GSA news & information

SUPPLEMENT TO GEOLOGY MAGAZINE

Separates option: A clarification

Many members who selected the $30 low-dues option that allows *Bulletin* article separates rather than a full *Bulletin* subscription have asked for a more detailed explanation of how the system works. All members who have taken GSA's low-dues option are entitled to order as many as 36 *Bulletin* articles per year. It is up to the member to choose the manner in which he or she selects the articles. For example, the member may order more than 3 copies of one single article in a month, more than 3 different articles in a month, or no articles at all in a month, as interest dictates. The total number of articles ordered during the year may not exceed 36, however.

In order to make the service as rapid and inexpensive as possible, the Society is relying on each member involved to keep a tally of the number of articles ordered. Mailing is not delayed in order to check quantities already taken. Records of each member's orders are kept for an ex post facto tally and possibly for an evaluation of readership and interest at a future date.

A convenient way for a member to keep a running tally of which articles he or she has ordered is to place a check mark beside the brief in *Geology* at the same time the order form is filled out. Although in January and February the order form was placed on the back of the briefs section, starting with March this has been avoided so that the section can be kept as a complete record of *Bulletin* articles offered.

Detachable address labels are now being used to mail members' copies of *Geology*. This label must be removed from the cover of *Geology* and placed on the order blank to validate the separates order. Each order blank is preprinted with the GSA article accession number codes relating to the articles that will appear in the next issue of the *Bulletin*. Lines are also provided to write in code numbers of articles from previous issues to save sending in two orders.

Articles are produced by running extra copies of the *Bulletin* without covers. Our printer at Burlington, Vermont, ships them in bulk to Boulder where the articles are collated, stapled, and held for mailing. As orders are received, they are xeroxed for file, and then the label is glued to a mailing envelope that is then filled with the articles ordered. We use a special "printed matter" postal rate to save postage but this does take longer than first-class mail.

Each article will be kept in stock for 12 months and can be ordered any time during that period. The copies on hand after 12 months from issue date will not remain in stock nor will they be available except in unusual circumstances.

The quantity of 36 articles for the year was set by the Council as the maximum quantity that the Society could produce with a $30-per-member dues rate. It was judged that if more *Bulletin* articles than this are desired, a member should take the entire *Bulletin* at the high-dues option. Of course, there is no requirement that a member with no need for 36 articles must order them, and clearly, there is no provision for a dues rebate if a member orders fewer than 36 articles. It should be emphasized that, within both the high-dues and low-dues options, the Society's cost of the publications mailed to each member exceeds the member's dues, leaving no contribution toward the other costs of operating the Society.

A provision for the sale of individual articles, singly or in quantity, for classroom or other use, will be announced in the near future if response from members indicates a demand.

Have you voted on the dues options?

In case you have not expressed your opinion about possible dues options and publication packages from the Society for 1976, there is still time to get your vote in to headquarters to be tallied for the May Council meeting. But *please send it in right away.*

If you didn't read the March News & Information section, or if you read it so long ago you've forgotten what it said, get the March issue off the shelf and look over the choices described in the first two pages of the news section. Then check your preferences and mail the coupon to headquarters—or, if you prefer, write us a letter.

Letters from members

Gentlemen:

The Geological Society of America has contributed vitally to the entire geologic profession, especially through stimulating communication among geoscientists, both by archival or reference publications and also by abstracts and presentations at professional meetings sponsored by our Society.

Economic conditions beyond our control are now severely hindering the Society's encouragement of communication. Clearly, GSA's officers are to be commended for proposing various changes in order to maintain the organization's future contribution to the profession.

However, some just-announced policy changes combine with recent trends to seriously jeopardize GSA's potential for stimulating communication. Particularly, although archival publication seems not so severely threatened, these tendencies may significantly reduce active participation in the Society's professional meetings, thus undercutting GSA's basic worth to the geologic profession by eliminating the only national (versus local) exposure and contact available to *many* geoscientists.

Four major concerns about our Society's meetings will focus attention upon the distressing trends which evoke this note. Hopefully, these points will stimulate discussion and, eventually, redirection!

The first major concern is the reduction in distribution of the abstracts volumes from GSA meetings. Many geologists have conscientiously followed the abstracts from *all* the sectional (as well as the national) meetings, and have found these volumes—by their current coverage of ongoing research and presentation of ideas not yet ready for formal archival publication—to be GSA's *most valuable and unique* contribution to geoscientific communciation. Many will order all the abstract volumes separately, but because people do not always act positively on optional benefits (even when perceived as highly valuable, as psychologists have noted), many will not. They thus will lose contact with much current activity within the profession, and circulation of ideas and concerns among geoscientists will become seriously restricted. In response, active workers will become discouraged from presenting materials at sectional meetings, since their ideas will no longer receive wide exposure to potential constructive response. Consequently, GSA should consider reinstating universal distribution of all the abstract volumes to the entire membership, and making economies elsewhere (such as, for example, by reducing the number of *Bulletin* separates down to 10 per year instead of 36, which is sizeably larger than the number of articles which many find relevant to their research and teaching needs).

The second major concern is that increasing and undue emphasis (now even formalized in preliminary announcements and abstract instructions) is being placed upon locally oriented papers for sectional meetings. Certainly, such meetings must always provide a forum for papers of local relevance. However, we seem to be in danger of emphasizing papers of local interest to the point of excluding other papers which deal with materials from regions outside the geographic area covered by the particular section. The *sectional* meetings of our *national* society thus are in danger of becoming essentially *local or regional* geologic societies, in contrast to their original purpose as public forums (via universal distribution of their abstracts) for presentation of research results, regardless of region of origin, when financial or geographic difficulties prevent a geoscientist from traveling to the national or appropriate section meeting. The sectional meetings' greatest value has been in providing a communication outlet for geologists residing within the section's area and thus near enough the meeting to attend. We are uncomfortably close to expecting persons whose research area is far from home to travel there not only to perform the research, but also now to present results in a sectional meeting far from home—a special inconvenience in these days of travel hardships. Consequently, the Society should reaffirm (perhaps simply by adding a few appropriate statements to preliminary announcements of sectional meetings) the essentially *national*, as opposed to strictly regional, character of our Society's sectional meetings.

The third major concern is that getting qualified papers accepted for presentation at GSA national meetings is becoming unduly difficult. Apparently, quite sizeable percentages of the abstracts submitted for the last few national meetings were rejected. Some of these might have been of marginal quality, but that so many would have been strains credibility; moreover, a few of those rejected subsequently became *invited* papers at national meetings of other prestigious geoscientific societies. Additionally, while a few papers selected for recent national meetings turned out to be major contributions, most were not. Evidently, extensive preselection of papers by program committees, which probably are inherently unable to reflect the widening range of interests of our diversified membership, seems now to be hampering rather than enhancing geoscientific communication.

