A. Dwight Baldwin, and John B. Curtis, Jr., Department of Geology, Miami University, Oxford, Ohio 45056; Paul Pushkar and John D. Steele, Department of Geology, Wright State University, Dayton, Ohio 45431 (present addresses: Curtis, 121-4 Roaming Road, Minot AFB, North Dakota 58701; Steele, Illinois State Geological Survey, Urbana, Illinois 61801).* (5 p., 4 figs., 2 tbls.)

Ground water that emanates from carbonate bedrock in the Scioto River drainage basin is characterized by $^{87}Sr/^{86}Sr$ ratios in the range of 0.708 to 0.709; unusually high Sr/Ca ratios in this water identify celestite lenses within the carbonate bedrock as the dominant source of strontium. Ground water from clastic bedrock, principally shale, has $^{87}Sr/^{86}Sr$ ratios that vary from about 0.710 to about 0.713 and shows low Sr/Ca ratios. Thus, two basic ground-water types that emanate from bedrock within the basin can be identified by these two parameters. Most ground water that has been in contact only with glacial till, which covers the northern two-thirds of the basin, has carbonate-type $^{87}Sr/^{86}Sr$ ratios as well as high Sr/Ca ratios. Celestite is apparently present in the till throughout much of the Scioto basin. Ground water that contains celestite-derived strontium, whether from the carbonate bedrock or the till, has so great a strontium content as to control completely the $^{87}Sr/^{86}Sr$ ratios of surface water northwest of the glacial boundary. This fact limits the usefulness of the $^{87}Sr/^{86}Sr$ parameter as a tracer in water studies within the basin. *Key words: geochemistry, strontium isotopes, ground water, surface water.*

☐ 50703—Foraminiferal Life and Residue Assemblages from Cretaceous Slope Deposits. *William V. Sliter, U.S. Geological Survey, Menlo Park, California 94025.* (10 p., 9 figs., 2 tbls.)

Distinctive foraminiferal assemblages and dissolution patterns are associated with Cretaceous clastic deep-water sediments along the eastern North Pacific continental margin. These sediments were deposited in bathyal, low-oxygen chemically reducing environments, as is evidenced by their foraminiferal composition, lithology, sedimentary constituents, organic-carbon content, and associated organisms. In species composition and morphology, the foraminiferal assemblages closely resemble modern faunas from low-oxygen environments on the continental slope and in deep-water basins along the eastern North Pacific Ocean. The Cretaceous life assemblage is characterized by species of *Praebulimina*, the subfamily Chilostomellinae,

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and several agglutinated and nodosariid genera, among others. In southern California this assemblage is restricted to the laminated mudstone facies of the Upper Cretaceous Point Loma Formation, which exhibits limited bioturbation and contains large amounts of organic detritus and pyrite. By comparison with modern depositional environments, bottom conditions probably were oxygen deficient but not anaerobic.

Differential preservation of the foraminiferal fauna in the Point Loma Formation resulted from diagenic dissolution in the chemically reducing sediments. The subsequent residue assemblage is enriched in resistant forms such as thick-walled, compact calcareous and agglutinated benthic species; it is impoverished in planktonic and less resistant benthic species. Selected species are ranked according to their susceptibility to dissolution by noting their successive stage of preservation. These data illustrate the complex interactions between environmental and diagenetic processes that strongly influence interpretations of paleontologic age and environment of deposition. *Key words: micropaleontology, foraminifera, Holocene, paleoecology, ecology, continental slope, diagenesis.*

☐ 50704—Geology and Age of the Wolf River Batholith, Wisconsin. *W. R. Van Schmus, Department of Geology, University of Kansas, Lawrence, Kansas 66045; L. G. Medaris, Jr., Department of Geology, University of Wisconsin—Madison, Madison, Wisconsin 53706; P. O. Banks, Department of Geology, Case Western Reserve University, Cleveland, Ohio 44106.* (8 p., 7 figs., 4 tbls.)

The Wolf River Batholith is an anorogenic plutonic complex in central and northeastern Wisconsin that is similar lithologically to the rapakivi massifs of Finland. Quartz monzonite, the most abundant rock type present, can be subdivided into three major lithologic units, one of which commonly has well-developed rapakivi texture. Other rock types include syenite, granite, quartz and feldspar porphyries, monzonite, and anorthosite; the anorthosite exists as isolated masses within the quartz monzonite and may or may not be genetically related to the main complex.

