GSA news & information

SUPPLEMENT TO GEOLOGY MAGAZINE

Headquarters copes with the money crunch

The membership is well aware of the budgeting problems that have beset the Society during the past two years. It is appropriate to bring everyone up to date on some of the corrective actions that have been and are being taken and to explain some inconveniences that may result.

Starting in 1975, the following were discontinued: *The Geologist* (a newsletter to all members), the publication of a separate Annual Report, and many direct mailings. Substituted for these, but incorporating the same basic information at a considerable reduction in cost, was a News & Information section distributed as a center section in *Geology*. Many other economies were instituted, such as the positioning of Penrose Conferences and Society meetings on a "break-even" basis, member dues payment covering at minimum cost the publications received, member payment of the $2 dues assessment to AGI, and the removal of subsidy from *Geology*. Other economies during the year were the reduction of book publications, the transfer of large maps from the *Bulletin* to the Maps and Charts series and, particularly, the initiation of Microform Publications for those items of scientific merit for which the Society could no longer withstand financial losses.

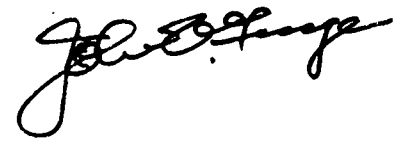
Market value of our investments has declined from $10,303,000 (12-31-71) to $7,510,000 (7-31-75) due to adverse market conditions. During this period the general reserve fund has been exhausted, costs of publication have escalated at the rate of 12% per year, and other costs to GSA have escalated at a rate of more than 10% per year. Such items as the increase to the nonmember subscriber of *Geology*, from $9 to $18 yearly, reflect the fact that the Society's endowment can no longer subsidize its publication.

At headquarters in Boulder, two lines of attack have been followed. The first has been to institute cost economies wherever possible and the second has been to reduce headquarters staff.

The cost economies have included such items as computerization of preregistration for the annual meeting and for dues billings, as well as for cost accounting at headquarters. These economies are partly offset by the added labor caused by the new Federal Pensions Law and regulations from IRS imposed on nonprofit organizations. The bill for outside auditors (including divisions and sections) will not go down. Neither will amortization and operating costs of the Society's headquarters building. Let's face it, the cost of living for individuals and for nonprofit societies is rapidly increasing.

Now, let's look at headquarters. Since January 1975 the total man-hours (mostly woman-hours) at headquarters has been reduced by 7 percent, and scheduled reductions will account for another 4 percent by January 1976. When we look at the current inflation rate of wages, this means that the total dollar outflow at headquarters has gone down (or, at worst, stayed even) during the year. The staff reductions are partly compensated for by newly instituted efficiencies but will in part be reflected by less prompt service to members. Perhaps the most obvious of these "slowdowns" is in the *Bulletin* separates option. The separates are printed with the *Bulletin* in Burlington, Vermont, shipped to Boulder, collated and stapled into separate papers, stocked in bins, and then used to fill individual orders. As the transportation is *NOT* based on first-class mail, and as the assembly and filling of orders is a hand operation, it is not fast at best. Add to this the fact that most orders each month arrive during one week. Clearly, the financial constraint on hiring extra help means that some orders will be slow—or very slow—in reaching the member. PLEASE BE PATIENT!

We welcome your suggestions. At headquarters we are doing our best to cope with the situation of decreased endowment income and rapidly increasing costs of doing business, while, at the same time, attempting to meet our charge of "advancing the science of geology in North America."



— *John C. Frye*, Executive Director

South-Central Section announces slate

The following slate of nominees will be voted on by the voting membership present at the annual business meeting of the South-Central Section on Thursday, February 26, 1976, at Rice University, Houston, Texas.

Chairman ..... David V. LeMone (1977-78)
Vice-Chairman ..... Norman J. Hyne (1977-78)
Secretary-Treasurer .... Melvin C. Schroeder (1977-78)
Management Board (2-year terms, 1976-1978)
Member-At-Large ..... John C. Gries
Member-At-Large ..... Norman F. Williams

Nominations sought for 13th edition of American Men and Women of Science

For the first time, *American Men and Women of Science* will be published with all volumes appearing simultaneously—six volumes plus geographic and discipline indexes bound in a separate volume—due late in 1976. An extremely accelerated production schedule will give users more current information. New methods will allow more frequent revision creating an even more up-to-date service to the scientific community.

This edition will cover an A-Z compilation of the majority of disciplines. The fields of engineering, economics, psychology, political science, and sociology are under consideration for future volumes.

Since its inception in 1906, *American Men and Women of Science* has been the recognized authority for biographical information on the scientific community. The nomination of qualified scientists is important to its continued growth. Acceptance for inclusion is based on the following criteria:

1. Achievement, by reason of experience and training, of a stature in scientific work equivalent to that associated with the doctoral degree, coupled with presently continued activity in such work; or

2. Research activity of high quality in science as evidenced by publication in reputable scientific journals; or, for those whose work cannot be published because of governmental or industrial security, research activity of high quality in science as evidenced by the judgment of the individual's peers; or

3. Attainment of a position of substantial responsibility requiring scientific training and experience to the extent described in (1) and (2).

A single mailing for updating information and nominations was sent to 12th edition biographees during the summer of 1975. Those scientists whose names currently appear in the directory are requested to notify the editors of any address change since the last edition. Send nominations and address change notification to The Editors, *American Men and Women of Science*, P.O. Box 25001, Tempe, Arizona 85282.

The Jaques Cattell Press of Tempe, Arizona, will continue to edit the directory, which will be published by the R. R. Bowker Company of New York.

SCHEDULE OF 1976 SECTION MEETINGS

SOUTH-CENTRAL SECTION
February 26-27, Houston, Texas
Send abstracts by October 10 to John A. S. Adams, Department of Geology, Rice University, P.O. Box 1892, Houston, Texas 77001.

NORTHEASTERN SECTION
March 25-27, Arlington, Virginia
Send abstracts by November 3 to Norman L. Hatch, Jr., U.S. Geological Survey, 926-A National Center, Reston, Virginia 22092.

SOUTHEASTERN SECTION
March 25-27, Arlington, Virginia
Send abstracts by November 3 to Michael W. Higgins, U.S. Geological Survey, 928 National Center, Reston, Virginia 22092.

CORDILLERAN SECTION
April 5-7, Pullman, Washington
Send abstracts by November 3 to J. W. Mills, Department of Geology, Washington State University, Pullman, Washington 99163.

NORTH-CENTRAL SECTION
April 28–May 1, Kalamazoo, Michigan
Send abstracts by December 15 to W. Thomas Straw, Department of Geology, Western Michigan University, Kalamazoo, Michigan 49001.

ROCKY MOUNTAIN SECTION
May 20-21, Albuquerque, New Mexico
Send abstracts by December 29 to Lee A. Woodward, Department of Geology, University of New Mexico, Albuquerque, New Mexico 87131.

ABSTRACT FORMS ARE AVAILABLE FROM
Abstracts Secretary, Geological Society of America, 3300 Penrose Place, Boulder, Colorado 80301.

Please refer to your preliminary announcement [in Geology magazine] for other sources of abstract forms and for more detailed information.

SPECIAL NOTE TO MEMBERS LIVING OUTSIDE CONTERMINOUS UNITED STATES

Those who live outside the conterminous United States may receive copies of the 1976 *Abstracts with Programs* for the section meetings too late to take advantage of the preregistration and housing forms.

Therefore, those who are planning to attend any of the section meetings are urged to write to the appropriate local committee chairman for information. (Names and addresses are listed above.) As soon as it is available, a copy of the program section of the *Abstracts with Programs* (containing preregistration forms, housing applications, and field trip information) will be air mailed.

AGI White House Conference

Starting this year, the Federal Administration initiated a program of inviting associations and their key leaders to discuss issues with Administration leaders. These two-hour White House Conferences are held an average of twice a month. The AGI, through its Executive Director, Fred Honkala, arranged a conference for representatives of the eighteen AGI member societies which took place on July 21. Frank B. Conselman, currently AGI president, was program chairman and moderator.

Representatives of GSA were President Julian Goldsmith and Treasurer August Goldstein, Jr. Past-President Clarence Allen, although officially representing another society, also took part in the conference. Thus, three of the four members of GSA's Executive Committee were participants.

Representatives of the Administration were Vincent McKelvey, Director, USGS; Jack Carlson, Assistant Secretary, Department of the Interior; J. Cravens, FEA; and representatives from the Energy Research and Development Administration and the National Science Foundation.

AGI's press release issued following the meeting stated, in part:

"A cross-section of the country's most prominent earth scientists today set before top federal officials their warnings and recommendations regarding a number of scientific issues they termed 'critical to America's continued health and survival.'

"In broad summary, their statements dealt with problems of future shortages: shortages of fossil minerals for energy fuel; shortages of a variety of non-energy related 'strategic minerals'; and shortages of information and credible statistics regarding the country's resource crises.

"Administrators and top representatives from the Department of Interior, Federal Energy Administration, Energy Research and Development Administration, National Science Foundation and other agencies listened attentively to the presentations of 12 speakers, representing the more than 70 earth science delegates in attendance. The meeting was held in the East Wing of the White House.