Consequently, GSA should consider substantially expanding the size of our national meetings, so that the obvious diversity and quantity of ideas being generated within the profession can be presented and selected by the *attendees* themselves rather than by smaller committees. Expanding these meetings would increase geologic communication not only by permitting presentation of many papers for which currently no program space exists, but also by encouraging authors of such papers to attend and participate

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.

(rather than staying home). Obviously, expanding these meetings will necessitate significantly more concurrent sessions (and possible reduction in the number of cities potentially able to accommodate us), but other disciplines' professional societies already quite successfully run annual meetings several times larger than ours. Larger meetings' potential for greater stimulation of communication requires our serious consideration of this suggestion, and corresponding rejection of the sometimes-heard emotional response that our meetings are "too big already."

The fourth major concern is that presentation of papers at GSA sectional meetings may become as restricted as at national meetings. Again, geologists attend such meetings to interact with other active scientists via formal presentation of papers and informal discussion of concerns (rather than to attend a few "important" papers preselected by committees); again, an obvious solution is to expand these meetings' size. That significant reduction of communication via sectional meetings is a real possibility is evidence from brief consideration of some of the new abstract instructions.

For example, why should an author be restricted to presenting one (and coauthoring only two) papers at a sectional meeting? Competent and responsible geoscientists have written or made significant (coauthor) contributions to three or four papers well worth presenting at a single sectional meeting. Is our organization going to impose on such productive individuals the hardship and inconvenience of having to travel to three or four different sectional meetings in one year (or of having to find another comparable outlet—of which none exists for most geologists) in order to make his full professional contribution? Setting higher and more reasonable limits (such as two presentations and four coauthorships) for a number of submissions to one meeting would alleviate this problem, while at the same time preventing gross abuses of the coauthorship privilege and also not inhibiting persons submitting only one paper. Sufficient room will have to be made available at the meeting to present all the papers (unless, as we perhaps should consider, some of the abstracts published are presented orally only by title reading), and the cost of the abstract volume may have to increase somewhat—a very minor price to pay for the increased accessibility to information reflecting current activities of the profession as a whole. (Parenthetically, in line with this concern, the new requirement that each author's name must be followed by his full address, even if two or three or more coauthors are from the same organization, seems exceptionally wasteful of valuable publication space, especially where several collaborators at an institution have legitimately coauthored an abstract.)

As another example, how can submitting a list of papers presented at previous professional meetings possibly contribute to stimulating communication and interaction? Such a requirement seemingly can only operate to limit circulation of ideas, which is the main goal of our meetings. Will program committees read these titles and reject submitted papers on grounds such as "This paper does not contain sufficient new information" or "This paper's topic is too far removed from this author's previous experience for the paper to be of adequate quality"? The difficulties (and potential for unfair abuse) are obvious and overwhelming. Will productive workers who have presented several papers recently be penalized by having their abstracts rejected because they have "talked too often"? Will a geoscientist who has finally resolved a problem project after long struggle be penalized similarly because he has not spoken at all recently?

These two examples illustrate the potential for limitation of communication at sectional meetings which some of the Society's new policies or instructions can encourage. Thus, such potentially restrictive policies hopefully can be altered as soon as possible.

In conclusion, economic conditions obviously dictate changes from GSA's previous practices in promoting geologic communication. However, presently proposed policies and recent trends seem to threaten the Society's potential contribution via professional meetings, our principal vehicle for communicating about ongoing research work. Consequently, GSA should reconsider (and alter where necessary) some of these tendencies, so that our diminished resources nonetheless encourage maximum communication among geoscientists, and so that our organization maintains (rather than loses) its basic relevance to the very real communication needs within the geologic profession.

Thank you for your attention.

Sincerely yours,
Roger J. Cuffey
Associate Professor of Paleontology
Fellow, GSA

Penrose Conferences

Plio-Pleistocene Geochronology: Application of Geochronology to Pliocene and Pleistocene Geology

A Penrose Conference titled "Plio-Pleistocene Geochronology: Application of Geochronology to Pliocene and Pleistocene Geology" will be convened by Paul Damon, Glen Izett, and Charles Naeser at the Sierra Nevada Inn in Mammoth, California, June 8 through 13, 1975. The purpose of the conference is to bring together geochronologists and users of radiometric age data to further the understanding of the special problems and limitations of geochronology as applied to Pliocene and Pleistocene geologic problems. Radiometric age data are being used by increasing numbers and kinds of Earth scientists to aid in solving problems associated with the Pliocene and Pleistocene stratigraphic record.

Conference topics will include problems of radiometric dating of upper Cenozoic deposits, with application to tephrochronology, stratigraphy, paleontology, and paleomagnetism. Field trips are planned to upper Cenozoic marine and nonmarine sequences in the Los Angeles and Mammoth areas.

A registration fee of approximately $250 to $300 will cover costs for lodging, meals, and other conference costs and all field trip costs, including transportation. Partial financial support is available for student and international participants.

To apply, write to Paul Damon, Department of Geosciences, University of Arizona, Tucson, Arizona 85721, or Glen A. Izett or Charles Naeser, U.S. Geological Survey, Denver Federal Center, Denver, Colorado 80225.

Deadline for applications is April 1, 1975.

Paleozoic Margins of Paleo-American and Eurafrican Plates

A Penrose Conference on "Paleozoic Margins of Paleo-American and Eurafrican Plates" will be convened by James W. Skehan, S.J., and Nicholas Rast at the University of New Brunswick at St. John, May 24 through 28, 1975.

This four-day conference, sponsored by the Geological Society of America, will concentrate on the evidence for the margins of plates that bordered the proto-Atlantic Ocean in Paleozoic time. In this sense it represents a corollary to the Penrose Conference on "Pre-Mesozoic Plate Tectonics" organized by John Dewey and Henry Spall in Vail, Colorado, in January 1975, which stressed Precambrian plate tectonics.

Attendance at the conference will be limited to approximately 75 persons. Limited funds will be available to support promising students with a special interest in the subject, and to assist some international guests of the conference.

A registration fee of $225 will cover accommodations, meals, and other conference costs. Lodging will be at a nearby hotel in St. John. The conference will be followed by two days of optional field trips near St. John that will cost an additional $70 total, including accommodations, meals, and transportation.

General inquiries should be addressed to James W. Skehan, S.J., Weston Observatory, Boston College, Weston, Massachusetts 02193, and local inquiries should be directed to Nicholas Rast, Department of Geology, University of New Brunswick at Fredericton, Fredericton, New Brunswick, Canada.