Whole-rock Rb-Sr data yield an age of 1,468 ± 34 m.y., with initial $Sr^{87}/Sr^{86} = 0.7048 \pm 0.0017$ (λ (Rb^{87}) = 1.39×10^{-11} yr^{-1}). U-Pb data from cogenetic zircon fractions define a concordia intercept age of 1,510 ± 15 m.y. for traditionally used values of the U^{235} and U^{238} half-lives or an age of 1,485 ± 15 m.y. based on recently redetermined values. Rb-Sr data also show that the syenite complex of the Wausau area is approximately, if not exactly, the same age as the Wolf River Batholith.

The Wolf River Batholith is similar in age to other granite masses in southeastern Missouri and the southwestern United States and is apparently a representative of widespread anorogenic igneous activity that existed throughout the southern part of the North American continent 1,400 to 1,500 m.y. ago. *Key words: geochronology, igneous rocks, Precambrian, absolute ages.*

☐ 50705—Nested Submarine-Fan Channels in the Capistrano Formation, San Clemente, California. *Roger G. Walker, Department of Geology, McMaster University, Hamilton, Ontario, Canada L8S 4M1.* (10 p., 18 figs., 1 tbl.)

At San Clemente State Beach, eight turbidite-filled channels are exposed in a sea cliff 550 m long and 30 m high. The channel margins show a progressive northwestward lateral shift in position and thus are nested one alongside another. Three adjacent channels trend between 270° and 300°, with west-northwest turbidity-current flow. Four other adjacent channels trend between 230° and 240°, with southwest flow. Seven of the eight channels received mud and silt deposits in the form of a drape over the channel walls before deposition of graded sand beds took place. In some channels, these graded beds belong to the "classical" turbidite facies, but in others, the sandstone deposits are pebbly, beds are thick, and interbeds of shale are thin to absent. In three of the channels, there is an overall upward fining and thinning of beds, implying progressive channel abandonment. By contrast, the beds filling one channel become coarser and thicker upward, implying a prograding turbidite lobe. The channels are assigned to the braided suprafan part of the submarine-fan model. *Key words: turbidite, submarine-fan, channels, Capistrano Formation, Miocene.*

☐ 50706—Stratigraphic Importance of Chlorite in the Cretaceous Raritan Formation Underlying Coastal New York. *Richard S. Liebling and Horst S. Scherp, Department of Geology and Geography, Hunter College, 695 Park Avenue, New York, New York 10021.* (4 p., 2 figs.)

Because biostratigraphic and obvious structural markers are lacking, correlation and interpretation of the exclusively clastic Cretaceous section underlying Nassau County, Long

July BULLETIN briefs

Island, New York, have been based solely on the nature and distribution of various sediments.

Detailed clay mineralogical analysis of drill-core samples now establishes an extensive horizon of chlorite-bearing clay in the Raritan Formation, which is interpreted to constitute a time-rock unit. The structural attitude of the chlorite zone with respect to overlying rocks suggests the presence of an angular unconformity.

The contact between the Raritan and the Magothy Formations—traditionally recorded at the bottom of a laterally discontinuous gravelly layer—is placed at the unconformity. *Key words: sedimentary petrology, stratigraphy, clay mineralogy, structural geology.*

☐ 50707—Avalonian Igneous Activity in the Manhattan Prong, Southeastern New York. *Douglas G. Mose, Department of Geology, Brooklyn College, Brooklyn, New York 11210, and Department of Geology, Florida State University, Tallahassee, Florida 32306; John Hayes, Department of Geology, Brooklyn College, Brooklyn, New York 11210.* (4 p., 3 figs., 1 tbl.)

