GSA news & information

VOLUME 3, NUMBER 11

NOVEMBER 1981

Science editors named for GSA publications

Society President Howard R. Gould has announced the completion of agreements with the following noted geologists to fill the positions of external Science Editors for GSA's publications, *Bulletin, Geology*, books, and maps and charts.

The new positions were created by the Council at its meeting last May, on the basis of recommendations of the Special Publications Study Committee.

Named as Editors for the *Bulletin:*

Robert D. Hatcher, Jr.
Dept. of Geology
University of South Carolina
Columbia, SC 29208
(803) 777-6683

William A. Thomas
Dept. of Geology & Geography
University of Alabama
University, AL 35486
(205) 348-5095

Named as Editor for *Geology:*

Eldridge M. Moores
Dept. of Geology
University of California
Davis, CA 95616
(916) 752-0352 (office)

Named as Editor for all GSA books:

William G. E. Caldwell
Dept. of Geological Sciences
University of Saskatchewan
Saskatoon, Saskatchewan S7N 0W0, Canada
(306) 343-3175

Named as Editor for the GSA Map and Chart series:

John C. Reed, Jr.
U.S. Geological Survey, MS 913
Box 25460, Federal Center
Denver, CO 80225
(303) 234-4857

WHERE TO SEND MANUSCRIPTS

Authors should continue to address manuscript submissions for all GSA publications to the following address:

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

Manuscripts will be processed through GSA headquarters so that complete records will be maintained for the convenience of authors.

Notice—F.Y.I.

Bulletin changes decided by GSA Council for 1982 cause some temporary delays

As the *Bulletin* is now closing out its *Part II* microfiche production, every effort is being made to include manuscripts that have been "in process" for some months. *Part I* and *Part II* have to be coordinated, as you all know. Delay for *Part II* means delay for *Part I* also. We regret that the *Bulletin* has been behind schedule and that subscribers have been receiving copies of both Parts late. Unfortunately, this situation must continue for the remaining issues for 1981. By January of 1982, however, we plan to be on schedule once again.

In response to the Council edict that the *Bulletin* will once more accept longer papers (maximum of 70 pages, including illustrations), we have been inundated with fine papers, too good to reject. We are now looking at a backlog of some seven or eight months of accepted papers waiting for publication.

Bulletin Manager

Separate publications planned

Indices to *Bulletin* and *Geology* due in February 1982

The annual indices to the 1981 volumes of the Society's two journals will be published in February 1982 rather than as part of the December issues of those journals as in the past. The primary reason is the difficulty of completing the indices in time for publication with the December issues.

The indices, each of which include an author-sort as well as a topical-sort for all articles published during the year, include listings for the articles in the December issues. Thus, the indices cannot be completed until the make-up of the December issues is complete and can be furnished to the indexer.

In the past two years, this has created unnecessary expense and delays in publishing the December issues. This year, headquarters is faced with the additional problem created by the delay of *Bulletin,* caused by the transition from the two-part format back to a one-part format.

The plan is to publish each index as issue number 13 of each journal about February 1, 1982. Advertisers will be given the opportunity to purchase space in each index to help offset the cost. The index to *Bulletin* will be mailed to all subscribers to the 1981 volume of *Bulletin,* and *Geology* index will be mailed to all 1981 *Geology* subscribers.

Thanks to volunteers for committee work

The GSA Council has expressed it appreciation to the many members who have volunteered for committee work of the Society during the past year. Volunteers are considered and selected by the Committee on Committees. Each year there are only a relatively few slots to be filled; therefore only a small fraction of those volunteering have been given committee assignments. GSA members are strongly encouraged to continue volunteering for these important assignments. The roster of volunteers is the prime source of candidates for consideration by the Committee on Committees and the Council.