Deadline for applications is April 1, 1975.

Please note:

Participation in Penrose Conferences is normally limited to those who have an active interest in the subject to be considered. *Anyone* interested in attending may apply; participation is not restricted to members of the Geological Society of America. Get in touch with the convenor at the address listed in the calendar on this page if you wish to be considered for any of the Penrose Conferences for 1975. Convenors' decisions on participants are final and not transferable. Attendance must be limited to ensure the effectiveness of the conferences.

Calendar of 1975 Penrose Conferences

May 24-28
Paleozoic Margins of Paleo-American and Eurafrican Plates, St. John, New Brunswick. Convenor: James W. Skehan, S.J., Weston Observatory, Boston College, Weston, Massachusetts 02193.

June 8-13
Plio-Pleistocene Geochronology: Application of Geochronology to Pliocene and Pleistocene Geology, Mammoth, California. Convenor: Glen A. Izett, U.S. Geological Survey, Denver Federal Center, Denver, Colorado 80225.

September 14-19
The Relationship of Magmatic Sulfides to Differentiated Mafic Plutons, with Emphasis on Minnesota's Duluth Complex, Ely, Minnesota. Convenor: Bill Bonnichsen, Department of Geological Sciences, Cornell University, Ithaca, New York 14853.

September 21-26
Regional Geophysics and Tectonics of the Intermountain West, Alta, Utah. Convenor: Robert Smith, Department of Geology, University of Utah, Salt Lake City, Utah 84112.

November 16-21 (tentative)
The Lithosphere-Asthenosphere Boundary, Vail, Colorado. Convenor: Thomas Jordan, Department of Geological and Geophysical Sciences, Princeton University, Princeton, New Jersey 08540.

December 14-19
Geodynamics of Continental Interiors (site not yet selected). Convenor: Charles Kahle, Department of Geology, Bowling Green State University, Bowling Green, Ohio 43403.

Publications

New Maps and Charts Series initiated

The Council has authorized the initiation of a series of maps and charts.

Most maps and charts formerly published as foldout illustrations in the *Bulletin* will now be published in this series, as well as other maps or charts that need to be published by the Society. Foldout illustrations will continue to be included in Memoirs and Special Papers.

Maps and charts will be either folded in an envelope or rolled in a sturdy mailing tube. The folded version will cost less than the rolled (flat, suitable for mounting) version.

Maps and charts to be considered for publication in the new series should be sent to the Science Editor, Geological Society of America, 3300 Penrose Place, Boulder, Colorado 80301.

Seven published maps have been included in this new series, primarily to aid in cataloging them. They were listed on the outside back cover of the February issue of *Geology*.

The Maps and Charts Series is available on standing order. For details and order form for standing orders, please see below.

Associated societies name officers for 1975

The Geochemical Society

President, *George W. Wetherill,* Planetary and Space Sciences Department, University of California, Los Angeles, CA 90024, (213) 825-4908. Vice-President, *Karl Turekian,* Department of Geology, Yale University, New Haven, CT 06520. Secretary, *Ernest E. Angino,* Department of Geology, University of Kansas, Lawrence, KS 66045. Treasurer, *J. Stephen Huebner,* U.S. Geological Survey, National Center, Mail Stop 959, Reston, VA 22092. Past-President, *C. Wayne Burnham,* 207 Deike Building, Pennsylvania State University, University Park, PA 16802.

Geoscience Information Society

President, *Jack L. Morrison,* U.S Geological Survey, Department of the Interior, P.O. Box 7944, Metairie, LA 70071, (504) 837-4720. Vice-President and President-Elect, *Vivian S. Hall,* Geology Librarian, University of Kentucky, 100 Bowman Hall, Lexington, KY 40506. Secretary, *Barbara M. Christy,* Geology Library, University of North Carolina, Chapel Hill, NC 27514. Treasurer, *Aphrodite Mamoulides,* Librarian, Shell Development Company, P.O. Box 481, Houston, TX 77001. Past-President, *Evelyn Sinha,* Principal Investigator, Ocean Engineering Information Service, P.O. Box 989, La Jolla, CA 92037.

Mineralogical Society of America

President, *Arnulf Muan,* 242 Deike Building, Pennsylvania State University, University Park, PA 16802. Vice-President, *E-an Zen,* U.S. Geological Survey, National Center, Mail Stop 959, Reston, VA 22092. Secretary, *Joan R. Clark,* U.S. Geological Survey, National Center, Mail Stop 906, Reston, VA 22092. Treasurer, *George W. Fisher,* Department of Earth and Planetary Sciences, The Johns Hopkins University, Baltimore, MD 21218. Past-President, *S. William Bailey,* Department of Geology and Geophysics, University of Wisconsin, Madison, WI 53706, (608) 262-1806.

National Association of Geology Teachers

President, *Robert E. Boyer,* Department of Geological Sciences, University of Texas, Austin, TX 78712, (512) 471-7228. Vice-President, *Edward C. Stoever,* School of Geology and Geophysics, University of Oklahoma, Norman, OK 73069, (405) 325-6511. Secretary-Treasurer, *Edgar J. McCullough, Jr.,* Department of Geosciences, University of Arizona, Tucson, AZ 85721, (602) 884-1335. Past-President, *Thomas E. Hendrix,* Department of Geology, Indiana University, Bloomington, IN 47401, (812) 337-5582.

Paleontological Society

President, *William A. Oliver, Jr.,* U.S. Geological Survey, National Museum of Natural History, Washington, DC 20560, (202) 343-3523. President-Elect, *Ellis L. Yochelson,* U.S. Geological Survey, National Museum of Natural History, Washington, DC 20560, (202) 343-3232. Secretary, *Warren O. Addicott,* U.S. Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025, (415) 323-8111, ext. 2767. Treasurer, *George J. Verville,* Amoco Production Company, P.O. Box 591, Tulsa, OK 74101, (918) 627-3400. Past-President, *James W. Valentine,* Department of Geology, University of California, Davis, CA 95616, (916) 239-1648 or 239-0350.

Society of Economic Geologists, Inc.

Terms of officers-elect begin on April 1, 1975, and end on March 31, 1976.

President, *Paul K. Sims,* 1315 Overhill Road, Golden, CO 80401. Vice-President, *Ulrich B. Petersen,* Department of Geological Sciences, Hoffman Laboratory, 20 Oxford Street, Cambridge, MA 02138. Secretary, *Arnold L. Brokaw,* 185 Estes Street, Lakewood, CO 80226, (303) 234-5115. Treasurer, *Robert M. Grogan,* P.O. Box 1549, Knoxville, TN 37901. Past-President, *Ernest L. Ohle,* P.O. Box 15787, Salt Lake City, UT 84115.