The Manhattan Prong in southeastern New York consists primarily of a Cambrian-Ordovician sequence (Lowerre Quartzite, Inwood Marble, Manhattan Schist) that unconformably overlies the Fordham Gneiss of uncertain age. Rb-Sr whole-rock analyses of the Pound Ridge Granite Gneiss, a rock unit within the Fordham Gneiss, indicate that the granite gneiss formed 596 ± 19 m.y. ago, with an initial $^{87}Sr/^{86}Sr$ ratio of 0.7287 ± 0.0130. Field relations suggest that the Pound Ridge Granite Gneiss was an Avalonian volcanic rock or accumulation of migmatitic fluids. As such, this Rb-Sr age determination is a minimum age for the Fordham Gneiss. *Key words: geochronology, absolute age, intrusions, metamorphic rocks, Precambrian, faults.*

☐ 50708—Quaternary Vertical Movements in the Greater Antilles. *William Thornton Horsfield, Department of Geology, University of the West Indies, Mona, Kingston 7, Jamaica (present address: Koninklijke/Shell Exploration and Production Laboratory, Volmerlaan 6, Rijswijk (ZH), Netherlands).* (6 p., 5 figs.)

The variable elevation of raised Quaternary marine terraces in the Greater Antilles is interpreted to be due principally to variable tectonic uplift. Such terraces are highest and most numerous in northwestern Haiti and southeastern Cuba. Elsewhere, they tilt noticeably away from this focus and are at lower elevations and less numerous. The dome-like uplift is in a region characterized by graben faulting and late Cenozoic alkaline volcanism, an association which invites comparison with the Rhine and East African Rift Systems.

Quaternary tilting is also inferred from the depth variations over shallow submarine banks. A profile across some of these banks to the east of Jamaica indicates a local synclinal axis. *Key words: Quaternary, tectonics, Caribbean, raised reefs.*

☐ 50709—Radiometric Ages from the Serra dos Carajas Area, Northern Brazil. *Celso B. Gomes and Umberto G. Cordani, Instituto de Geociências, Universidade de Sao Paulo, Sao Paulo, Brasil; Miguel A. S. Basei, RADAM-Belém, Trav. Benjamin Constant, 1027, 66000 Belém-Para, Brasil.* (4 p., 3 figs., 2 tbls.)

K-Ar and Rb-Sr age determinations for rocks of the Serra dos Carajas area, northern Brazil, indicate that the rocks were affected by the Transamazonian orogenic cycle, whose syntectonic phase is supposed to have taken place at about 1,960 m.y. ago. Posttectonic activity in the region is related to some granitic intrusions about 1,800 m.y. old, followed by the accumulation of postorogenic sedimentary and associated volcanic rocks. One of the anorogenic bodies is about 1,400 m.y. old. A late Paleozoic magmatic episode is indicated by diabase dike intrusions. Events prior to the Transamazonian orogeny have been also recognized in the area between Serra do Cinzento and Serra Buritirama. *Key words: geochronology, regional geology, Brazil.*

☐ 50710—Geology and Geochemistry of Triassic Diabase in Pennsylvania. *Robert C. Smith II, Arthur W. Rose, and Robert M. Lanning, Department of Geosciences, The Pennsylvania State University, University Park, Pennsylvania 16802 (present addresses: Smith, Pennsylvania Geological Survey, Harrisburg, Pennsylvania 17120; Lanning, U.S. Navy, Corpus Christi, Texas).* (13 p., 7 figs., 6 tbls.)

Based on chemical composition and mineralogy, three types of Triassic diabase are recognized in Pennsylvania. The probable oldest type (Quarryville type) occurs as an olivine tholeiite dike swarm. The York Haven type is quartz tholeiite, forming sheets, dikes, and a few flows. The

youngest Rossville type is also quartz tholeiite that occurs as sheets and dikes. Within samples of the same type, chemical composition is very uniform. In content of major elements, rare earths, and Ba, the Rossville type resembles island-arc tholeiite. The York Haven type is similar to continental tholeiite.

Based on calculated cooling rates and the homogeneity within each type of magma, plus paleomagnetic data, we conclude that each type was emplaced within a relatively short time period, and that all sheets, dikes, and flows of a single compositional type are essentially contemporaneous. The trend of Triassic diabase dikes in Pennsylvania parallels the trend of Precambrian and Paleozoic dikes, suggesting that trends of dikes may reflect pre-existing structural weaknesses in the basement rather than being an exact indicator of stress orientation during Triassic time.