"The geologists and geophysicists described 'confusing and seemingly contradictory statistics regarding oil and gas resources' by private industry, association groups, federal and state agencies and geologists themselves as one of the major causes for widespread public mistrust and failure to come to grips with acute shortage problems. They also gave support to recent, controversial U.S. Geological Survey estimates of undiscovered petroleum resources, and agreed with the USGS conclusion that substantial oil and gas remain undiscovered within U.S. boundaries, both on land and on the Outer Continental Shelf.

"Additional Conference presentations dealt with imminent shortages of a variety of non-energy strategic minerals, which several scientists agreed could pose even greater problems for American technology than possible fuel shortages. Federal officials were urged to support comprehensive research to develop methods of conserving and recycling vital minerals, and to give greater emphasis to accelerated exploration and production of domestic mineral resources."

Choose your membership option now

1976 dues statements were mailed to all members in September. Time is running short for those who have not yet selected an option and mailed the statement back to headquarters along with their dues payment.

Mailing labels for January issues of the *Bulletin* and *Geology* will be made up December 1, so only those members who have submitted their option form and payments before November 30 will be guaranteed uninterrupted mailings. Remember also that mailings of the *Abstracts with Programs* for some of the spring section meetings begin in January.

Don't delay—we want to serve you.

BYU donates selenite crystal to headquarters

The most recent addition to the varied display of minerals and rocks at GSA headquarters is a huge selenite crystal, a gift from Brigham Young University, Provo, Utah. We are particularly indebted to Professor Morris S. Petersen of Brigham Young who personally brought the crystal to headquarters. Its size is illustrated by the fact that, wrapped in blankets, it occupied the entire rear seat of his car. As soon as a protective case can be assembled, the crystal will be on display in the front lobby.

Mineral specimens arrive; donor unknown

Thanks to fine detective work on the part of the Post Office, two nice mineral specimens recently reached headquarters—but without the sender's name. One is a typical Franklin, New Jersey, assemblage of willemite, zincite, and franklinite; the other is hauerite with calcite and sulfur from Boling Dome, Texas. Enough of the damaged package survived to show a Detroit postmark; the specimens were wrapped in a Houston newspaper.

We assume that these specimens are gifts to the Society and are grateful for them. We would like to identify the sender, however, so that we can acknowledge and accession the gifts properly. Will the donor please come forward?

Publications

Change in management of the Treatise on Invertebrate Paleontology

Richard A. Robison, Hedberg Professor of Geology, University of Kansas, has recently been appointed director of the KU Paleontological Institute and managing coeditor of the *Treatise on Invertebrate Paleontology*. The appointment coincides with the retirement of Curt Teichert as Regents Professor of Geology. Teichert will continue as an active coeditor of the *Treatise*, which is jointly published by the Geological Society of America and the University of Kansas.

Part W *Miscellanea*, Supplement 1 (trace fossils and Problematica, second edition), the latest addition to the *Treatise*, was published last May; price, $20. Walter Häntzschel, who died in April 1972, left an almost complete card index with descriptions of genera and a largely complete list of selected illustrations. From this material, and with the active help of Mrs. Häntzschel, the manuscript for this volume was compiled in the editorial office in Lawrence. The Supplement deals with trace fossils and a variety of problematical fossils: borings, coprolites, microproblematica, and pseudofossils, to mention only the larger groups. The total number of generic names listed is 690. There is a glossary of trace fossil terminology in English, French, and German, and a reference list of more than 1,800 titles.

Manuscripts for a portion of Part A, Introduction; for a Supplement to Part F on Paleozoic Corals by Dorothy Hill; and Part T, Echinodermata 2 (Crinoidea) are substantially completed, and it appears that one of these will be the next addition to the *Treatise*, possibly within the next year.

The *Treatise* is divided into parts bearing index letters, each except the initial and concluding ones being defined to include designated groups of invertebrates. The chief purpose of this arrangement is to indicate their systematic sequence while allowing publication of units in whatever order each may be made ready for the press. The outline of subjects to be treated in connection with each large group of invertebrates includes description of morphological features, with special reference to hard parts; ontogeny; classification; geological distribution; evolutionary trends and phylogeny; and systematic description of genera, and high taxonomic units.

All Fellows, Members, and Student Associates of GSA may buy one copy of each Part and Supplement (original and revised editions) at 20 percent member discount. Orders from GSA members must be personal orders placed directly with the Society in order to earn the discount. For a list of parts in print and parts in preparation, please request a copy of the *Treatise* flyer from GSA headquarters.

Do you need information on purchase of annual meeting field trip guidebooks?

For those wishing to buy guidebooks for the field trips held in connection with the Salt Lake City annual meeting, a complete listing of titles, publishers, and prices (if available at press time) will be found on page 903 of *Abstracts with Programs*, vol. 7, no. 7. If you do not have access to the abstracts volume, complete information may be obtained by writing headquarters, attention: Lee Swift.

Cash discounts offered for books

At a recent meeting of the GSA Publications Committee it was voted to extend an additional discount of 5 percent for payment of cash in advance on book orders, effective January 1, 1976. The 5-percent cash discount applies to all book orders, and for members of the Society is in addition to the 20-percent member discount allowed on individual personal orders. Please check current prices before remitting cash.

Excerpt from reviewer's letter

". . . I have no reservations about recommending . . . . paper for publication. I believe it will be a contribution in . . . . He has taken the time to submit the paper to several reviewers prior to submitting it to the Society, and I think this to be a good procedure. Therefore, the manuscript you sent me is a really a revised paper taking due consideration [of] the comments of several reviewers. I would like to see more authors follow this procedure."

That and which

Paraphrased from an author of a *Bulletin* article: "By the way, why don't you mix up 'that' and 'which' once in a while?" Editor's response: "We follow standard reference works on the use of 'that' and 'which' for clarity of use, especially because we find which many authors don't know that one to use."

Donald B. McIntyre, chairman of GSA's Committee on Publications, offers a comprehensive review and evaluation. Clip and save.

Microfiche readers

INTRODUCTION

After hearing Dan Merriam's report in 1974 from the Subcommittee on Microform Publications and touring Marathon's research library with Clarence Sturdivant, I determined to learn more about microfiche by using them. As a result, we converted the catalog of the Science Libraries at the Claremont Colleges to microfiche (with considerable benefits in cost and convenience), and I have tried out every kind of reader that I could obtain. Letters from GSA members and discussion at meetings of the Committee on Publications show that many need advice on selection of equipment for reading our microform publications. The following remarks are personal opinions set down for the committee, but the editor thinks that they may be useful to a wider audience in GSA.

WHAT IS A MICROFICHE?

A microfiche, or "fiche," is a sheet of film, usually about 4" x 6", with reduced images arranged in a grid pattern. The standard for 8½" x 11" documents is a 24x reduction with 98 pages per fiche, arranged in 7 rows of 14 columns. Other magnifications and layouts are used for special applications, such as computer output and parts catalogs. Reductions of more than 90x (ultrafiche) are used when it is essential to compress large files into the smallest possible space.

FICHE VERSUS MICROFILM

Microfilm on reels is analogous to computer tape used for files that are created and read sequentially. Microfiche, on the other hand, are like card files or the magnetic discs used on a computer for random access; all parts of the file are read and brought up to date with equal convenience. Fiche are easy to duplicate and to mail. If too great a reduction is used, the advantages of random access are lessened, and the expense of the microfiche reader is of course increased. The growing importance of fiche is evidenced by the recent change of name of National Microfilm Association to National Microform Association.

FORMATS

The NMA standard 24x reduction, with 7 rows of 14 columns, has been used in all publications of the Geological Society of America, American Geophysical Union, Dawson Reprints (Journal of Geology, Journal of Petrology), and in a dozen journals published by the American Institute of Physics. The main reason to depart from NMA format is that the standard shape of computer documents is 14" x 11", wider than it is high. Partly to accommodate this, and partly because Computer Output Microform (COM) is generated by the computer directly without first printing a page and then photographing it, COM is usually at 42x reduction, with 208 pages per fiche in 13 rows of 16 columns, or at 48x reduction, with 288 pages in 16 rows of 18 columns.

KINDS OF MICROFICHE READERS

The simplest reader is a hand lens with a holder to keep the fiche in focus; ambient light is used for illumination. All other readers are projectors, with mirrors to "fold" the light path inside a compact box. To achieve the necessary magnification in a small space, portable readers use Fresnel lenses and an ingenious design for the light path. Small readers are, therefore, not necessarily cheap, although the price may be reduced by substituting plastic for the metal cases and sturdy construction of library models. Microfiche readers can be classified as follows:

1. Pocket readers. These are of the hand lens type, using ambient light and batteries or electricity from a standard circuit.
2. Lap readers. These are compact and lightly constructed readers of the projection type. They normally plug into a standard electric circuit, although battery packs are usually available.
3. Portable readers. Although a lap reader may be portable, it is not necessarily so. The portable reader is sturdy, often built into a briefcase. It is designed especially for salespeople who require sturdy and compact equipment. Some portable readers project onto a screen, which may be the lid of a briefcase, or onto a wall. A portable reader would not necessarily be ideal for someone who wishes to read scientific articles at home.
4. Desk readers. These are not designed to be portable. They must be compact in order to conserve space on a working desk. Some are not very sturdy, based on the assumption that use would be limited to one person who would treat the equipment with care.
5. Library readers. These are standard equipment, made of durable materials, and able to withstand heavy use from the general public. Although they sit on a desk, saving space is not the primary consideration in their design.