Letter to the Editor

A CENTENNIAL SONNET

Suess! thou shoulds't be living in this decade, Centennial
both of GSA
and Das Antlitz der Erde. The Science hath need of thee. GSA
will celebrate
with D-NAG: more than twenty volumes from some hundred
pens to survey
mere North America. Surely right yours too to commemorate
recognizing that your three volumes dealt with the planet wholly
treating natural terranes without regard for national frontiers
expressing relationships in the consistent idiom attainable only
by a lone ranger unencumbered by committees and by partners.
Can the aims of D-NAG be achieved? Hopefully so but fears
galore
arise with news that national frontiers will impose less than a few
divisions of natural terranes: Cordillera into three or more;
Continental Interior and Appalachians each in two.
Your broad intelligence many a monograph to a few lucid lines
would reduce.
Oh! for the likes of you such a work to produce.

E. T. Tozer
Geological Survey of Canada
Energy Mines & Resources, Canada
Ottawa, Canada, K1A OE8

A CENTENNIAL SONNET: AN UNSONNETARY REPLY

Methinks a cynic hath bespoke above. All Hail to Suess,
and Bacon, too, Centennials and more should everyone enjoy.
Remind thee those were times when knowledge be
encompas'd by one man, or few. But profligacy of pen,
fertility of body and ideas preclude simplicity
in undertakings such as this. D-NAG perhaps engages
but similar percentages of minds to sift
and sort and synthesize. If all t' parts were done
in closets dark, wouldst surely be a camel clothed
as horse. But lest despair reign mightily,
coordination is the key. Forget not also, one man
perforce still synthesizes all. Give hail!
Bert Bally; D-NAG's Suess, withal!

Allison R. Palmer
Centennial Science Program Coordinator

GSA News & Information
Vol. 3, no. 11 November 1981

GSA NEWS & INFORMATION (ISSN 0164-5854) is the monthly newsletter of The Geological Society of America, Inc., P.O. Box 9140, Boulder, Colorado 80301. Second-class postage rates paid at Boulder, Colorado, and at additional mailing office.

Prepared from contributions from the staff and membership by John C. Frye, Executive Director; James R. Clark, Production Manager; June Thomas and Ann H. Fogel, Production Assistants; Advertising Sales, James R. Clark.

CENTENNIAL NEWS

D-NAG and the GSA Foundation

If you have been following this column, you are well aware that during the past year the Decade of North American Geology has gone from an idea to a thriving international program to synthesize the geology of North America (actually, the North American Plate and adjacent areas).

GSA is playing a major role in preparation and production of a new Geologic Map of North America and of 16 of the 25 volumes of regional synthesis which will comprise the Geology of North America. The remaining volumes are being produced by the Geological Survey of Canada, which is also involved along with the USGS in preparation of the North American geophysical and geological maps. The base for all maps has been specially prepared by the USGS.

In addition, the umbrella of D-NAG now has beneath it the COSUNA project of AAPG to prepare correlation charts of the conterminous United States; the Tectonic Map project, also of AAPG, to prepare the update of King's classic map; the Continent-Ocean Transects Project sponsored by the Canadian Committee on the Lithosphere, the Comité de los Institutos de Geologia y Geofisica, U.A.N., Mexico, and the U.S. Geodynamics Committee, to prepare 26 geological/geophysical transects around the continental margin—with each 100–200-km-wide transect extending from clear continental to clear oceanic crust; the North American Magnetic Anomaly and Gravity Anomaly Map Projects of the Society of Exploration Geophysicists to prepare up-to-date maps on these topics; and the North American Lineament Map Project of the USGS based on satellite imagery supplied by NASA.

The estimated total cost for this massive effort is ten to twelve million dollars. GSA's costs for coordination of the D-NAG program, production and publication of the Geologic Map and its share of the synthesis volumes, and publication of the continent-ocean transects will be about four million dollars.

The GSA Foundation was created to receive funds for the D-NAG project and other programs benefitting the science of geology. While large grants will necessarily have to provide the bulk of the funding for D-NAG, this is a project in which we all have a stake because its products will enrich almost all areas of geological activity in subsequent decades—from exploration to basic academic research. It needs a strong component of grass-roots support.

You should have received a recent mailing from the GSA Foundation soliciting your contributions to the D-NAG program. Every dollar raised will go to enhance the quality of the products that we produce or to subsidize costs of these products so that they can be widely disseminated to all segments of the North American geological community at affordable prices.

You will be proud of your participation in this magnificent enterprise sponsored by your society!