The two quartz tholeiites can be formed by crystallization of 30 to 45 percent of the olivine tholeiite magma as olivine, minor clinopyroxene, and plagioclase or spinel, accompanied by assimilation of orthopyroxene, probably from the mantle. Rare-earth and Sr-isotope data suggest that the York Haven type probably assimilated as much as 20 percent crustal material, whereas the Rossville type assimilated little or none. These phenomena of multiple-stage fractionation and reaction of the magma with mantle and crust probably apply to most magmas. *Key words: igneous petrology, geochemistry, magma genesis, trace elements, Triassic, Pennsylvania.*

☐ 50711—Use of Fourier Shape Analysis in Zircon Petrogenetic Studies. *Gary R. Byerly and John V. Mrakovich, Department of Geology, Michigan State University, East Lansing, Michigan 48824; Robert J. Malcuit, Department of Geology, Denison University, Granville, Ohio 43023 (present address, Byerly: Mineral Sciences, Smithsonian Institution, Washington, D.C. 20560).* (3 p., 2 figs., 3 tbls.)

Zircon morphology has long been an important parameter in the study of petrogenesis in igneous and metamorphic rocks and provenance in sedimentary rocks. Fourier shape analysis is a much more sensitive technique for morphological analysis than the more widely used elongation ratio. Secondly, subtle variations in shape can also be determined by Fourier shape analysis.

Zircon populations from three compositionally similar granitic plutons from the Western Intrusive Series of the Sierra Nevada batholith differ significantly in average morphology as determined by Fourier shape analysis. This technique resolves a two-dimensional shape into multiple shape components (harmonics) with each component making an independent contribution to the total shape. Seven of the nine harmonics analyzed are statistically significant in orthogonal comparisons of the zircon populations.

Information carried by each harmonic should be of use in determining the significance of zircon morphology in petrogenic studies and will prove especially useful where differences are subtle. *Key words: zircon, Fourier shape analysis, statistics.*

☐ 50712—Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex. *Bruce H. Wilkinson, Department of Geology and Mineralogy, The University of Michigan, Ann Arbor, Michigan 48104.* (9 p., 11 figs.)

Matagorda Island is a wide, sand-rich, barrier-island complex on the central Texas coast. This barrier initially formed as an intermittently emergent sand shoal which migrated landward during the late Holocene transgression and then became stabilized as the Gulf of Mexico reached stillstand. The subaerial portion of the island complex rests on a blanket of middle Holocene bay-estuarine mud which was deposited behind the landward-migrating sand body and then was overridden by it.

Following stillstand, Matagorda Island prograded Gulfward approximately 1.6 km. During this progradation, two large tidal passes, which connected the Gulf of Mexico with San Antonio and Mesquite Bays, were closed. The island was further modified by migration of Cedar Bayou several miles to the west across the island's southern end.

Two sources of sand contributed to this barrier complex. Prior to stillstand, erosion of Pleistocene strandplain sand and middle Holocene fluvial-deltaic sand which was exposed on the shelf supplied most of the sediment to the early barrier. Following stillstand, with progradation, shelf sands were too deeply submerged to be eroded by Gulf waves. Sand, discharged into the Gulf by the Colorado and Brazos Rivers and transported southwestward by longshore currents, was deposited on the beach and shoreface of Gulfward-building Matagorda Island. *Key words: marine geology, sedimentation, barrier islands, Texas coast.*

☐ 50713—Preferred Orientation in Quartz Ribbon Mylonites. *C.J.L. Wilson, School of Earth Sciences, Department of Geology, University of Melbourne, Parkville, Victoria 3052, Australia.* (7 p., 7 figs.)

Quartz mylonites composed of elongate ribbon quartz without appreciable recrystallization at grain boundaries were examined and contrasted. One was from a lower greenschist facies environment at Mount Isa, Australia, in which the *c*-axis preferred orientation of the ribbons is either a pronounced orthorhombic distribution or a small-circle distribution (with a small opening angle) about the normal to the foliation and lineation. The other was an upper greenschist or lower amphibolite facies mylonite from Risfjället in the Swedish Caledonides, in which the *c*-axis preferred orientation of the ribbon is a maximum lying close to the foliation and normal to the lineation. Variation in preferred orientation can be accounted for by temperature and (or) strain-rate differences, with basal-slip mechanisms predominant at lower temperatures and prismatic slip (and possibly other slip systems), together with diffusion-controlled processes, predominant at higher temperatures. *Key words: quartz, mylonite, deformation, preferred orientation, structural geology.*

☐ 50714—Competence of Rivers to Transport Coarse Bedload Material. *Victor R. Baker, Department of Geological Sciences, The University of Texas at Austin, Austin, Texas 78712; Dale F. Ritter, Department of Geology, Southern Illinois University, Carbondale, Illinois 62901.* (4 p., 1 fig.)