Society of Vertebrate Paleontology

President, *Wann Langston, Jr.,* Texas Memorial Museum, 24th and Trinity Streets, Austin, TX 78705. Vice-President, *Malcolm C. McKenna,* Department of Paleontology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024. Secretary-Treasurer, *Ernest L. Lundelius, Jr.,* Department of Geological Sciences, University of Texas, Austin, TX 78712. Past-President, *Mary Dawson,* Section of Vertebrate Fossils, Carnegie Museum, Pittsburgh, PA 15200.

Science editor sought

The Geological Society of America is seeking candidates for science editor for the Society to commence work about January 1, 1976. Bennie Troxel, science editor since July 1971, is resigning effective that date so that he can continue his geologic research and other interests. Applications and inquiries should be directed to the executive director, John C. Frye, at the Geological Society of America, 3300 Penrose Place, Boulder, Colorado 80301. Confidentiality of inquiries is assured.

New membership card planned for 1976

The Society plans to change the form of membership cards for 1976. Although the present blue and white plastic card that has been used for 1974 and 1975 is both durable and attractive, it is expensive. It costs 16 cents, and with the added costs for programming, printing, handling, and mailing, the expense becomes prohibitive during this austere period.

We attempted to cancel the order for the 1975 cards; however, they were already in production at the time of our call.

The 1976 card will be a good quality, wallet-sized, hard-paper card that is serviceable as well as attractive. The card will be included with the dues statement rather than mailed separately after payment is received at headquarters, as is done now.

This new procedure for 1976 will save not only on the cost of the card, but also on costs for handling and an extra mailing. We estimate that this small change will save about 20 cents per member.

Engineering Geology Division
Geological Society of America

CALL FOR PAPERS

for the 1975 annual meeting, Salt Lake City

Those planning to submit papers for presentation at the annual meeting should note that there is a deadline of July 1, 1975, for submission of abstracts to GSA headquarters.

Anyone who has plans for organizing a half-day session or symposium under the sponsorship of the Engineering Geology Division should submit such plans at the earliest possible date so that they may be reviewed and coordinated with other Engineering Geology Division plans and programs.

Plans and particulars should be sent to James W. Skehan, S.J., Weston Observatory—Boston College, Weston, Massachusetts 02193.

Dunn duns for specimens to build U.S. National Mineral Collection

The mineral collections of the National Museum of Natural History, Smithsonian Institution, Washington, D.C., are among the largest in the world, states Pete J. Dunn of the Department of Mineral Sciences. These collections are readily available to, and used by, the scientific community for research. In addition to the National Museum's study and exhibit collections, the museum maintains a repository for type and described mineral specimens, that is, those from which data have been gathered and usually published. The type collection presently contains more than 500 mineral species and is continually growing. The number of described mineral specimens presently exceeds 4,700 specimens. We should all be concerned about the preservation of minerals for which analytical data in any form exist. The data become far less significant if the specimens are lost, for the information cannot be verified, amended, or enhanced by subsequent, perhaps more sophisticated, studies.

Far too often, minerals described in published papers are deposited in drawers or cabinets by the authors and subsequently forgotten. With the passage of time and continual shifting from place to place, these specimens are usually lost. Such loss, though unintentional, is irresponsible and a disservice to our science.

Just as it is important to publish our research and disseminate knowledge, it is also important to see to it that the specimens involved are preserved. Repositories of described specimens should continue to grow in depth and quality. Authors are therefore asked and strongly encouraged to send all analyzed or otherwise described mineral specimens to the Division of Mineralogy, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560. Acknowledgment of receipt will be made by letter, and the specimens will be carefully curated. Postage franks are available upon request. In turn, the museum will continue to do its best to furnish research materials to the scientist on written request.

We ask you, the responsible research mineralogist, to help us build the U.S. National Mineral Collection for the generations who will follow us. Please cooperate and send your specimens today. A photocopy of this page in a prominent place will be a helpful reminder. Thank you.

— *Pete J. Dunn*
Department of Mineral Sciences
Smithsonian Institution
Washington, D.C. 20560

A precocious Atlantic reconstruction:

by F. B. Van Houten
Department of Geological and Geophysical Sciences, Princeton University, Princeton, New Jersey 08540

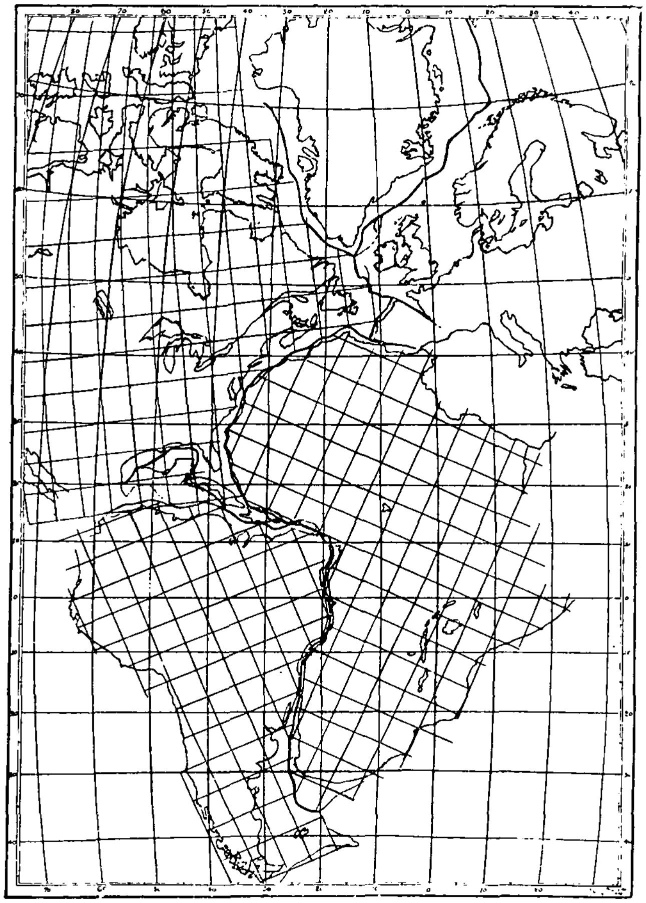

Figure 1. Assemblage of Atlantic continents based on bathymetric data (Choubert, 1935, Fig. 2).

Boris Choubert published in 1935 an illustrated interpretation of drifting Atlantic continents based on a virtual precursor of the "Bullard fit." He cited more pertinent geological data for the North Atlantic reconstruction than any author until the past few decades. Yet this pioneer has been overlooked in all of the recent historical reviews.