POCKET READERS

Pocket readers are designed for quick reference to data, rather than for continuous reading of text. However, I have read entire articles with a pocket reader, and a colleague who wears thick glasses has also done this.

A fine screw on the lens is used to focus the image, but depth of focus is very small, and eyestrain can result from unconscious attempts to correct for an im-

(continued on p. 638)

properly positioned lens. Once correct focus is achieved and the eye is relaxed, reading is remarkably easy, although, if the holder is loose, it may be difficult to prevent the fiche from moving out of focus. Two users should not expect to share a pocket reader without carefully refocusing.

I recommend 15x magnification. Any smaller magnification should be carefully tested by the individual to make sure that it is satisfactory. I can read a 42x COM with a 15x Taylor-Merchant. I find that in using ambient light it is best to look toward a dark background. Although most pocket readers lack mechanical guides for positioning the fiche at a particular frame, I find that searching a fiche is not difficult.

The cheapest reader I know about is Taylor-Merchant's 153L. It costs $29, weighs 3 ounces, measures 6" x 2" x 1", and uses ambient light. This is the one I have. Its only disadvantage is that the holder is not as tight as I would like it to be. This reader is suitable for viewing Kodachrome slides of maps.

The best optics that I have seen are on D.O. Industries' Exac-tics. It costs $60 (at 10x; more for the 15x that I would recommend), weighs 15 ounces, measures 8" x 2½" x 4", and uses three C batteries. A 110V adapter can be purchased.

The Microvision R24-48 reader is an attractive, compact design, with folding index guides, and costs $80. My eyes found it difficult to adjust to this reader, but practice might make this easier.

LAP READERS

A lap reader should be light and compact, although not necessarily sturdy enough to be readily portable. Because lap readers are designed for NMA standard fiche of 8½" x 11" documents, rather than COM, the ideal shape and size of screen is predetermined.

The best lap reader appears to be Bell & Howell's "Briefcase Reader," manufactured by their Micro Design Division; it costs $145. Dimensions open: 10 3/8" high x 3½" wide x 6¼" deep. Dimensions closed: 10 3/8" high x 9 5/16" wide x 3 3/8" deep. The screen size is 6 5/8" x 9". Weight: 5 lbs. 10 oz. This reader is a new version of Micro Design's former Companion Model 220. The new reader is better as well as being at a slightly lower price. I know one college library that has several readers of the older model for checkout by students. I have purchased the "Briefcase Reader" for our geology library at Pomona College.

Another good lap reader is Micobra's K-100 Escort costing $139. I found this reader to be very satisfactory, although it is not as compact or portable as Bell & Howell's "Briefcase Reader." Weight is less than 5 lbs. Screen size: 7⅓" x 10". It has a well-designed system for "turning the page" in moving from frame to frame.

Visidyne's Voyager II reader, which costs $149, is rather similar to the Micobra lap reader. I prefer the Micobra.

PORTABLE READERS

Bell & Howell's "Briefcase Reader," described above as a lap reader, qualifies as portable. The cost is $145.

Washington Scientific Industries manufactures truly portable readers built into a briefcase. The Informant I is for full-size images of 8½" x 11" documents or for three-quarter magnification of COM. The cost is $199 with one lens; additional lenses cost about $50 each.

The Taylor-Merchant 300XF is a projector capable of throwing an image on a wall or screen. Cost is $85. A fitted briefcase is available for $33.

Northwest Microfilm advertises a unit, NMI 75, that is said to be portable, with built-in carrying handle. Weight: 15 lbs.

DESK READERS

Here I include simply the more compact of the library readers. The best known are Eastman Kodak's Ektalite Series: For 8½" x 11" documents, No. 120 at $105 and No. 220 (with a larger screen) at $160; other magnifications are available, especially for COM. Ektalite readers have plastic gears and the quality of the curved image could be improved.

Data View has several readers sitting on 10" x 10" bases. These readers are modular and easily adapted to changing needs. A dual-lens reader with an 8½" x 10¾" screen costs $185; with a 10½" x 11¼" screen the cost is $195. These readers seem well made and have good optics.

The Quantor 305 can be used as a desk reader. It produces a three-quarter-size image of COM and costs $185. This reader is the one used in our Business Office.

Northwest Microfilms NMI 75 also produces a three-quarter-size image of COM. The base is 9" x 8". I do not have the price, and I have not seen this reader.

LIBRARY READERS

It should be remembered that all other readers give up something for weight, size, or portability. Size and quality of the image may be significantly reduced, viewing may be markedly directional, focus may not be retained when the fiche is moved, and using the index and finding an individual frame may be inconvenient. In choosing a reader, the user should consider the following:

1. Shape of page. Is the reader to be used for 8½" x 11" documents, 14" x 11" computer output, or some other format? If in doubt, get a screen adapted to COM, and remember that it is not practicable to turn a fiche on its side for viewing. I use a screen 15½" wide x 11¼" high. Realist makes a 19" x 13" screen. Lap readers are designed for the tall format of an 8½" x 11" document, and not for the wide format of COM. Some readers are designed to project two pages together; for example, a parts catalog with illustrations and text on adjoining pages.

MICROFICHE READERS (continued)

2. Is it necessary to have full "blowback" or will three-quarters be adequate? This determines the required screen dimensions as well as magnification of the lens. 24x is usually correct for documents (NMA standard), 42x or 48x for COM. If in doubt, get a dual-lens reader. With two lenses, my reader can give me full-scale images for both formats. It is very annoying to have an image that is too big for the screen.

3. Most COM fiche have an index at the bottom right-hand corner, and it is necessary to be able to move the fiche quickly from the index to a predetermined page. The reader should have an index pointer to make this operation a simple one. Because lap readers are designed for reading continuous text and not COM, they usually either lack the indexing system or have a simplified and less convenient form. The user should determine whether the system provided is adequate for his or her particular needs.

4. The fiche should stay in focus when moved. This is usually achieved by use of a "floating lens" that touches the fiche carrier.

5. The holder should not be easily scratched. This is not likely to be a problem with a library reader, which will have a glass holder, but lap readers commonly use plastic carriers to save weight and these are easily scratched.

6. Some readers have dual carriers, so that two fiche can be in the machine, although not read, simultaneously. These are used when an index is on one fiche and the subject is on another; for example, a parts catalog. I have no need for this feature.

7. The image must not require a directional view that is too narrow; that is, the image should be readable when viewed from an angle oblique to the screen. This is perhaps less important on a lap reader, but even then the user should determine that the result will be satisfactory in practice.

8. Front projection is a system whereby the image is projected downward from the top front of the reader onto an opaque screen, which is located at the back of the reader and is tilted at an angle convenient for viewing. Canon's Canorama 400 is an excellent example, and I recommend it. The result is much less tiring on the eyes; glare and directional effects are eliminated. This feature is especially valuable when the fiche has black text on a white page; with ordinary readers the eye looks directly at the light source, wherease with front projection the image is seen by reflected light, as it is when one reads a printed book.

9. Same-way scan. Whereas other readers move the fiche carrier in the direction opposite the image scan, Realist's readers scan the image in the same direction as the carrier travels. Some users find this a help. Perhaps because I am accustomed to a microscope, I find no difficulty in using a reader that lacks this feature.

10. If there are interchangeable lenses, is it easy to change them? If the lenses are the "drop-in" type, and the reader will be left in a public place, will the lenses be safe?

11. Are the light bulbs easily changed and reasonably priced? If the reader is cooled by a fan, is it quiet?

12. Is the reader sturdy enough for the use to which it will be put? Are its dimensions, weight, and portability adequate?

13. Is hard-copy of the magnified image required? If so, what is the page cost? Is the paper readily available? Does it have a long shelf-life? Is the reader coin-operated? Can it be locked?

14. Would it be an advantage to ensure the integrity of a fiche library by using a reader with automated retrieval of individual fiche? This is possible but expensive.

The following are examples of what I have called library readers:

Bell & Howell: SRII, screen 11" wide x 8½" high (3/4 size), $187 with single lens, $260 with dual lens.

Bruning: 100A, screen 8½" x 11", $175; 150 is the same as B & H's SRII; 200, screen 15½" wide x 11½" high, $265 for single lens, $340 for dual lens.

Canon: 400, screen 12" x 15", $225 for single lens, $285 for dual lens.

Datagraphix: Screens from 9" x 11½" to 12" x 15", prices from $160 to $270.

Data View: Screen 10½" x 11¼", dual lens, $195.

Kodak: Ektalite 120, 20x, $105; 140, 40x, $120; 220, 20x $160, larger screen.

GAF: 7700 DMR, 3/4 blowback, $179; 7800 DMR, full-size blowback.

Micro Design manufactures readers for Bell & Howell and for Bruning: 910, $175; 920, $185; 950 (front projection), $185.

Microlite: 175 with 5½" x 8½" screen, $125.

Quantor: 305, 3/4 blowback, $185; 307, full-size blowback, $244.

Realist: Vantage I for NMA format, $200; Vantage II, 90 percent blowback for COM, $285 with dual lens; Vantage X-1, 11" x 14" screen, Vari-Optic zoom control with 25 percent additional magnification. These readers have "same-way scan."

Three M: Consultant 114, $225 with one lens.

Washington Scientific Industries: Mini Cat II, $199 with one lens.

Xerox: 320, 9" x 12" screen, $239 with one lens; 322, 12" x 9" screen.