Shear-stress analyses provide easily determined estimates of competence of rivers to transport coarse bedload material. Relevant data from diverse geological and

engineering reports are integrated, and a good correlation between competent particle size and shear stress results, when data points are derived in a uniform way.

Because flow mechanics differ in contrasting fluvial environments, the shear stresses needed to entrain large sediment may diverge considerably from values based on theoretical grounds. In shallow rivers, entrainment may occur at lower shear stresses than predicted by the Shields theory because hydrodynamic lift and bank caving provide additional transporting force. In very deep flows, the shear stresses needed to initiate particle movement are greater than theoretical values. Potential use of the empirical relationship between particle size and shear stress is limited by the following considerations: (1) random nature of turbulent lift forces, (2) problems in interpreting the significance of the sedimentary deposit, (3) sediment finer than 5 cm in diameter is not considered, and (4) the analysis ignores special considerations of sediment packing, shape, and grain-size distributions. *Key words: sediments, geomorphology, fluvial features, alluvium, erosion.*

☐ 50715—Gravity-Induced Folding off a Gneiss Dome Complex, Rincon Mountains, Arizona. *George H. Davis, Department of Geosciences, University of Arizona, Tucson, Arizona 85721.* (12 p., 11 figs., 1 tbl.)

Detached isoclinal folds, overturned asymmetric folds, and unbroken cascades of recumbent folds pervade sheets of sedimentary and metasedimentary rocks of Paleozoic and Mesozoic age that occur around the base of the Rincon Mountains near Tucson, Arizona. The sheets of folded rocks rest subconcordantly on the gently dipping surface of the granitic gneiss that composes much of the range. This surface, known as the Catalina fault, parallels the attitude of the foliation in the gneiss and is folded about two macroscopic upright antiforms and an intervening synform.

The low-angle tectonic displacement reflected in the folds was brought about by local gravitational tectonics. The slip-line directions inferred from the geometry of the fold arrays define a radial pattern centered on the Rincon Mountains. The forms of the folds are consistent with the characteristics of gravity-induced folds.

Most of the gravity-induced folding is interpreted to have accompanied the 28- to 24-m.y. uplift that ended the Tertiary metamorphism of gneiss in the Rincon Mountain complex. The Catalina fault is interpreted to be a décollement, above which the sedimentary and metasedimentary rocks folded independently of their substratum. *Key words: structural geology, gravity tectonics, folds, gneiss dome, structural analysis.*

☐ 50716—Petrography and K-Ar Ages of Dredged Volcanic Rocks from the Western Hawaiian Ridge and the Southern Emperor Seamount Chain. *David A. Clague, Scripps Institution of Oceanography, La Jolla, California 92037; G. Brent Dalrymple, U.S. Geological Survey, Menlo Park, California 94025; Ralph Moberly, Hawaii Institute of Geophysics, University of Hawaii, Honolulu, Hawaii 96822 (present address, Clague: U.S. Geological Survey, Menlo Park, California 94025).* (8 p., 4 figs., 2 tbls.)

Alkalic basalt dredged from Yuryaku Seamount in the southernmost Emperor Seamount chain and from the western Hawaiian Ridge at Pearl and Hermes Reef and at two unnamed seamounts 160 and 380 km west of Midway is similar to the alkalic basalt that caps the volcanoes in the Hawaiian Islands. Conventional and $^{40}Ar/^{39}Ar$ K-Ar analyses give best weighted mean ages of 42.3 ± 1.6 m.y. for Yuryaku Seamount, 27.3 ± 0.4 m.y. and 26.7 ± 0.5 m.y. for the two unnamed seamounts, and 20.1 ± 0.5 m.y. for the volcano that forms Pearl and Hermes Reef. The data show that the age of the Hawaiian-Emperor bend is about 41 to 43 m.y. Although the volcanoes in the Hawaiian-Emperor chain generally increase in age to the north and west of the island of Hawaii, the measured age-distance relations along the chain are not linear in detail. A phonolite, possibly a differentiated member of a posterosional nephelinic suite and the first found on the Hawaiian Ridge, was recovered from Pearl and Hermes Reef. Samples of analcime tephrite recovered from the unnamed seamount 380 km west of Midway may also be derived from a posterosional nephelinic suite. *Key words: volcanic chain, geochronology, chemical analyses, basalt.*