Current enthusiasm for theories on plate tectonics and continental drift has produced several good historical reviews, especially of the latter concept (Hallam, 1973; Marvin, 1973; Sullivan, 1974). Quite understandably the reviewers have emphasized the contributions of Wegener (1915, 1924) and DuToit (1937) during the lean years of disbelief in the 1920s and the 1930s. It is a bit sad, however, that in recognizing these and other pioneers, Boris Choubert (1935) was overlooked. He is not even included in Kasbeer's (1972) very useful bibliography of the ideas, with detailed references to their origin and development. In spite of these omissions, Choubert deserves recognition.

Boris Choubert's most striking contribution was a reassemblage of continents bordering the Atlantic Basin (Fig. 1) that is remarkably like the oft-cited "Bullard fit" (Bullard and others, 1965), including the displacement of Iberia to the east above Algeria and the closing of the Bay of Biscay. He also illustrated (Fig. 2) and discussed a number of structural relations across the Atlantic Basin more specifically than any previous geologist. His reconstruction of the North Atlantic continents and review of the role of northwest Africa remained the most detailed until the past few decades. His diagrams and comments emphasize that late Variscan events in northwest Africa were closely related to those of southwest Europe, with major deformation near the end of Westphalian (Late Pennsylvanian) time; that the northern and southern Appalachians had a rather different history; and that mid-Paleozoic deformation had affected Morocco as well as the northern Appalachians. Choubert also portrayed such favorites as the Cornwall-Kelvin transverse belt extending into northwest Africa (Drake and others, 1968; Schenk, 1971), and he pointed out that the Triassic basins and basalt imply rifting of the Atlantic continents.

An historical note

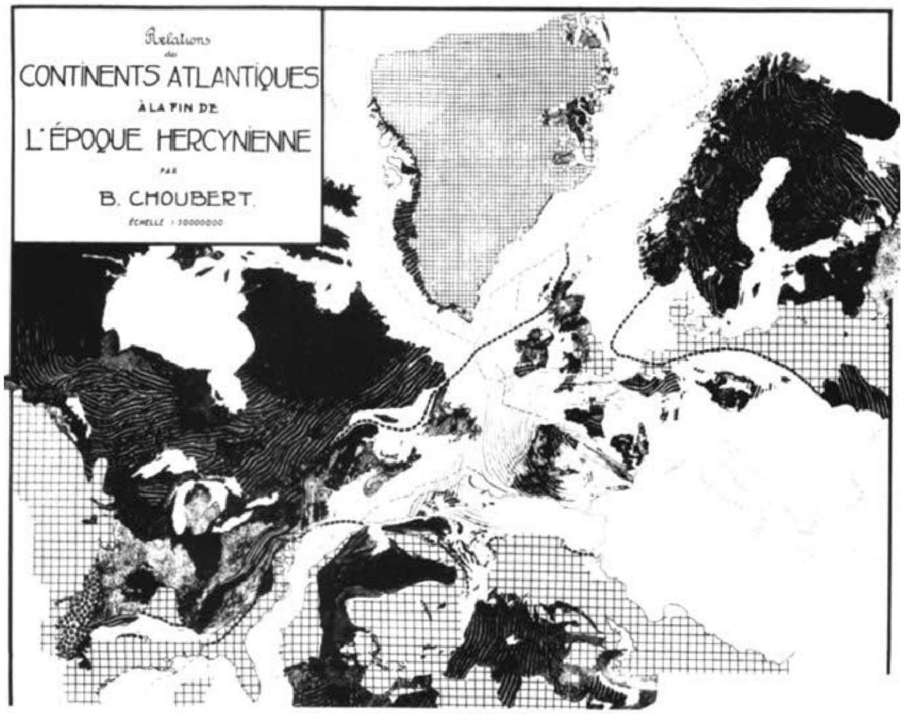

Figure 2. Relations of North Atlantic continents at the end of the Paleozoic Era (Choubert, 1935, Pl. A, north half).

Obviously, the capacity for imaginative interpretations has not waned over the past forty years. During this spree, northwest Africa has been pushed both eastward and westward relative to the African platform to satisfy one or another model, and it has been fit against North America everywhere from Florida to Newfoundland. A recent discussion of the opening of the North Atlantic Basin based on Mesozoic stratigraphy of western Morocco (Choubert and others, 1971) revived Choubert's model with Morocco fit against maritime Canada. This arrangement may not be the real thing, but these specific stratigraphic data, and many others that are becoming increasingly abundant and available on both sides of the Atlantic, impose critical constraints on attempts to reassemble the continents.

In defense of his premature speculations, Choubert argued that a geologist does not necessarily have to investigate the *cause* of global changes to discuss the *consequences* he finds on the Earth's surface. Lack of confidence in this precept among geologists undoubtedly postponed a widespread interest in continental drift.

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April BULLETIN briefs

Brief summaries of articles in the April 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.*

☐ 50401—Structure and Petrology of a Cumulus Norite Boulder Sampled by Apollo 17 in Taurus-Littrow Valley, the Moon. *Everett D. Jackson, U.S. Geological Survey, Menlo Park, California 94025; Robert L. Sutton, U.S. Geological Survey, Flagstaff, Arizona 86001; Howard G. Wilshire, U.S. Geological Survey, Menlo Park, California 94025.* (10 p., 10 figs., 3 tbls.)

A glass-coated half-meter-size boulder collected by the Apollo 17 crew near the foot of the Sculptured Hills is a coarse-grained (0.5-cm) plagioclase-orthopyroxene cumulate. The boulder contains at least nine structural surfaces and four glass veins. Three of the returned samples resulted in the identification of six surfaces and one vein. One of the structural surfaces visible in the boulder was identified as primary cumulus planar lamination, which was folded through an angle of at least 35° between two oriented samples, whereas fracture sets representing the other surfaces were coincident. The boulder is believed to be a sample of the deeper highlands or submare lunar crust, derived from a depth of 8 to 30 km and somewhat shock-metamorphosed during at least two excavation events. The cumulus texture of the boulder precludes its being representative of any magmatic liquid composition, suggests that the lunar crust is heterogeneously layered, and that plagioclase sank in magmatic liquids that formed the lunar crust.

☐ 50402—Tectonics near the Junction of the Aleutian and Kuril-Kamchatka Arcs and a Mechanism for Middle Tertiary Magmatism in the Kamchatka Basin. *Vernon F. Cormier, Lamont-Doherty Geological Observatory and Department of Geological Sciences of Columbia University, Palisades, New York 10964.*(11 p., 5 figs., 2 tbls.)