A list of names, addresses, and telephone numbers of manufacturers of microfiche readers and related equipment as well as a bibliography are available from GSA headquarters upon request.

—*Donald B. McIntyre*, Chairman
GSA Committee on Publications

COCORP report

The first of a planned series of tests to be conducted by the Consortium for Continental Profiling (COCORP) was accomplished during March 1975, in Hardeman County, Texas, near the town of Quanah. The purpose of the tests is to demonstrate the feasibility of applying continuous seismic reflection techniques to the solution of geological problems in the deep crust and, possibly, the upper mantle of the Earth. The work is funded by the National Science Foundation and is part of the U.S. Program for the International Geodynamics Project. The Consortium consists of representatives from Cornell University, the University of Houston, Princeton University, and the University of Wisconsin. Cornell University has the operational responsibility.

Three lines of continuous profiling were run: a north-south line 16.6 km long; a parallel line 8.7 km long and 3.2 km east of the first line; and an east-west line 9.3 km long, intersecting both of the north-south lines. The data acquisition and data processing were done under contract to Petty-Ray Geophysical, Inc., and their interest and efforts, beyond the normal contractual bounds, contributed greatly to the success of the test. The contributions of W. H. Mayne and R. E. Carlile were particularly noteworthy.

A 48-channel digital recording system with samples at 8 millisecond intervals was employed. Station intervals were 100 metres with 24 geophones per station arranged in-line so that there was a 100-percent ground overlap between adjacent stations. Geophones were Electro Technical Laboratory EV22C with a natural frequency of 7½ Hz. The VIBROSEIS* method was used with an array of five vibrators, two Y-900 and three Y-1100, operating in-line 20 metres apart. The vibrators advanced 16 times at 6.5-metre intervals and the summed outputs of the 16 stages comprised a record. A 10-32 Hz linear upsweep of 15 seconds duration was used, and the recording time was 30 seconds, resulting in a 15-second two-way time record. The two-way time to basement in this area is about 1.6 seconds.

The data from this test, including copies of seismic sections and/or copies of the tapes at various levels of processing, are listed below and will be obtainable in the near future for the cost of reproduction. For a variety of complex reasons the following procedure is required in order to obtain the data:

(1) Indicate in writing which items are desired. Address your letter to Professor S. Kaufman, Department of Geological Sciences, Cornell Unviersity, Ithaca, New York 14853. Do *not* send any payment.

(2) In response to your letter, a formal "Authorization for Purchase" will be sent to you when the material is available.

(3) Forward the authorization to the contractor in the manner indicated on the authorization, together with your purchase order.

The following items will be available for purchase shortly.

I. Basic package of 20 blackline prints — $30.00
1 Generalized location map
2 Expanded spread (Line 1)
3 Noise study display (Line 1)
4 Correlated record section display — 10 records (Line 2)
5 Line 1 (CDP stack)
6 Line 1 (residual statics, CDP stack, decon & AGC)
7 Line 1 (½ scale display of Item 6)
8 Line 1 (velocity analysis pt-1)
9 Line 1 (velocity analysis pt-2)
10 Line 2 (CDP stack)
11 Line 2 (residual statics, CDP stack, decon & AGC)
12 Line 2 (½ scale display of Item 11)
13 Line 2 (decon, residual statics, CDP stack & AGC)
14 Line 2 (residual statics, CDP stack, LOPASS FILTER & AGC)
15 Line 2 (residual statics, CDP stack, HORIZONTAL COHERENCY FILTER & AGC)
16 Line 2 (velocity analysis)
17 Line 3 (CDP stack)
18 Line 3 (residual statics, CDP stack, decon & AGC)
19 Line 3 (½ scale display of Item 18)
20 Line 3 (velocity analysis)

The normal scales for the seismic sections are 5 centimetres to the kilometre, and 6.4 centimetres per second.

II. Digital tape copies are available by individual line or individual level of process. The cost is $35.00 per reel (including the ½ inch by 2400 foot reel).

	Number of Reels		
	Field Data	Correlated Data	Stacked Data
Line 1	4	1	1
Line 2	2	1	1
Line 3	2	1	1

The tape formats are SEG B for the field data; SEG X for the correlated data and the CDP 12-fold stacked data. The stacked data have been processed "residual statics — 12 CDP stack — deconvolution — AGC."

Cornell University is required to maintain a repository for all aspects of COCORP data. We therefore request those who receive the data to furnish us with all non-proprietary results of their use of the data including processing outputs, write-ups, preprints, copies of reports, etc.

— *S. Kaufman*

* *Registered trademark of Continental Oil Company.*

Vol. IV of Memorials series now available

The Geological Society of America Memorials volume IV is now available at $7.50. The 195 pages contain memorials for 1972 to the following deceased Members and Fellows of the Society:

Arch Rombough Addington (1894-1972) by George M. Stanley; Frederick James Alcock (1888-1972) by Hugh S. Bostock; Esther Richards Applin (1895-1972) by Jean M. Berdan; Leslie Park Barrett (1887-1972) by R. M. Crump; Robert Glenn Bates (1923-1972) by George V. Cohee; Byron Britton Brock (1904-1972) by D. A. Pretorius; Reuben Clare Coffin (1886-1972) by Harold T. Morley; Carey Croneis (1901-1972) by L. L. Sloss; Armand John Eardley (1901-1972) by William Lee Stokes; George E. Ekblaw (1895-1972) by H. B. Willman and W. Calhoun Smith; Harold C. Elliott (1910-1972) by Willard E. Cox; George Malcolm Fowler (1885-1972) by Charles H. Behre, Jr.; Crawford Ellsworth Fritts (1927-1972) by D. H. Richter; Don L. Frizzell (1906-1972) by John W. Koenig; Mary Welleck Garretson (1896-1971) by Charles H. Behre, Jr.; James Rogers Gill (1922-1972) by W. A. Cobban; Herman Gunter (1885-1972) by Victor T. Stringfield; Charles Sumner Gwynne (1885-1972) by Chalmer J. Roy; John Vernon Harrison (1892-1972) by Bernhard Kummel; Donnel Foster Hewett (1881-1971) by Richard H. Jahns; Charles George Johnson (1914-1969) by Frank C. Whitmore, Jr.; William Drumm Johnston, Jr., (1899-1972) by John Van N. Dorr II; Remington Kellogg (1892-1969) by Frank C. Whitmore, Jr.; Walter Richard Landwehr (1893-1972) by William Paxton Hewitt; Manuel Maldonado-Koerdell (1908-1972) by Zoltan de Cserna; Victor Ben Meen (1910-1971) by George Switzer; Siemon W. Muller (1900-1970) by Benjamin M. Page, Norman J. Silberling, and A. Myra Keen; William Thomas Pecora (1913-1972) by V. E. McKelvey; Thomas Gregory Perry (1919-1972) by Donald E. Hattin; Russell Spurgeon Poor (1899-1972) by Robert O. Vernon; Edward H. Rainwater (1909-1972) by R. J. Le Blanc; Roger F. Rhoades (1905-1972) by Charles S. Content; Erich Maren Schlaikjer (1905-1972) by Warren L. Taylor; James Robert Smith (1925-1972) by W.G.E. Caldwell; Arle H. Sutton (1896-1972) by Harold W. Scott and Carleton A. Chapman; Joel Howard Swartz (1893-1971) by Irwin Roman; Edward Leffingwell Troxell (1884-1972) by Charles D. Campbell; and William Harrison White (1913-1972) by K. C. McTaggart.

Necrology

Ronald D. De Rudder, Bellaire, Texas; Oliver B. Hopkins, Miami, Florida; Kevan T. Liss, Adrian, Michigan; Louis L. Ray, Rockport, Indiana; George D. Thomas, Shreveport, Louisiana; Henry A. Waldrop, Boulder, Colorado.

U.S. National Report to IUGG (1971-1974) offered at 50% discount to GSA members

The report of the U.S. National Committee for the International Union of Geodesy and Geophysics has been issued. An offer from the American Geophysical Union makes it available at half price to members of all societies participating.

The current report represents a more complete coverage of geophysical work than any previous U.S. report has attempted. The more than 100 authors were urged to prepare review papers, not simply reports with bibliographies; they were also invited to include the work done in other countries as needed to place the U.S. work in context. A completely new feature of this year's report is the inclusion of four introductory papers, each of which highlights an area of current interest.

The report, which is reprinted from *Reviews of Geophysics and Space Physics,* is 1,100 pages, approximately half being bibliographies. Individual members of the GSA may purchase the report at a special 50-percent discount (list price, $20). Orders at this special $10 price must be prepaid. Send payment and shipping address directly to American Geophysical Union, 1909 K Street N.W., Washington, D.C. 20006. Please be sure to mention that you are a member of GSA when you order.

Nominations Committee asks members' suggestions

The Committee on Nominations seeks members' advice in one of the most important contributions that can be made to the health of the Society. Early in 1976, the committee will draw up a list of Members or Fellows whom they consider to be suitable replenishments for the gradually changing group that guides and manages Society affairs. Their final lists will be presented to the Council in May. In its turn, the Council will decide on a slate of officers to be placed on the ballot for the fall election. Chances are that a single slate will be presented for vote of the membership, though write-in votes are encouraged and are always welcome. The single slate concept, however, is all the more reason why your advice is needed for the Committee on Nominations. Its members cannot possibly know all of the potential leaders of the Society—they need your help. Nominations are to be made for president (usually the incumbent vice-president), vice-president, treasurer, and four councilors.