☐ 50717—Geology of Middle Stone Age Archaeological Sites in the Main Ethiopian Rift Valley. *Robert L. Laury and Claude C. Albritton, Jr., Department of Geological Sciences, Institute for the Study of Earth and Man, Southern Methodist University, Dallas, Texas 75275.* (13 p., 12 figs., 1 tbl.)

On a ridge west of Lake Ziway, northernmost of the Galla Lakes, rich Middle Stone Age sites are present in paleosols of the late Pleistocene Gademotta Formation. The underlying rocks are alkali rhyolite and tuff, the eruption of which commenced more than 1 m.y. ago and was climaxed by caldera collapse and explosive ejection of pumiceous tephra. Lower Gademotta sediments consist of tuffaceous laharic mudstone interbedded with thick paleosols developed on unsorted colluvial volcanic detritus. Artifacts are lacking.

A paleosol in the middle of the Gademotta Formation contains obsidian tools of Levallois-Mousterian technology, the earliest Middle Stone Age artifacts thus far discovered in the area. This soil was covered by a crystal-rich volcanic ash, which has been dated at ~181,000 yr B.P. Above the ash, in turn, are three superposed paleosols, each with Middle Stone Age artifacts intercalated with water-laid sandstone, and two additional ash beds.

Late in the sedimentary history of the Gademotta Formation it was eroded by intermittent streams forming deep gullies which subsequently were aggraded. Perhaps the cutting and filling were related to the fluctuations of an ancient lake whose level may have reached more than 100 m above present Lake Ziway (1,636 m). The consistent occurrence in this region of Middle Stone Age sites—>35,000 to >100,000 yr B.P., elevations ⩾ 150 m above Lake Ziway—suggests geographic control of human settlement by high lake stands during late Pleistocene time. Topographically lower volcanic hills, which probably formed contemporaneously with Gademotta Ridge, appear not to have been inhabited until the Late Stone Age (<15,000 yr B.P.) when the lake level was substantially lower. *Key words: stratigraphy; sedimentation; Quaternary; Ethiopia; rift valley; man, ancient; geochronology; geomorphology.*

☐ 50718—Sedimentary Tectonics in Southwest Pacific Marginal Basins Based on Leg 30 Deep Sea Drilling Project Cores from the South Fiji, Hebrides, and Coral Sea Basins. *George deVries Klein, Department of Geology, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801.* (7 p., 9 figs., 1 tbl.)

The vertical sequences of sedimentary facies in three southwest Pacific marginal basins are controlled by sea-floor spreading. The basal sediments at site 285 (South Fiji Basin) and site 286 (Hebrides Basin) are turbidites that coarsen upward into debris-flow conglomerates because of submarine-fan progradation. The clastic facies are overlain by biogenic sediments and are capped by pelagic red clays. At site 287 (Coral Sea Basin), the vertical sequence is partly reversed, consisting of basal biogenic sediments overlain by olive clays that were produced by turbid suspension and are capped by silty-clayey turbidites organized into graded cycles.

The following tectonic-sedimentary events are suggested. During initial rifting of the marginal basins, the overlying blanket of oceanic sediment was slumped onto the basin floor. The basin environment was characterized by high slope instability during early stages of basinal sea-floor spreading, which favored deposition of coarser turbidites and debris-flow sediments on fans prograding basinward. As the basin widened during later stages of spreading, regional slope gradients declined, and associated turbidity currents were characterized by reduced flow intensity. After spreading appeared to have ceased, pelagic oceanic sedimentation occurred, followed by pelagic red clays once the basin floor subsided below the calcite compensation depth. Higher sediment accumulation rates are characteristic of the early stage of sea-floor spreading, intermediate sediment accumulation rates are characteristic of the late stage of spreading, and low accumulation rates are characteristic of the pelagic phase. The reversed facies sequence at site 287 owes its origin to deposition of a clastic wedge of turbidites associated with later vertical uplifts along the basin boundary. Sediment accumulation rates increased during this resurgent tectonic phase. Such resurgent tectonic phases may repeat the facies sequences observed at sites 285 and 286. *Key words: sedimentology, marine geology, marginal basins, sedimentary tectonics, southwest Pacific, turbidites, pelagic sediments, ocean sediments.*