UPDATE

In November *Geology*

1. Early history of scleractinian corals and its geological consequences, by G. D. Stanley, Jr.
2. Age, origin, and significance of an unconformity that predates island-arc volcanism in the northern Sierra Nevada, by R. J. Varga, E. M. Moores
3. Late Quaternary deformation of the Toppenish Ridge uplift in south-central Washington, by N. P. Campbell, R. D. Bentley
4. Problems in determination of the water content of rock-salt samples and its significance in nuclear-waste storage siting, by E. Roedder, R. L. Bassett
5. Dynamical model for temporal variation in magma type and eruption interval in Kohala volcano, Hawaii, by M. D. Feigenson, F. J. Spera
6. Evaluation of the Wells fault, northeastern Nevada and northwestern Utah, by C. H. Stevens
7. Deformation of crystalline materials in thin section, by W. D. Means, Z. G. Xia

Articles in *Bulletin, Part II,* September 1981

Articles in *Bulletin, Part II* are listed below. (Summaries only of these articles are in *Bulletin, Part I.*)

1. The nature and magnetic expression of isograds in the contact aureole of the Liberty Hill pluton, South Carolina, by J. Alexander Speer. (On microfiche: 97 p., 10 figs., 11 tables).

Articles in *Bulletin, Part II,* October 1981

1. Geology and petrology of Quaternary volcanic rocks, Garibaldi Lake area, southwestern British Columbia, by Nathan L. Green. (On microfiche: 111 p., 14 figs., 11 tables).

New forms well accepted in 1981

REPORT FROM THE ABSTRACTS COORDINATOR

The end of another season of processing abstracts for the Society's seven annual meetings was marked on September 18 with the publication of volume 13, number 7, of *Abstracts with Programs* for the Annual Meeting in Cincinnati.

The 1,098 volunteered abstracts submitted for this year's Annual Meeting closely matched the 1,105 submitted in 1980 and was only about 100 off from the all-time record established in 1979 (see table). An additional 266 invited Symposia abstracts also were submitted this year, about the same number submitted in 1980.

Several changes were implemented this year in the way GSA processes abstracts. Most apparent to scientists in the field were the form itself, which now will change each year; the rapid acknowledgment to authors of receipt of their abstracts at headquarters; and the equally rapid advice to authors on whether their papers were accepted for presentation. (All acceptance notices to authors were in the mail this year within five working days after completion of the Joint Technical Program Committee's meeting at which the acceptance decisions are made.)

It has been a tremendous help that the geologic community this year overwhelmingly accepted the requirement that the current year's abstract form be used for preparation of abstracts. This acceptance already has made possible the reduction of many labor costs involved in processing.

Perhaps more important, that acceptance has paved the way for other improvements in 1982. For example, abstract forms next year will be pre-numbered to allow for the mechanism of the last, and most expensive, processing chores, such as the preparation of the extensive double indices of authors in *Abstracts with Programs*.

A microcomputer system has made possible most of the time-related improvements, examples of which are the elimination of multiple typing of the same data, prompt acknowledgments to authors, early mailing of acceptance notices, and immediate response to author inquiries.

TABLE 1 -- History of abstract submissions for Annual Meeting, by classifications.