All suggestions received by February 1, 1976, will receive careful consideration. Write directly to headquarters. Suggestions will be forwarded to the committee.

To ensure thorough consideration by the committee, please back up each suggested nomination with a brief biographical sketch and a summary of his or her chief contributions to geology.

Membership

New Student Associates

Listed below are 461 Student Associates who have become affiliated with the Society since January 1975:

Irving D. Affeldt III
Victor F. Agbe-Davies
Jeff Agee
Donald H. Alexander
Dewey W. Allen III
Robert B. Almy III
Michael L. Ammerman
Michael A. Andersen
Carl W. Anderson
James R. Anderson
Norman N. Anderson
Arild Andresen
Edmund D. Andrews
Kevin T. Aul
James A. Austin, Jr.
Dale W. Avery
Mark W. Ayers

William C. Bagby
Betty J. Bailey
Edwin S. Bair
Clyde D. Baker
Arthur Baldasari
Warren S. Baldridge
James Bambrick
Barbara A. Barreiro
Rudolfo Beer
James F. Behensky, Jr.
Philip G. Behrman
Kathleen C. Bennett
Jeffrey R. Benoit
Richard C. Berg
William W. Besse
Randal L. Billingsley
William J. Bippus
James J. Bjaloncik
Kenneth W. Blake
David C. Blanchard
Kip K. Boden
Marcia Bookman
Ruta D. Bormanis
Erhard Bornemann
Robert J. Bouchard
Donald J. Brittnacher
Helen A. Brohl
Alan H. Brown
William D. Brown
Bruce E. Brunette
William K. Bucher
Paul E. Buchholz
Todd F. Butler

Georgette K. Callas
James T. Campion, Jr.
Michael R. Canich
Richard K. Cardwell
Christine Carlson
Royce P. Carr
Louis J. Caruso
Catharine M. Catranis
Brendan Caulfield
Peter A. Cawood

John F. Chappell
Raymond G. Charles
Ronald R. Charpentier
Pete J. Chimney
C. Michael Clayton
Richard S. Clingan
Raymond O. Coderre
Lynne Cohen
Gregory L. Cole
Steven L. Collins
Darlene A. Condra
Harry E. Connors III
Kevin J. Coppersmith
William C. Corea
Joe R. Corporon
Gary D. Couples
Kelly D. Courtright
Paul W. Cousins
Brett F. Cox
Robert G. Cuddy

Jeffrey N. Damp
Paul A. Danckwerth
Craig B. Davis
Jonathan O. Davis
Sumner D. Day
Peter C. Day
Joel A. Degenstein
Gary D. Delaney
Robert V. Demicco
John E. Desantis
Cheryl E. Desforges
William J. Deutsch
Gwendolen M. Ditson
James B. Dixon
Joan E. Donaldson
Joseph J. Donovan
Abdourhman K. Doughrt
Timothy J. Drexler
George E. Duchossois
Mark T. Duigon
Mack S. Duncan
Pamela Dunlap
Thomas L. Dunn
Karl F. Duscher

Bryce H. Easter
Claudia Ebert
Michael E. Effler
Jess B. Elgan
Daniel T. Elliott
Eugene G. Ellis
Sandra M. Endrodi
Richard C. Ennis
David Epp
Dale L. Erlandson
Diane M. Eskenasy
Valerie M. Ewing

John J. Faulhaber
Lloyd C. Felton, Jr.
Carmen M. Fernandez

Ronald H. Fewkes
John W. Fink
Richard C. Fink
Christopher T. Finlayson
Joyce M. Fishman
Douglas A. Fiske
Robert L. Fitez
Edward B. Flaherty
Thomas Flaherty III
Darby I. Fletcher
Bernadette M. Flinchbaugh
Barry P. Fogel
Saul L. Furtunoff
John C. Fountain
Steven B. Fradkin
Grasso Franco
Roy W. Freeman
Ronnie L. Frierson
Adam A. Frisch
Marek V. Frydrych
Kazuya Fujita
Wayne R. Fuller

James E. Gaiser
James H. Gamber
Linda Garifal
Paul B. Garrison
Francois J. Gauthier
Martin J. Gayer
Francis C. Gehrling
Murry S. Gerber
Kathleen M. Gerety
Karl H. Gloeckner
David W. Godlewski
Arthur G. Goldstein
Robin Golnazarians
Peter D. Goreau

Robert F. Grabb, Jr.
Norman G. Grannemann
John H. Gray
William W. Gray
Jack Grippi
Phyllis D. Grob
Marilyn A. Grout
George A. Grover, Jr.
Daniel E. Grundvig
Margaret E. Guthrie

Sandra M. Hagstrom
Gregory A. Hahn
Kenneth E. Hall
Andrew L. Hardiman
Andrew G. Harding
Douglas A. Harned
Stephen B. Harper
David M. Harris
Charles A. Harrison
Clare O. Harrison
John G. Hattner
Jerry L. Haug
David W. Hawkins

Nathan Hawley
David L. Hayslip
John O. Heggeness
Thomas H. Hendershott
Lillian M. Hess
John C. Heter
James P. Hibbard
Nurit Hildebrand
David H. Hinton
Clarice A. Hintz
Robert A. L. Hodge
Kathleen A. Hohman
Frederick N. Holabird
Kenneth J. Hollett
Carleen D. Holloway
Gary R. Holzhausen
Duane G. Horton
Keith A. Horton

Eric W. Hovanitz
U. Hla Htay

Tim H. Ingwell
Joe L. Iovenitti
Lynne E. Irvin
Laurel A. Iverson
Henry A. Ivey

David R. Janecky
Kent R. Johnson
Larry C. Johnson
Michael L. Johnson
Stephen A. Johnson
David G. Jones
Douglas S. Jones
Walter L. Jungblut

John Kaldi
James E. Kamis
Brian Y. Kanehiro
Charles E. Katherman
James R. Kauppila
Kyle L. Kayler
Lloyd D. Keigwin
Robert E. Kell
Peter C. Keller
David L. Kimbrough

Robert W. Kinsman
Paul R. Kirschling
Roy Kligfield
Douglas A. Knapp
Richard M. Knapp
William W. Knaup
Wayne S. Knerr
Bruce E. Knudson
Douglas M. Koza
Anthony E. Krancer
Walter P. Kropp
Carl A. Kuehn

Mark L. Labovitz
James L. Labowski
Donald S. Lamb
Ronald J. Lantzy
Samuel O. Laosebikan
David W. Larson
Yaghoob Lasemi
Dennis R. Lawton
Edward M. Layman

Stephen P. Leatherman
Philip B. Lelyveld
Sandra R. Leo

Terry L. Leyenberger
Lawrence H. Liebs
Suzanne K. Linfante
Deborah A. Lipsey
David C. Logan
Harlan G. Low
Frederic C. Lucas
Margaret T. Lundeen
Daniel R. Lux
Maurice B. Lynch

Robert P. MacDaniel
Gerda M. MacGregor
John D. Mack
John J. Mahoney
Mary Frances Maiello
Marion J. Malinowski
Lindsey V. Maness, Jr.
H. Kim Manley
Douglas C. Manowitz
Pedro A. Marin
Kit D. Marrs
Robin Martin
Tim P. Martinson
Larry A. Mayer
George D. Mayo, Jr.
William R. McCann
Robert K. McClure
William J. McCluskey
Michael O. McCurry
Robert P. McElrath
Cynthia McFee
Richard D. McJunkin
Ronald L. McKellar
Peter K. M. Megaw
Michael F. Mendeck
Christopher M. Menges
Randall T. Metz
Janet R. Miller
Robert B. Miller
Stanton H. Moll
Stuart A. Moller
Amanda Moor
Craig H. Moore
George T. Morahan
Michael R. Moran
Alan J. Morris
Lawrence V. Mott
Phillip R. Moyle
Douglas N. Mugel
Donald C. Murphy
Mark T. Murphy
Elimelech H. Mwanangonze

Richard F. Nanna
Colleen Nelson
Nancy E. Neubert
Frederick A. Newcomb
Gabriel R. Newman, Jr.
Jerry M. Nichols
H. Roy Northrop

James J. O'Brien III
Sean J. O'Brien
Anne F. O'Connell
Charles M. Onasch
Michael E. Osburn
Mary F. Ostrowski

Daniel B. Palmiter
Kenneth C. Papke
Mark A. Parchman
Gary A. Parkison
Stephen C. Parsons
Joseph P. Pavletich
Thomas L. Pellegrini
Peter E. Penoyer
William J. Penrose
Aimee Pergalsky
Wayne F. Perkins
Christopher S. Peters
Douglas C. Peters
Shirley J. Peterson
Michael J. Pierce
Bernard J. Pierson
David J. Pimm
David A. Ponce
Felipe A. Pontigo, Jr.
Gary A. Posehn
D. Brandreth Potter
Sara G. Power
George H. D. Prentice
Barbara J. Puchy
Charles E. Pumroy

John L. Rabb
John R. Reay, Jr.
David E. Reiter
Stanley P. Rennaux
Calvin C. Reppe
William C. Richmond
Mary C. Rindosh
Mary S. Robison
David L. Rose
Linda A. Roszkowski
Kurt W. Rudolph
Peter L. Russell
Carolyn Rutland