☐ 50719—Color Changes in Pollen and Spores: A Review. *Jane Gray, Paleoecology Laboratory, Museum of Natural History, and Department of Biology, University of Oregon, Eugene, Oregon 97403; A. J. Boucot, Department of Geology, Oregon State University, Corvallis, Oregon 97331, and Paleoecology Laboratory, Museum of Natural History, University of Oregon, Eugene, Oregon 97403.* (15 p., 4 figs.)

The absence of land-plant-type spores from a number of Silurian, and some Ordovician, samples is attributed to original absence; prelithification and postlithification oxidation and postlithification weathering; and alteration and destruction involving chiefly thermochemical (heat), piezochemical (shear), and possibly radiochemical (radiation) reactions.

Energy for thermal alteration and destruction (conversion to amorphous carbon and to graphite) may be generated geothermally (related to sedimentary or tectonic overburden) or by igneous activity (volcanic or intrusive), or it may be, though not invariably is, generated by tectonic activity involving folding, faulting, and shearing. Superheated steam, originating geothermally or as a result of igneous or tectonic activity, may be a potential source of heat for the thermal darkening or destruction of spores. Shear that results in physical as well as piezochemical alteration of spores and pollen may be provided, respectively, by overburden pressure or tectonic pressure. High temperatures need not be a factor. The decay of radiogenic isotopes may alter spores and pollen if radioactive minerals are present in adequate concentrations in microfossil-bearing rocks.

Shrinkage cracks developed in strongly devolatilized organic microfossils and fracturing of organic microfossils during tectonic activity both contribute to the difficulty of retrieving altered microfossils from rock samples. Brittle, highly altered microfossils are also easily broken during extraction of rock samples. Fossil specimens that are sufficiently fragmented by these means are no longer recognizable, and hence for practical purposes, they are "absent" in the rock unit.

Because the color of organic matter is a function of its decomposition, regional color plots of organic microfossils appear to have potential for predicting the properties of petroleum in the same way that they have been used to predict the properties of coal. *Key words: Silurian, spore, thermochemical, piezochemical, radiochemical.*

☐ 50720—Tectonic Relations of South Georgia Island to the Southernmost Andes. *I.W.D. Dalziel, Lamont-Doherty Geological Observatory and Department of Geological Sciences, Columbia University, Palisades, New York 10964; R. H. Dott, Jr., and R. D. Winn, Jr., Department of Geology and Geophysics, University of Wisconsin, Madison, Wisconsin 53706; R. L. Bruhn, Lamont-Doherty Geological Observatory and Department of Geological Sciences, Columbia University, Palisades, New York 10964.* (7 p., 9 figs., 2 tbls.)

Rocks on South Georgia Island at the eastern end of the North Scotia Ridge are no older than late Mesozoic. The Cumberland Bay and Sandebugten graywacke and mudstone sequences there are comparable in general lithology and structural style to the Lower Cretaceous Yahgan Formation of the Beagle Channel area in southernmost South America. The Cumberland Bay rocks, which form most of South Georgia Island, were thrust northeastward over the Sandebugten sequence. The Cumberland Bay and Yahgan sequences contain Cretaceous fossils, whereas the Sandebugten rocks are unfossiliferous.

The dominant dispersal of Cumberland Bay detritus was toward the northwest. The Sandebugten dispersal pattern was more complex but was dominated by a south-directed component. In Early Cretaceous time, however, the South Georgia microcontinent apparently was attached to South America along the present southern margin of the Burdwood Bank. The Cumberland Bay, Sandebugten, and farther westward along strike, the Yahgan, apparently were deposited in a marginal small ocean basin between a calc-alkalic volcanic arc built on a sliver of old South American continental crust and the main part of the South American continent from which the sliver moved away. According to this interpretation, deformation of the sediments occurred when the arc moved back toward the continent in middle Cretaceous time and the basin was closed and uplifted with the arc. *Key words: areal geology, continental drift, Cretaceous, paleogeography, sedimentary petrology, tectonics.*