Abstract Classification	All Volunteered 1976	1977	1978	1979	1980	1981 Volun	1981 Symp	1981 Total
Archeological Geology	12	12	13	14	10	10	11	21
Coal Geology	27	20	27	22	19	30	7	37
Economic Geology	62	46	56	90	73	86	15	101
Engineering Geology	14	3	13	40	14	21	10	31
Environmental Geology	26	18	28	15	22	19	0	19
Extraterrestrial Geology	4	7	5	3	4	4	8	12
General Geology	15	5	5	14	8	6	0	6
Geochemistry	131	91	92	110	106	91	12	103
Geology Education	17	9	19	18	21	7	2	9
Geomorphology	34	32	27	26	25	27	0	27
Geophysics	9	14	20	14	20	11	7	18
Geoscience Information	4	0	11	7	10	6	5	11
History of Geology	4	4	12	8	5	2	7	9
Hydrogeology	29	20	30	40	39	36	32	68
Marine Geology	82	77	82	118	94	52	0	52
Mathematical Geology	0	0	3	3	6	3	0	3
Micropaleontology	25	10	22	15	33	26	13	39
Mineralogy/Crystallography	37	42	49	53	53	40	7	47
Paleontology/Paleobotany	67	56	60	71	74	79	19	98
Petrology, Experimental	0	20	18	28	28	23	0	23
Petrology, Igneous	136	68	74	95	71	63	0	63
Petrology, Metamorphic	0	30	48	44	33	41	0	41
Petrology, Sedimentary	0	0	0	17	24	34	0	34
Precambrian Geology	10	9	40	22	26	25	0	25
Quaternary Geology	28	38	59	63	45	57	6	63
Sedimentology	78	47	68	60	72	50	3	53
Stratigraphy	27	24	24	38	31	28	24	52
Structural Geology	29	25	35	37	52	87	4	91
Tectonics	55	44	62	96	64	102	6	108
Volcanology	0	0	21	21	20	17	0	17
Other	0	0	0	6	3	14	68	82
Unclassified (Special)	0	0	0	0	0	1	0	1
TOTALS	962	771	1,023	1,208	1,105	1,098	266	1,364

In 1981 this equipment also was used for production and printout of the various "sorts" of the three hundred program events for the Annual Meeting. In 1982 the technical program printout will be produced camera-ready by this system, eliminating the only remaining duplication of the key-stroking of these data.

We now plan to utilize this system, starting in 1982, to produce the technical program printouts and indices for the six section issues of *Abstracts with Programs* as well. By thus unifying and simplifying the production procedures for all seven issues, we hope to keep costs low. More important, any reduction of the time required for processing should translate to later abstract deadlines. That, in turn, should allow for the presentation of more current science at GSA's seven annual meetings.

UPCOMING MEETINGS

Two symposia to be held at 1982 Rocky Mountain Section Meeting in Bozeman, Montana

A one- to two-day symposium, "Structure and Tectonic Evolution of the Fold-and-Thrust Belt," will be held at the 1982 Rocky Mountain Section Meeting, GSA (May 7–8, 1982), hosted by Montana State University, Bozeman, Montana. The symposium will be subdivided into three general categories: (1) structural geology of the western Montana fold-and-thrust belt; (2) tectonics and regional geophysics of the northwestern United States; and (3) oil and gas resources of the northern Rocky Mountain fold-and-thrust belts. The submission of abstracts of papers and poster sessions relevant to these subjects is encouraged. The symposium chairman is David Lageson, Department of Earth Sciences, Montana State University, Bozeman, MT 59717.

In addition, a one-half to full day (depending upon response) symposium will be held, "Geologic Aspects of the Disposal of High-level Nuclear Waste in Igneous Rocks." The symposium will emphasize the hydrogeologic, geochemical, mineralogic-petrographic, structural, and thermal-mechanical aspects of the problem and is open to papers covering observational, experimental, and theoretical studies. We encourage the submission of abstracts of papers that treat the basic scientific aspects of the disposal of high-level nuclear waste in igneous rocks, rather than project-oriented progress reports. The symposium chairman is Klaus Keil, Department of Geology and Institute of Meteoritics, University of New Mexico, Albuquerque, NM 87131.

One copy of the abstract should be sent to the respective symposium chairman by November 15, 1981, for review and symposia organization. Final abstracts are to be submitted (camera ready) using GSA forms to Robert A. Chadwick, Program Chairman, Rocky Mountain Section, GSA, Department of Earth Sciences, Montana State University, Bozeman, MT 59717.

Second International Conference on Geological Information, May 23–27, 1982

The Second International Conference on Geological Information will be held at the Colorado School of Mines on May 23–27, 1982. The conference will be sponsored and organized by the Geoscience Information Society and the Geological Information Group of the Geological Society of London, together with the International Union of Geological Sciences, Association of Chief Librarians of National Geological Surveys, and Association of Geoscientists for International Development.