Constance A. Sancetta
Charlotte M. Sanchez
Richard F. Sanford
Sally L. Sargent
Mary E. Savina
Mark H. Scheihing
Robert R. Schneider
Jerry D. Schultz
John C. Schumacher
Daniel E. Schwartz
Donald P. Schwert
Mark G. Shahly
David L. Shearer
Kenneth A. Shewell
Paul C. Shiverick
Michael G. Sholley
Jay N. Silverman

(continued on p. 643)

New Members

The following 275 persons have been elected to Membership by committee action during the period April 1 through August 31, 1975:

George F. Adams
Lynette J. Aey
Francis Albarede
Nancy S. Alexander
Thomas M. Allred
Bevan W. Alwin
Donald O. Asquith
Jayne C. Aubele
David P. Aubin
Donald L. Aurell

Steven Bachman
Ronald F. Bacon
Michael E. Badley
James M. Barker
David A. Barthelmy
Henry L. Barwood
Robert M. Beer
Charles A. Beers
Ahmed M. Behi
Linda J. Benke
James R. Besig
Jack J. Bhatt
David C. Bice
Leonard J. Billingsley
Edward F. Birckhead
Eric D. Bjorken
Robert B. Blakestad, Jr.
Bruce R. Bland
Karl R. Blasius
Robert R. Blickwedehl
Jacqueline Bocquet
Michel Bonneau
William T. Box, Jr.
Robert E. Brossoie
Aart Brouwer
Vernon M. Brown
Laurence Brundall
Dennis L. Bruns
Cathy McGhee Buchanan

Glenn R. Buckley
Richard H. Burroughs
Jay R. Byerly
Richard E. Byrd

Gary L. Caines
Donald M. Caldwell
Edward J. Calhoun
J. Frisbee Campbell
Alfred P. Canepa
Dale C. Carlson, Jr.
Paul E. Carrera
Gerald V. Carroll
James W. Carter II
Thomas B. Cartwright
Charles F. Caskey
Michael P. Charette
Dale Chayes
Craig E. Cheatum
Robert W. Cheung
Kenneth E. Childs
Lawrence A. Chitwood
Brian E. Christianson
Stephen B. Church
Lindgren L. Chyi
David A. Clague
Joseph C. Cohen, Jr.
Sally A. Cole
Charles M. Collins
Daniel E. Collins
Merilyn M. Collins
Daniel C. Cook, Jr.
John R. Cook
Laurence S. Cooke, Jr.
James L. Craig
Gordon Crawley
Curtis D. Cushman
Bruce L. Cutright
Gregory M. Cwayna

Paul B. Dahlgren
Diana C. Dale
Scott M. Daniel
Raymond B. Daniels
Allen D. Davis
Robert S. Detrick, Jr.
Daniel R. Dombroski, Jr.
William L. Douglas
Thomas W. Doupe
John M. Dunlavey
Kenneth N. Durham

Andrew D. Eaton
Dale E. Egner
John C. Eichelberger
Anna M. Einwich
Herbert A. Elliott, Jr.
Marion F. Ely II
James M. Evensen

Barry M. Faulkner
Robert J. Fennema
Richard E. Fidler
Faith Fiene
Sands H. Figuers
Edmund L. Fivas
Rick S. Fredericksen
David C. Fredley
Kevin J. Freeman
Vicki L. Freeman
Robert W. Fujimoto
Alfred L. Futrell, Jr.

Michael J. Galloway
David L. Gerry
Ronald B. Gibbs
John O. Goffe
James R. Grainger
Borwin W. Grauert

Glenn A. Gray
Daniel M. Groome
Gilberto Guarin
Spence Gustav

Helen M. Hankins
Roy Hargreaves
David P. Harper
Michael Harris
Jerry L. Harrold
Russell G. Harter
Rosemary Harvey
Mirza S. Hasan
Karen S. Hee
William J. Henning
Charles A. Hickcox
Richard D. Hillard
John E. Hiner
Stuart Hirsch
William J. Hlavin
Charles J. Hoke
Walter C. Homan
Robert D. Howell
Marilyn L. Hubert
Donald M. Hussong
Deborah R. Hutchinson

Joseph R. Infascelli

Thomas C. Johnson
John D. Jones
Kathleen A. Jordan
Michael A. Jordan

Louis S. Karably
Teresa L. Keck
David J. Kelso
Susan W. Kieffer
David W. Kirtley
Tyrone A. Knauf
Daniel H. Knepper, Jr.
Larry W. Knox
Constantina N. Kotopouli

Barbara A. Lanan
Clyde R. Langdale
Robert M. Lanning
Dwight J. Larkin
Thomas A. Larson
Alan V. Lattanner
Guy W. Leach
Richard Leiby
Joseph Levay
Ralph D. Lingberg
William F. Lingquist
Michael S. Lipp
Spencer Eh-Yee Loh
Hernando Lozano

Keith B. MacDonald
James L. Mack, Jr.
Donald J. Mandel, Jr.
Edward A. Mankinen
Albert P. Marranzino
Henry W. Marsh
Robert E. Mayberry
Richard G. McCain
Kimball P. McCloud
Keith I. McConnell
Lavon M. McCormick
Richard L. McGehee
Martin A. Menzies
Michael C. Merry
Darryl G. Miller
Victor J. Miller
Thomas E. Mills
Carol L. Molnia
David A. Monachello
Stephen C. Moore
Bimal Mikhopadhyay

Walle J. Nauta
Robert W. Nesbitt
Keith R. Newsom
Cathy C. Nielsen
Bernard L. Noeller
Ronald P. Nowak
Eric G. Nupen

Chester A. Oakley
Luc Ortlieb
Robert M. Otis

John S. Pallister
Marie S. Pavish
Susan Petty
Mike P. Plamondon
Joan Pope
John T. Popp
Frank W. Potter
John E. Puffer

Susan E. Rafferty
Richard G. Randall
Monte E. Ray
Joseph B. Reining
Walter L. Rennick
Carrol A. Richards
Dean A. Richesin
Gary A. Robbins
Gene D. Robinson
Edward C. Robison
Mark S. Roth
Bret G. Rothwell
James D. Rush
Graham Ryder
Michael James Rymer

Edgar E. St James, Jr.
Robert J. Savage
Daniel T. Schaffer
Philip A. Schenewerk
Martin A. Schuepbach
Maurice L. Schwartz
Stuart L. Schwotzer
James S. Scott
Nelson Shaffer
Asghar J. Shariff
Katherine A. Sheedy
Ehud Zvi Shertok
Thomas W. Sieh
Benedito C. E. Silva
Larry C. Simpson
A. Richard Smith
Alan L. Smith
Marcus J. Smith
Baltazar Solano R.
Ronald L. Soroos
Susan E. Soule
Thomas E. Spittler
John S. Stacey
Thomas W. Stander
Larry W. Stavert
Don A. Stephens
Charles R. Stern
David L. Stoudt
John L. Sullivan
Richard D. Supina
Frank H. Swan III
Douglas B. Swift
George P. Szell

Alfred J. Tamburi
Marc J. Tardy
Mack Taylor
Marilyn E. Tennyson
Steven W. Terlecki
John D. Tewhey
Karen A. Theisen
Daniel D. Tisoncik
Gael H. Troughton
Robert R. Tyson

Charles J. Verro

Ralph A. Watson
William T. Watson
Michael T. Weaver
Rodney J. Weick
John A. Westgate
John W. Whitney
Gary A. Williamson
Henry H. Wilson
Brian F. Windley
Steffen Wolff
Young K. Woo

Student Associates (continued)

Donald H. Simpson
Robert P. Singer
Grant M. Skerlec
Craig B. Smith
Ronald L. Smith
Russell C. Smith
Thomas A. Smith
Jan Sniderman
Roger K. Soderberg
Ralph P. Soule
Richard H. Spaw
Robert J. Sperandio
Deborah A. Spratt
William D. Spronz
Samuel F. Squiller

Ronald D. Staggs
Steven G. Stancel
Ronald W. Stanton
James A. Stewart
Donald J. Stierman
Ronald K. Stoessell
Claudia E. Stokley
Richard L. Stollar
Allen L. Stork
Douglas K. Strickland
Gary L. Stringer
Denise C. Suek
Jerry W. Sullivan
D. M. Summers
Eugene D. Sungy

Robert P. Swiatek
Harold E. Syms

Kathleen L. Taggart
Michael A. Talcott
Samba S. Tata
Frederick W. Taylor
Frederick W. Taylor
James C. M. Taylor
Daniel J. Tearpock
Vernon J. Temple, Jr.
Thomas Tesoriero
W. Dennis Thomas
Kurt O. Thomsen
Devin R. Thor
Robert C. Thunell
Clinton R. Tippett
Melonie F. Tonkin

David J. Toth
Deborah L. Totten
Gilbert L. Treadwell
Allan H. Treiman
Arthur S. Trevena
Jack N. Tuller
James A. Turner

William D. Underwood
Gregory A. Upham

Robert J. Varga
Robert A. Vargo
Thomas A. Vinckier
Kenneth J. Vines
Brent J. Voorhees

Stephen D. Wallace

John V. Walther
Joseph C. Warlow
Ronnie A. Warren
Phillip C. Watson
Kathy A. Weakley
David C. Weaver
Robert H. Weimer
Paul W. Welber
Craig E. Wells
Chiye R. Wenkam
Matthew J. Werhner
David Wesolowski
Michael W. West
Joseph B. Whalen
Kenneth R. Whaley
Kenneth N. Whetstone
Robert S. White
Robert D. Whitman

Robert J. Wilber
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November BULLETIN briefs

Brief summaries of articles in the November 1975 GSA Bulletin *are provided on the following pages to aid members who chose 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.*

☐ 51101—Allometric change of landforms. *William B. Bull, Geosciences Department, University of Arizona, Tucson, Arizona 85721.* (10 p., 9 figs., 3 tbls.)