Fourteen new fault-plane solutions were determined for earthquakes in the region, and seismicity maps are presented for the periods January 1934 to January 1972 and January 1962 to January 1972. For fault-plane solutions determined for the Commander Islands, the horizontal component of the slip vectors is consistent with relative plate motion occurring parallel to the trend of the Aleutian arc. Along the southern margin of the Commander Islands, the dip of the fault planes along which this motion occurs is nearly horizontal; along the northern margin, the dip is nearly vertical. Fault-plane solutions for earthquakes along the east coast of Kamchatka south of the arc-arc junction indicate northwesterly underthrusting of the Pacific plate. Solutions north of the junction indicate that compressive stress normal to the east coast of Kamchatka continues to 58° or 59° N., but they are not proof that the Kamchatka Basin is underthrusting northeast Kamchatka. The rough basement topography, reduced sediment thickness, and high heat flow in the Kamchatka Basin north of the Commander Islands are the apparent results of a Cenozoic emplacement of basaltic magma. Extensive magmatism in the Kamchatka Basin was initiated 30 to 40 m.y. ago when subduction along the Aleutian arc ceased west of 176° E. The resultant release of compressive stress along the plate margin in the Commander Islands is proposed as the mechanism that mobilized a mantle diapir from an oceanic slab that dipped northward beneath most of the Kamchatka Basin. Migration and intrusions of this diapir may have involved generation of oceanic crust.

☐ 50403—Late Paleozoic Glaciation: Part VI, Asia. *Lawrence A. Frakes, Department of Earth Sciences, Monash University, Clayton, Victoria 3168, Australia; Elizabeth M. Kemp, Bureau of Mineral Resources, Geology and Geophysics, Canberra, A.C.T. 2601, Australia; John C. Crowell, Department of Geological Sciences, University of California at Santa Barbara, Santa Barbara, California 93106* (11 p., 8 figs.)

Occurrences of glacial deposits of late Paleozoic age in the Northern Hemisphere are known only in peninsular India, along the Himalayan trend from the Salt Range in Pakistan to Sikkim and Bhutan, and there are possible deposits rafted by shore ice in Siberia. The relatively thin glacial deposits of Pakistan and Indian are dated by microfloras and invertebrate faunas as being within the range Stephanian-Sakmarian. Deposition was from ice bodies scattered between the south-central peninsula and the shores of the Tethys Sea, somewhere near the present position of the Himalayas. Ice possibly reached the sea in the region of the Salt Range and in the Kumaon Himalayas. Rock paleomagnetism studies indicate that most of India and Pakistan would have been positioned at paleolatitudes between 40° and 50° S.; global temperatures thus probably were lower than at present. The rafted deposits of Siberia probably accumulated in paleolatitudes between about 50° and 60° N. and, being Kazanian in age, they postdated most Gondwanaland tillite deposition (Westphalian to Sakmarian) but were approximately contemporaneous with ice-rafted deposits of southeastern Australia.

☐ 50404—Bright Angel and Eminence Faults, Eastern Grand Canyon, Arizona. *Peter W. Huntoon and James W. Sears, Department of Geology, University of Wyoming, Laramie, Wyoming 82071.* (6 p., 10 figs.)

The Bright Angel and Eminence faults trend northeastward through the eastern Grand Canyon region. The Bright Angel

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fault is parallel to basement foliation. Activity along the fault dates from Precambrian time. The first record of movement indicates that it was reverse; it coincided with the deposition of the basal Shinumo Quartzite. Additional reverse movement occurred following intrusion of the Unkar Group by diabase sills and dikes. The Precambrian Chuar Group was later broken by a series of northwest-trending normal faults that tilted the section toward the northeast, causing minor adjustments along the Bright Angel fault.

Possible reverse movement along the Bright Angel fault is recorded in a local angular unconformity between the Paleozoic Redwall and Supai Formations. East-dipping Laramide (?) monoclines developed as reverse movement occurred along selected pre-existing northwest-trending Precambrian faults. Tensional faulting beginning in Miocene (?) or Pliocene (?) time caused downfaulting, east side down, along the Bright Angel fault. The Eminence fault, west side down, is part of a graben complex.

☐ 50405—Carbonate Breccia (Rauhwacke) Nappes of the Carson Sink Region, Nevada. *R. C. Speed, Department of Geological Sciences, Northwestern University, Evanston, Illinois 60201.* (14 p., 7 figs., 2 tbls.)

Nappe piles of lower Mesozoic pelite in the Carson region of Nevada contain sheetlike carbonate complexes (breccia, unbrecciated masses, minor gypsum), referred to as carbonate breccia nappes and the rocks within them collectively as rauhwacke, after similar rocks in the Alpine chains. In the Carson region, rauhwacke occurs only in nappe piles of pelitic rocks, suggesting that nappe tectonics and rauhwacke origin were related.

The largest and most thoroughly studied carbonate complex, the Muttlebury nappe, consists of masses of deformed carbonate rocks, 2 m to 10 km in outcrop length, that are irregularly distributed through dominant carbonate breccia. The breccia, largely polymict and massive but locally stratified, is probably of intraformational origin. It is argued that rauhwacke of the Muttlebury nappe and elsewhere in the Carson region is derivative from detached masses of the Jurassic Lovelock Formation. Gypsum in the Lovelock Formation is believed to have been partly calcitized, yielding marble, the most abundant rock type of the Muttlebury nappe. Breccia is proposed to have originated by dissolution of gypsum that escaped calcitization and by subsidence and collapse of the intercalated carbonate rocks.

The Muttlebury nappe was emplaced as the sole of a thick pelite nappe, perhaps contemporaneously with solution breccia-tion. After emplacement, both nappes were folded with their substrate. It is hypothesized that translation of the nappe pair depended on the low strength of the gypsiferous proto-Muttlebury nappe. As gypsum dissolved, the rheologic contrast of the Muttlebury nappe and its surroundings diminished, and translation of the nappe pair was progressively hindered. Once the proportion of solution breccia was sufficient, further displacement was taken up by folding.

☐ 50406—The Character of Channel Migration on the Beatton River, Northeast British Columbia, Canada. *Edward J. Hickin and Gerald C. Nanson, Department of Geography, Simon Fraser University, Burnaby, British Columbia, Canada.* (8 p., 9 figs., 1 tbl.)

Dendrochronological surveys on ten point-bar complexes on the Beatton River, northeast British Columbia, provide the basis for measurement of lateral migration and incision during the last 250 yr. The rate of channel-bend migration reaches a maximum value where the ratio radius of channel curvature to stream width ($r_m w_m$) approximates 3.0. The rate of channel migration rapidly declines for bends with values of $r_m w_m$ greater or less than 3.0. In addition, the spacing of flood-plain ridges (*d*) increases with increasing rates of bend migration.