The conference theme will be "International cooperation to identify and share geological information." The program will include sessions on current activities in both national surveys and geoscience information groups; international programs and their prospects for the future; and development of inventories of natural resources information (bibliographic databases and numeric data banks, including their content and availability). Specialized sessions will be planned for topics such as building library collections, specialized data files, map acquisitions, translations, and publishing.

During the conference, field trips will introduce registrants to the general geology of the Rocky Mountain Front Range. There will be visits to the national, international, and corporate earth-science data centers and libraries in the Denver area.

For more information, please contact D. C. Ward, 223 Natural History Building, 1301 West Green Street, Urbana, IL 61801, or A. P. Harvey, Dept. of Library Services, British Museum (Natural History), Cromwell Road, London SW7 5BD, United Kingdom.

Symposium, "Role of the Unsaturated Zone in Radioactive and Hazardous Waste Disposal," Philadelphia, Pennsylvania

A special session on the role of the unsaturated zone in radioactive and hazardous waste disposal will be held as part of the Spring Annual Meeting of the American Geophysical Union to be held in Philadelphia, Pennsylvania, during the week of May 31–June 4, 1982. The symposium is sponsored by the AGU Committee "Water in the Unsaturated Zone."

The program will focus on the use of laboratory analysis, field observations, and numerical and analytical calculations. Possible topics include unsaturated zone modeling, characterization of attenuation properties, field studies, and chemical reaction characterization.

Anyone interested in contributing a paper should submit an abstract in AGU format by February 15, 1982, to James W. Mercer, GeoTrans, Inc., P.O. Box 2550, Reston, VA 22090. Additional information can be obtained by calling Mr. Mercer (703) 435-4400, Mr. P.S.C. Rao (904) 392-1951, or Mr. I. Wendel Marine (803) 725-3469.

ISAP Symposium, Salvador, Brazil, September 1982

An International Symposium on Archean and Early Proterozoic Geologic Evolution and Metallogenesis (ISAP) is being organized to be held in Salvador, Brazil, at the beginning of September 1982. The definitive dates will appear in the First Circular and will be chosen to immediately precede the XXXII Brazilian Geological Congress. The sympo-

(continued on page 200)

Penrose Conference

A GSA Penrose Conference, "Tectonic History of the Ouachita Orogen," will be held May 23–28, 1982, at DeGray State Park Lodge, Arkadelphia, Arkansas. The conveners are William A. Thomas, Department of Geology and Geography, University of Alabama, P.O. Box 1945, University, Alabama 35486 and George W. Viele, Department of Geology, University of Missouri, Columbia, Missouri 65211.

The Ouachita orogenic belt extends from the southwestern Appalachians to the Marathon region of Texas and beyond into Mexico; thus it flanks the southern margin of the North American craton. During the past decade, in the context of plate tectonics, many new ideas have been developed for the tectonic history and regional tectonic setting of the Ouachita orogen. Recent discussions of the tectonic history have emphasized early Paleozoic rifting and spreading followed by Carboniferous convergence and southward subduction of the North American continent beneath the Llanorian microcontinent. That comprehensive interpretation provides the framework for this Penrose Conference and for discussion of relations of the Ouachita orogen in both space and time to the southern margin of the North American craton, to the southwestern part of the Appalachian orogen, to possible displaced terranes of the northern Appalachians, and to basement rocks on the outboard side. Data pertinent to these discussions come from a variety of geological and geophysical studies, and new data are being generated by such projects as the recent COCORP seismic line across the Ouachitas.

The purpose of this Penrose Conference is to bring together specialists from diverse fields of study to focus on tectonic history of the Ouachita orogen. Major topics for discussion at conference sessions are environments of deposition and tectonic framework of early to middle Paleozoic strata; provenance and tectonic framework of the Carboniferous flysch; the Benton–Broken Bow uplift as a subduction complex; and the regional tectonic setting of the Ouachita orogen. We anticipate that participants will include those who have specific data relative to the Ouachitas, as well as those who can provide insight into both ancient and modern analogs for various aspects of Ouachita geology. We also anticipate that each discussion topic will encompass data from several subdisciplines of the geological sciences. The conference will include a field trip in the Ouachita Mountains in the area around DeGray Dam and Lake Ouachita. In addition, an optional field trip will be conducted on May 23 (before the conference begins) in the eastern outcrops of the Ouachita Mountains in Arkansas.