Allometry is the study of the relative rates of change of two variables of a system. In the study of landforms, or the processes acting upon them, the power function $Y = aX^b$ is useful for correlating changes in variables. Allometric analysis includes the study of dynamic interrelations during geomorphic history, or the static interrelations at a given time. Such analyses may include aspects of geomorphic open systems that are tending toward a steady state, have attained a steady state, or do not tend toward a steady state. The highly flexible allometric model can be used to demonstrate adjustment between interdependent variables of hillslopes, streams, and depositional environments.

It is highly unlikely that geomorphic steady states exist, because the dependent variables of a geomorphic open system cannot attain a time-independent state where the independent variables do not remain constant. Independent variables, such as climate, uplift, base level, erodibility of surficial materials, and impact of man, are changing at rates that are sufficiently rapid as to preclude attainment of steady state, particularly for those landforms that require geologic time spans to approach steady-state configurations. For most studies of processes and landforms, a broad perspective of the interrelations of materials, processes, and landforms can be obtained by using the model of allometric change in which landscape elements and processes are changing at different rates.

☐ 51102—Tertiary marine paleotemperatures. *Samuel M. Savin, Robert G. Douglas, and Francis G. Stehli, Department of Earth Sciences, Case Western Reserve University, Cleveland, Ohio 44106 (present address, Douglas: Department of Geological Sciences, University of Southern California, Los Angeles, California 90007).* (12 p., 14 figs., 3 tbls.)

Oxygen isotopic compositions of planktonic foraminifera from several Deep Sea Drilling Project sites provide a general picture of low-latitude marine temperatures from Maastrichtian time to the present. Bottom temperatures are indicative of high-latitude surface temperatures. Prior to the beginning of middle Miocene time, high- and low-latitude temperatures changed in parallel fashion. Following a short-lived drop in temperature near the Tertiary-Cretaceous boundary, temperatures remained warm and relatively constant through middle Eocene time. A sharp temperature drop in late Eocene time was followed by a more gradual lowering of temperature, culminating in late Oligocene time. A temperature rise through early Miocene time was followed in middle Miocene time by a sudden divergence of high- and low-latitude temperatures. This divergence is postulated to be related to the establishment of a circum-Antarctic circulation. A further drop in high-latitude temperatures in late Pliocene time probably signaled the onset of a major increase in polar glaciation.

Early Miocene, small-amplitude (1 per mil) sympathetic fluctuations have a period of several hundred thousand years. Superimposed upon these are much more rapid and smaller fluctuations (0.2 to 0.5 per mil) with a period of about 80,000 to 90,000 yr. This is similar to the period observed for Pleistocene isotopic temperature fluctuations.

In low latitudes, much smaller vertical temperature gradients seem to have existed during Maastrichtian and Paleogene time than exist at present. The absence of a sharply defined thermocline during early Tertiary time is also suggested.

☐ 51103—Velocity-bedform-texture patterns of meander bends in the lower Wabash River of Illinois and Indiana. *Roscoe G. Jackson II, Department of Geological Sciences, Northwestern University, Evanston, Illinois 60201.* (12 p., 18 figs., 3 tbls.)

Meander bends in the lower Wabash River of Illinois and Indiana display coherent patterns of current velocity, bed topography, lower-regime bed forms, and bed-material size. The upstream reach of a bend is a zone of transition from the reversed hydraulic and sedimentologic conditions of the preceding bend. A downstream shift of the cross-sectional maximum velocity magnitude from the inner (point-bar side) bank to the outer bank defines a transitional zone for velocity magnitude in each bend; in this zone, current velocities are strongest and dunes and sand waves most prominently developed at near-bankfull and higher flows. Similar translations of the cross-sectional maxima of depth, mean size of bed material, and dune height and a reversal in the orientation of spiral flow de-

fine a transitional zone for each of these four other parameters in each bend. A given meander bend at any stream discharge shows the following sequence of increasing length of transition zones: spiral flow, depth, velocity magnitude, mean size of bed material, and dune height.

Downstream from each transitional zone in a bend, the normal asymmetrical cross-sectional distribution of each parameter defines a fully developed zone for that parameter. Only in the fully developed zone does each parameter increase from the inner bank to the outer bank, as implied in the standard facies models for meandering streams. In both sharply curved and gently curved bends, fully developed zones for bed-material size do not exist. Sharply curved bends do not contain fully developed zones for velocity magnitude, which in other bends show the strongest velocities and largest dunes at near-bankfull or lower flows, especially if the zone is bypassed by overland flow during higher stream discharges.

Available data from laboratory channels and from other meandering streams suggest that the above patterns of velocity magnitude, spiral motion, and bed-material size characterize freely meandering streams. The transitional zones of sedimentary and hydraulic parameters and the variations of these parameters through different flows and dissimilar bend curvatures introduce significant complications to present depositional models of meandering streams.

☐ 51104—Hierarchical attributes and a unifying model of bed forms composed of cohesionless material and produced by shearing flow. *Roscoe G. Jackson II, Department of Geological Sciences, Northwestern University, Evanston, Illinois 60201.* (11 p., 1 fig., 6 tbls.)

From those bed forms generated by the shearing flow of a fluid and composed of cohesionless granular material, five hierarchical attributes are recognized: bed-form size, time span of existence of individual bed forms or bed configurations, superpositions, flow regime of bed forms in open-channel flows, and the Russian theory of channel process. The first two attributes permit the definition of three fundamental groups of bed forms common to all sedimentary environments dominated by shearing flow. Each group responds to different formative processes, themselves time hierarchical. The largest bed forms (macroforms), such as point bars, respond to the geomorphological regime of the environment and are relatively insensitive to changes in fluid-dynamic regime during an individual dynamic event (for example, a flood in a river). A two-zone structural model of turbulent boundary layers provides a genetic framework for the two smaller classes of bed forms. Mesoforms, such as dunes in rivers, respond to flow conditions in the outer zone of the turbulent boundary layer as the flow varies through a dynamic event; their lives scale correspondingly with the duration of that event. The smallest bed forms (microforms), for example, current lineations, are governed by the flow structure in the inner zone; their lives are much shorter than the periodicity of dynamic events.

The above considerations constitute a unifying model of the origin of bed forms. Three essential components of the model (bed-form size, time, and structure of the turbulent boundary layer) are readily measurable by present experimental techniques.

☐ 51105—Magnetic fabric around boulders in till. *M. Stupavsky and C. P. Gravenor, Department of Geology, University of Windsor, Windsor, Ontario N9B 3P4, Canada.* (3 p., 3 figs., 2 tbls.)

Variation in the magnetic till fabric around one large boulder and three small ones suggests that pressure melting of the debris-laden basal ice on the upstream side of the boulder caused the release of till-water slurry, some of which flowed around the boulders, filling in surface irregularities on the boulders and in the area behind them. The flow of the till slurry around the boulders caused alignment of the clasts in the till adjacent to the boulders.

☐ 51106—Reversal pattern and apparent polar wander for the Late Jurassic. *M. B. Steiner and C. E. Helsley, Institute for Geosciences, University of Texas at Dallas, Richardson, Texas 75080.* (7 p., 8 figs., 1 tbl.)

A paleomagnetic study of the Upper Jurassic (Kimmeridgian-Tithonian) Morrison Formation near Norwood, Colorado, indicates the existence of thirteen polarity intervals. The seven reversed intervals occupy much more of the section than the six normal intervals, suggesting that during this time the dominant polarity was reversed. Pole positions were computed for each portion of the section where directions were tightly grouped. The pole positions form two separate groups directly related to the stratigraphic position in the section of the samples from which they were computed. The two mean pole positions for the Morrison Formation, 142.2°E, 61.4°N (dp = 4.0°, dm = 6.5°) and 161.8°E, 67.5°N (dp = 3.5°, dm = 5.0°), define a path which includes the Cretaceous pole positions for

North America. The data indicate that the Jurassic apparent polar wander curve for North America is approximately a line of latitude (present-day coordinates) connecting published Triassic and Cretaceous pole positions. The data disagree with the commonly held view that the Jurassic portion of the North American apparent polar wander curve includes the present axial dipole.

☐ 51107—Unconformity-bounded stratigraphic units. *Ki Hong Chang, Department of Geology, Kyungpook National University, Daegu, Korea.* (9 p., 1 fig., 1 tbl.)

Unconformities have been used commonly as boundaries of stratigraphic units; such unconformity-bounded units have played an important role in the development of stratigraphy and will continue to do so. However, their value has been impaired by failure to understand that they constitute an independent category of stratigraphic units—that of *unconformity-bounded units*—with a distinctive significance of its own, and that they should not be confused with other commonly accepted kinds of stratigraphic units.