☐ 50407—Thermal-Infrared Images as a Basis for Structure Mapping, Front Range and Adjacent Plains in Colorado. *Terry W. Offield, U.S. Geological Survey, Denver, Colorado 80225.* (8 p., 7 figs.)

High altitude thermal-infrared images display many linear and circular topographic features. The features are enhanced by thermal shading effects and some are better displayed than in photographs. Comparison with geologic maps of a control area shows that most lineaments identified from the thermal images are faults. A circular feature at the Central City-Idaho Springs mineral district bounds most of the area of gold mineralization; it marks the most intensively altered ground in the district and may reflect subtle structure related to the presence of an unexposed intrusive body. Lineaments in the plains probably mark structural trends related to the Denver basin and to folds not otherwise expressed at the surface.

☐ 50408—Potassic Granophyre Associated with Precambrian Diabase, Sierra Ancha, Central Arizona. *Douglas Smith, Department of Geological Sciences, University of Texas at Austin, Austin, Texas 78712; Leon T. Silver, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California 91109.* (11 p., 11 figs., 2 tbls.)

Lenses of granitic and syenitic granophyre unusually rich in potassium crop out at and near the roof of a Precambrian sill complex of olivine diabase intruded into the Apache Group. Granophyre contains 7 to 11 wt percent K_2O, whereas intruded rocks of the Dripping Spring Quartzite contain 9 to 14 wt percent K_2O. The sedimentary rocks were enriched in potassium before emplacement of diabase, probably during diagenesis while saturated with saline water.

The granophyre apparently was mostly liquid when emplaced. Chemical data, together with arguments based on mineralogy, textures, and field relations, indicate that most of the granophyre was derived

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from Dripping Spring Quartzite. The granophyre, however, contains more Na, Ca, and P and less K than the sedimentary rocks. Rocks representing a differentiated fraction of diabase magma are concentrated below granophyre at the roof of the complex. The unusual crystallization profile may reflect an influx of water from the overlying sedimentary rocks into the magma. The influx of water may have been responsible for the extensive interaction between magma and country rock. Country rock fused during the interaction appears to have migrated to local structural highs.

Because the evidence that the granophyre formed largely from country-rock material is unusually clearcut, this granophyre may serve as a petrogenic model for some other silica-rich igneous rocks associated with intrusions of basaltic magma.

☐ 50409—Correlations between Dikes of the Monument Swarm, Central Oregon, and Picture Gorge Basalt Flows. *Jonathan S. Fruchter, Battelle Northwest Laboratories, Battelle Boulevard, Richland, Washington 99352; Stuart F. Baldwin, Center for Volcanology, University of Oregon, Eugene, Oregon 97403.* (3 p., 3 figs., 2 tbls.)

Samples obtained from dikes and other intrusive bodies of the Monument dike swarm in central Oregon were analyzed by instrumental neutron activation analysis. All but two of the dikes have distinctive trace-element compositions that identify them as possible sources for the basalt flows at the Picture Gorge type section and equivalent or stratigraphically lower flows elsewhere in the region. The correlations are supported by paleomagnetic polarity measurements and by major-element analyses of nine of the samples.

☐ 50410—Distribution and Trends of Discordant Ages of the Plutonic Rocks of Northeastern Montana and Northern Idaho. *Fred K. Miller, U.S. Geological Survey, Branch of Western Environmental Geology, 345 Middlefield Road, Menlo Park, California 94025; Joan C. Engels, 348 Waverley, Menlo Park, California 94025.* (12 p., 7 figs., 1 tbl.)

K-Ar dating of granitic rocks in northeastern Washington and northern Idaho indicates four distinct periods of intrusion at about 200+ m.y., 170 m.y., 93 to 101 m.y., and 45 to 51 m.y. The two oldest events are each represented by one pluton in the region. Plutons of the 93- to 101-m.y. event are abundant in the eastern and western parts of the region and may have occupied much of the intervening area before the youngest event. Except for a group of unrooted plutons in the upper plate of a thrust fault, no plutonic rocks between the west edge of the Pend Oreille River valley and the Purcell Trench south of lat 48°15′ N. yielded an age outside the 45- to 51-m.y. span. Westward from the Pend Oreille River valley, the plutonic rocks yield successively older ages over a zone 8 to 25 km wide. All coexisting mineral pairs from rocks within this zone yield discordant ages. West of the zone, mineral pairs yield concordant ages in the 93- to 101-m.y. range.

East of the Purcell Trench, a partly preserved mirror image of the Pend Oreille River zone of discordance is disrupted by faults in the trench and in places appears to have been removed. In the vicinity of the Purcell Trench, the apparent ages suggest a complex thermal history probably complicated by faults concealed in the trench.

☐ 50411—Pleistocene Tephra and Ash-Flow Deposits in the Volcanic Highlands of Guatemala. *Allan J. Koch, Mobil Oil Corporation, P.O. Box 5444, Denver, Colorado 80217; Hugh McLean, Texaco, Inc., 3350 Wilshire Boulevard, Los Angeles, California 90005.* (13 p., 13 figs., 1 tbl.)

The texture, thickness, and distribution of tephra layers indicate that they originated from five separate centers: the Pacaya volcanic complex, Agua Volcano, Acatenango or Fuego Volcanoes, the Lake Atitlán area, and the Laguna de Ayarza area. The exact sources of the ash flows are not known. Size of pumice clasts, pumice texture, and mineral content show that the basin-filling ash-flow tuff units are of primary origin and could not have resulted from inwash of previously deposited pumiceous tephra. Each ash-flow tuff apparently was deposited shortly after a tephra eruption.

Reconnaissance work indicates that the H ash-flow tuff unit and its underlying tephra cover a major portion of the volcanic highlands—at least 16,000 km^2 and 7,500 km^2, respectively. Their source probably lies close to the Lake Atitlán area.

Radiometric dating indicates that most major tephra and ash-flow deposits were deposited between 40,000 yr and 1.84 m.y. ago. Were similar eruptions to occur today, widespread devastation and loss of life could result.

☐ 50412—Submerged Shorelines and Shelves in the Hawaiian Islands and a Revision of Some of the Eustatic Emerged Shorelines: Discussion and Reply.

Discussion: *Christopher C. Mathewson, Department of Geology, Texas A & M University, College Station, Texas 77840.*

Reply: *Harold T. Stearns, 4999 Kahala Avenue, Apartment 445, Honolulu, Hawaii 96816.*

☐ 50413—Geology of Eastern Papua: Discussion and Reply.