Please write to the conveners by **February 15, 1982,** indicating your interest in attending the conference and describing areas of discussion to which you can contribute. Also, please indicate your interest in the optional field trip. Fee for the conference (less than $400) will be announced later, as will a separate fee for the optional field trip.

Calendar of Penrose Conferences

April 11–16, 1982
THE ANTARCTIC PLATE: A GLOBAL PERSPECTIVE
Skyland Lodge, Shenandoah National Park, Virginia 22849
Conveners: **Ian W. D. Dalziel,** Lamont-Doherty Geological Observatory, Columbia University, Palisades, NY 10964; **David H. Elliott,** Institute of Polar Studies, Ohio State University, Columbus, OH 43210

May 20–25, 1982
HYDRODYNAMICS AND GEOCHEMISTRY OF ORE GENERATION IN SEDIMENTARY ENVIRONMENTS
Lake of the Ozarks area, Missouri
Conveners: **William C. Kelly,** Department of Geological Sciences, University of Michigan, Ann Arbor, MI 48109; **John H. Sharp,** Department of Geology, University of Missouri, Columbia, MO 65211; **Donald E. White,** USGS, 345 Middlefield Road, Menlo Park, CA 94025

May 23–28, 1982
TECTONIC HISTORY OF THE OUACHITA OROGEN
DeGray State Park Lodge, Arkadelphia, AK 71923
Conveners: **William A. Thomas,** Dept. of Geology and Geography, University of Alabama, P.O. Box 1945, University, AL 35486; **George W. Viele,** Dept. of Geology, University of Missouri, Columbia, MO 65201.

August 8–13, 1982
ORIGIN OF FLUIDS AND METALS IN PORPHYRY AND EPITHERMAL MINERAL DEPOSITS
Holiday Inn, Dillon, CO 80435
Conveners: **P. James LeAnderson,** Department of Geology, Colorado School of Mines, Golden, CO 80401; **Arthur A. Bookstrom,** Climax Molybdenum Company, 13949 West Colfax Avenue, Golden, CO 80401; **Steve Ludington,** USGS, 959 National Center, Reston, VA 22092

August 22–28, 1982
LARAMIDE DEFORMATION OF THE ROCKY MOUNTAIN FORELAND
Rock Creek Mine Lodge, Red Lodge, MT 59068
Conveners: **David R. Lageson,** Department of Earth Sciences, Montana State University, Bozeman, MT 59717; **Gary D. Couples,** AMOCO Production Company, 1670 Broadway, Denver, CO 80202

September 7–13, 1982
THE SONOMA OROGENY AND PERMIAN TO TRIASSIC TECTONISM IN WESTERN NORTH AMERICA
Scott Shady Court Motel, Winnemucca, NV 89445
Conveners: **John H. Stewart,** USGS, 345 Middlefield Road, Menlo Park, CA 94025; **Hubert Gabrielse,** Geological Survey of Canada, 100 West Pender Street, Vancouver, BC V6B 1R8; **Walter S. Snyder,** Research and Development, Phillips Petroleum Company, Bartlesville, OK 74004

October 2–8, 1982
MODELS OF DIAGENESIS IN CLASTIC RESERVOIRS
California
Conveners: **James R. Wood, Jr.,** Chevron Oil Field Research Company, 3282 Beach Boulevard, LaHabra, CA 90631; **James R. Boles,** Department of Geological Sciences, University of California, Goleta, CA 93106; **Ian E. Hutcheon,** c/o James R. Wood, Jr., Chevron Oil Field Research Company, 3282 Beach Boulevard, LaHabra, CA 90631

NOTE:
Deadline for applications for the April 11–16, 1982 Penrose Conference (The Antarctic Plate: A Global Perspective) has been extended to **December 15, 1982.** Please write to conveners for information.

Report of the Committee on Publications

To the Council and Membership of the Geological Society of America:

The Committee on Publications held its spring meeting at GSA Headquarters in Boulder on March 24, 1980, and held an informal autumn meeting at the GSA Annual Meeting in Atlanta on November 16. The major concern of the Committee, as it has been for the past few years, was the health of the *Bulletin* in particular and publications of the Society in general.