Many unconformity-bounded units have been regarded as lithostratigraphic units. In order to maintain the original concept of lithostratigraphic units, this usage should be avoided. Similarly, many unconformity-bounded units are considered to be chronostratigraphic units in spite of the fact that unconformity surfaces inevitably cut across isochronous horizons.

Probably the most widely used unconformity-bounded units are those bounded by unconformities of regional or interregional magnitude and comparable in thickness to supergroups and in time span to one or more stratigraphic systems. The formal term "synthem" is recommended for these units. Synthems are useful in cratonic areas where stratigraphic schemes consisting of units of this kind provide a basis for tectonic correlation and best reveal geologic history. The use of synthems also promotes the recognition of natural geologic provinces and aids in the establishment of natural stratigraphic classifications.

The term "interthem" is proposed for minor disconformity-bounded units comparable in thickness with a formation of in time span with a stage. The prefixes "sub" and "super" may be used if further ranks of classification are needed.

☐ 51108—Granitic to ultramafic rock complexes of the Indian Ocean ridge system, western Indian Ocean. *Celeste G. Engel and Robert L. Fisher, Scripps Institution of Oceanography, University of California, San Diego, La Jolla, California 92037.* (26 p., 18 figs., 11 tbls.)

During expeditions to the western Indian Ocean, more than 4,500,000 sq km of the Central Indian Ridge and its branching Southeast Indian Ridge and Southwest Indian Ridge were explored by bathymetric, magnetic, and seismic-reflection profiling. In some 2,800,000 sq km of this region, igneous rocks of the crust, lower crust, and possible upper mantle are exposed by faulting or volcanism. Fifty-six dredge hauls of igneous rocks were obtained from the Vema Fracture Zone, Argo Fracture Zone, Marie Celeste Fracture Zone, and the newly delineated "Melville Fracture Zone."

Field and laboratory studies indicate that under a capping of young flow basalts, there is a regional complex of igneous rocks produced by magma generated under the ridges, trapped and differentiated into sill-like, podiform, and larger, crudely stratified to well-stratified sheets. Some associated diabase intrusions are granophyric, and are cut by late-stage dikelets of quartz monzonite and Na-rich trondhjemite. Both calc-alkaline and alkalic lines of differentiation are indicated.

The overlying basalt flows are pillowed with chemical and mineralogical characteristics typical of olivine-bearing tholeiite from the ridge-rise systems of the world oceans.

The ubiquitous nature of the crustal complex throughout the western Indian Ocean, together with data from the Atlantic and Pacific Oceans, suggest that similar rock complexes, dominated in their lower parts by stratiform bodies, are characteristic of most of the igneous crust throughout the world oceans.

☐ 51109—Rb-Sr study of granite and gneiss from Seoul, South Korea. *Paul D. Fullagar, Department of Geology, University of North Carolina, Chapel Hill, North Carolina 27514; Byong Kwon Park, Department of Earth Sciences, Korean Military Academy, Seoul, Korea.* (2 p., 2 figs., 1 tbl.)

Granite from Seoul, Korea, has Rb-Sr whole-rock ages of 161 ± 1 m.y. and an initial Sr^{87}/Sr^{86} ratio of 0.7116 ± 0.0003. Thermal effects associated with the intrusion of granite lowered the Rb-Sr ages of middle Precambrian gneiss.

☐ 51110—Holocene windward reef-flat history, Enewetak Atoll. *Robert W. Buddemeier, Hawaii Institute of Geophysics and Department of Oceanography, University of Hawaii, Honolulu, Hawaii 96822; Stephen V. Smith, Hawaii Institute of Marine Biology, University of Hawaii, Kaneohe, Hawaii 96744; Robert A. Kinzie, Department of Zoology and Hawaii Institute of Marine Biology, University of Hawaii, Honolulu, Hawaii 96822.* (4 p., 4 figs., 1 tbl.)

The Enewetak windward reef flat is composed of two petrographically distinct pavement types, neither of which appears to reflect the composition of the contemporary surficial biological community. Stratigraphic, petrographic, and radiocarbon analyses indicate a rapid build-up of reef structure followed by a period of erosion. The results are most consistent with a sea level that (1) reached the present level by about 4000 yr B.P. (or earlier), (2) was more than 1 m higher than at present during the period 3500 to 2000 yr B.P., and (3) fell to the present level within the past 2,000 yr.

☐ 51111—Seismicity, secular strain, and maximum magnitude in the Excelsior Mountains area, western Nevada and eastern California. *Alan Ryall and Keith Priestley, Seismological Laboratory, University of Nevada, Reno, Nevada 89507 (present address, Priestley: 33 Ardwick Street, Gore, New Zealand).* (8 p., 8 figs., 1 tbl.)

Seismicity in the Excelsior Mountains area appears to have been an order of magnitude higher for at least several decades than that which preceded great earthquakes in

central Nevada in 1915 and 1954. A high degree of crustal fracturing is indicated for this area by complex geology and by a scattered distribution of epicenters. A composite fault-plane solution is similar to those for large shocks at Fairview Peak and Rainbow Mountain in 1954, which shows that the same regional stress field is acting to produce earthquakes in both areas. The slope of the recurrence curve is higher than average for the Nevada region. Crustal strains recorded at Mina indicate that periods of strain build-up alternate with periods of strain release. Comparison of these characteristics with results of laboratory experiments and observations in other regions suggests that the area is one in which a moderate level of tectonic stress combined with a high degree of crustal fracturing leads to strain release by a continuing series of small-to-moderate earthquakes and fault creep. If so, the magnitude of 6¼ for the 1934 Excelsior Mountains earthquake may represent a maximum magnitude for this area.

☐ 51112—Chemical plumes in the mantle. *Don L. Anderson, Seismological Laboratory, California Institute of Technology, Pasadena, California 91125.* (8 p., 3 figs., 1 tbl.)

In developing the concept that chemical plumes have a deep-mantle origin, I propose that plumes result from original chemical inhomogeneities in the Earth. According to the hypothesis of inhomogeneous planetary accretion, the terrestrial planets formed with refractory cores and volatile-rich outer shells, that is, they are layered according to the sequence in which compounds condense from a cooling nebula. The primitive deep mantle is enriched in CaO-Al_2O_3-TiO_2 and the refractory trace elements and depleted in MgO-FeO-SiO_2 and the volatile elements relative to normal olivine-pyroxene mantle. The refractory trace elements include W, Ir, Y, Zr, Nb, Ba, Sr, rare-earth elements, and, most important for the present discussion, U and Th. In the deep mantle, this refractory material is less dense than ferromagnesian silicates and will rise until phase changes and loss of the low-melting-temperature fraction permit density equilibration. The low-melting-temperature fraction of this primitive refractory assemblage is anorthite, and a widespread anorthosite event probably occurred early in the history of the Earth. I propose that chemical inhomogeneities still exist and because of their high U and Th abundances provide the heat source for driving upper mantle asthenospheric convection. A conservative estimate indicates that the heat flow above frozen-in plumes is at least twice the normal heat flow at the base of the low-velocity layer. This heat is transmitted efficiently by convection to the base of the lithosphere, providing the "melting spot" required to explain linear island chains in the oceans and igneous traces on continents. When a continent comes to rest over one of these radioactive hot spots, the temperature at the base of the continental lithosphere is perturbed, causing doming or swelling and eventual fracture and magmatism. It is also possible that kimberlite and carbonatite intrusions are a result of thermal perturbations that result when continental lithosphere overrides a chemical hot spot. The locations of chemical plumes may control the patterns of continental breakup and dispersal even if they are dynamically passive.

☐ 51113—Unified theory of the onset of folding, boudinage, and mullion structure. *R. B. Smith, Department of Astro-Geophysics, University of Colorado, Boulder, Colorado 80302.* (9 p., 13 figs.)

A mathematical study of the flow of a layered fluid shows that homogeneous pure shear aligned with the bedding is a "possible" state of motion in the sense that it is an exact solution to the governing equation. In the case of a single layer of a Newtonian material between two thick layers of different viscosity, such a state of motion is unstable to small disturbances. The growing disturbances have foldlike or pinch-and-swell form, depending on whether the applied compression is parallel or perpendicular to the layering and on whether the layer is more or less resistant to deformation than the surrounding rock. The combination of these two factors gives four distinct cases. One of these, labeled inverse folding, is of no interest because its growth rate is too small. The other cases correspond qualitatively to folding, boudinage, and mullions. This result suggests that these three geologic structures are caused by a secondary flow driven by an interfacial discontinuity in normal stress.

☐ 51114dr—Plutonic evolution of the Canadian Cordillera: Discussion and reply.

Discussion: *J. A. Roddick, H. Gabrielse, and G. J. Woodsworth, Geological Survey of Canada, 100 W. Pender Street, Vancouver, British Columbia; and J. E. Reesor and W. W. Hutchison, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario.*

Reply: *Peter Petö, Department of Geology, University of Manchester, Manchester M13 9 PL, England (present address: Department of Geological Sciences, University of British Columbia, Vancouver 8, British Columbia.).*

☐ 51115dr—The founding of geology in America: 1771 to 1818: Discussion and reply.

Discussion: *Edmund M. Spieker, Department of Geology and Mineralogy, Ohio State University, Columbus, Ohio 43210.*

Reply: *Robert M. Hazen, Department of Geological Sciences, Harvard University, Cambridge, Massachusetts 02138.*