Discussion: *A. R. Lillie, University of Auckland, Auckland, New Zealand.*

Reply: *Emile Rod, 9 Minns Road, Gordon, New South Wales 2072, Australia.*

☐ 50414—Precambrian Crustal Development in Western Nigeria: Indications from the Iwo Region. *Fred H. Hubbard, Department of Geology, The University, Dundee DDI 4HN, Scotland.* (7 p., 4 figs., 1 tbl.)

The rocks of the Iwo region of southwestern Nigeria comprise a migmatite-gneiss-granite complex and a metasupracrustal sequence. Though dominantly of amphibolite facies grade, pyroxene granulite and charnockite remnants are found in the migmatite-gneiss-granite complex. Old supracrustal remnants, best identified in resistant quartzite horizons, are also represented, and a variety of granitic plutonic rocks form well-marked circumscribed associations. The main metasupracrustal belt is associated with a major dislocation zone and has two principal lithologies—dominant amphibolite and pelite west of the fault zone and quartzite and quartzofeldspathic gneiss to the east. Oligoclase-granite gneiss and pegmatite are associated with the schist. All the rocks of the area have been affected by late reworking, metasomatism, and granitic activity.

Archean crustal rocks are considered to have been involved in an Eburnian (1,950 ± 250 m.y.) reactivation of Proterozoic mobile-belt type. In the Kibaran period (1,200 ± 200 m.y.), activity of greenstone belt-granite type brought about the formation of the Ife supracrustal-granite gneiss association, with extensive basement reactivation being limited to the proximity of the downwarping supracrustal sequence. Late, widespread reworking and granitic plutonism is related to the Pan-African (Older Granite) event (600 ± 150 m.y.).

☐ 50415—Kaersutite and Kaersutite Eclogite from Kakanui, New Zealand—Water-Excess and Water-Deficient Melting to 30 Kilobars. *R. B. Merrill and P. J. Wyllie, Department of the Geophysical Sciences, University of Chicago, Chicago, Illinois 60637.* (6 p., 7 figs., 6 tbls.)

A natural kaersutite megacryst (compositionally equivalent to olivine nephelinite) and a kaersutite eclogite nodule (equivalent to olivine basanite) from the Mineral Breccia, Kakanui, New Zealand, were reacted in sealed platinum and $Pd_{70}Ag_{30}$ alloy capsules, both with excess water and with no additional water present, using half-inch piston-cylinder apparatus. Near-liquidus assemblages include orthopyroxene at pressures greater than about 15 kb in water-rich portions of the olivine-basanite system but not in the olivine-nephelinite system. Reversed high-pressure limits of the amphibole stability fields (excess water) have negative values of dP/dT, which crosses 25 kb at 1075°C and 30 kb at 925°C in the kaersutite system, but which crosses 25 kb at 1025°C and 30 kb at about 775°C in the kaersutite eclogite system. Comparison with experimental results reported elsewhere indicates that amphiboles persist to highest temperatures in basaltic liquids with greatest TiO_2 contents but with lowest $Na_2O/(Na_2O + K_2O)$ ratios and lowest SiO_2 contents.

☐ 50416—Sugarloaf Mountain Tephra—A Pleistocene Rhyolitic Deposit of Base-Surge Origin in Northern Arizona. *Michael F. Sheridan, Department of Geology, Arizona State University, Tempe, Arizona 85281; Randall G. Updike, Department of Earth Sciences, University of Wisconsin, River Falls, Wisconsin 54022.* (11 p., 6 figs., 3 tbls.)

Sugarloaf tephra forms an apron surrounding a rhyolitic dome northeast of the San Francisco Peaks, Arizona. Tuff-ring deposits, exposed for 180° around the north side of the endogenous dome, have a maximum thickness of 75 m. Plane beds, massive beds, and sand-wave beds are recognized in the tuff ring. A related 3- to 10-m-thick air-fall deposit extends northeast of the tuff ring. The dome, dated at 212,000 yr B.P., and its associated tephra deposits predate the adjacent Illinoian-age glacial deposits.

Interaction of a ground-hugging fluidized density flow with a cohesionless substrate is the model used for base-surge transport of the tephra deposits. Particle-size data show that the tuff-ring textural types represent discrete subpopulations. The two principal roots extracted by factor analysis of the size data are assigned to viscous and inertial shear at the base of the surge flow. Sand-wave beds form under the influence of viscous shear in a dilute-phase fluidized system with a thin traction layer. Plane beds develop through inertial shear in a 1- to 10-cm-thick bed-load layer beneath a dilute-phase fluidized surge cloud several meters thick. Massive beds result from a combination of viscous and inertial forces operating in a deflating, dilute- to dense-phase fluidized cloud. Solid fraction of the flowing cloud and thickness of the bed-load layer are the critical factors in developing the textures of the tuff-ring deposits.

☐ 50417—Tectonic Development and Metallogeny of Madagascar with Reference to the Fracture Pattern of the Indian Ocean. *Jan Kutina, Institute of Mineral Raw Materials, Sedlec 425, Kutna Hora, Czechoslovakia.* (11 p., 13 figs.)

Madagascar is apparently a large block of continental crust intermittently uplifted as a complex horst between two subsiding depressions within the system of north-northeast-trending fractures of the Indian Ocean floor. A set of major east-trending fractures intersect the Precambrian basement rocks. The fractures are probably of Precambrian age, but later movements occurred along them. The fracture zones occupy evenly spaced low areas followed by river valleys that cut the sedimentary cover of western Madagascar. The Mahanoro-Tsiribihina fracture zone in the middle of the island is roughly aligned with a segment of the east-trending Rodriguez fracture zone which intersects the crest of the Mid-Indian Ocean (Mid-Oceanic) Ridge east of long. 63° E. An axis of magmatic reactivation in central Madagascar corresponds to a deep-seated Precambrian fracture zone along which magmatic processes occurred at different times. Endogenous ore deposits of Precambrian and Paleozoic age are related to the intersection of the east-trending fracture zones with the axis of magmatic reactivation and lines parallel to this axis. The mineralization associated with Cretaceous intrusive rocks exhibits another pattern of distribution.

Madagascar essentially occupies its original place. Furthermore, India was not derived from the western Indian Ocean by continental drift. Instead, a continuous landmass existed in the region between the eastern coast of present-day Africa and the Mid-Oceanic Ridge. This interpretation does not contradict the derivation of India from the central part of the Indian Ocean between 75 and 55 m.y. B.P. as suggested by McKenzie and Sclater.

If the above interpretations are correct, disintegration of a continental mass as well as continental drift have contributed to the origin of the Indian Ocean.