The Committee's reports were presented to GSA Council on May 14 and November 16 by the Committee Chairman.

After a review of the status of manuscript flow for the *Bulletin,* considerable discussion ensued as to how to increase manuscript submissions within the framework of existing format of the *Bulletin.* Such approaches as continuing the active encouragement of manuscript submissions of outstanding papers at the annual and sectional meetings, on a personal basis encouraging scientists conducting exciting research to submit their results to the *Bulletin,* and advertising the rapid publications of papers in the *Bulletin* were favored by the Committee. One proposal presented to Council was to discontinue the Special Paper Series, channeling the shorter contributions to the *Bulletin* and the longer contributions to the Memoir Series.

There was considerable discussion concerning the sales of maps in the Map and Chart Series. Most maps fail to break even. Because the GSA is one of the few remaining organizations where maps can be published by the general earth-science community, it was the consensus of the Publications Committee that every effort be made to improve the series. It was concluded that one of the main reasons for low sales on most maps was the high price. In order to try and bring the price down, it was suggested that on a trial basis selected contributions to the Map and Chart Series be published as full-scale black-and-white geologic maps accompanied by a 35-mm kodachrome slide and/or color microfilm with accompanying text. The first contribution to be published in this format has now been accepted for publication and will appear near the end of 1981, simultaneously and cross referenced with an accompanying *Bulletin* article.

In connection with the GSA Centennial, it was suggested that the Society nominate a short list of hallmark papers published by the GSA during the past 90 years. It was suggested that the History of Geology Division be invited to prepare such a list so that other groups in the Society could add, delete, or modify this list to arrive at what might be considered a consensus on the most significant works published by the Society.

Considerable discussion ensued concerning how the Centennial Program of the Society would impact the continuing Society publications, such as the *Bulletin, Geology,* and the various other series. There was concern that with some publications suffering difficulties, the Centennial Program might add extra burdens on the Society. The Publications Committee expressed these concerns to Council and hoped that a way could be found to improve the on-going publications of the Society while also undertaking the Centennial Program. The Committee suggested the two operations should be completely separated.

The Publications Committee discussed the marketing efforts of the Society. It was the consensus of the Committee that the Society should be more aggressive in its marketing of GSA publications. Marketing procedures of other organizations should be examined so that the most effective program can be designed for the GSA.

During the summer of 1980, following difficulties that developed at GSA Headquarters, a Special Publications Study Committee was appointed to investigate thoroughly all aspects of GSA publications. The work of this committee through the fall of 1980 and the spring of 1981 largely supersede that of the Publications Committee. Thus, only an informal meeting was held at the Annual Meeting in Atlanta. The Publications Committee was represented on the Special Publications Study Committee by Ward Neale, current chairman of the Publications Committee. At the informal meeting in November, the Publications Committee, along with some interested Society members, discussed a number of issues that were brought before Council by the Committee Chairman.

Of particular concern was assurance that the publications of the Society would continue to appear on time and would sustain their quality. Manuscript flow should continue unabated; and in order to offer an incentive to authors, it was suggested that the *Bulletin* should publish longer papers in the *Part I* format. The Publications Committee also suggested that its charge should be expanded so that its work could be conducted with full knowledge of the financial conditions of the Society and overall policy of the Society and with a closer working relation with Council. Publication, dissemination, and promotion of quality scientific research is the main task of the Society. The Publications Committee hopes the Society will continue as the leader of the general earth-science community through this transition period and into the future, and it stands ready to assist the Society in every way possible to achieve its goals.

Respectively submitted,
B. Clark Burchfiel, Chairman

Annual Report for 1980—The Geological Society of America

1981 EXECUTIVE OF THE CANADIAN GEOSCIENCE COUNCIL

The Canadian Geoscience Council comprises representatives of Canadian earth science societies, drawn from industry, government, and the universities, and actively encourages the development of the geosciences for the benefit of the nation by providing advice to various levels of government in terms of science policies and education.

Earlier in 1981, the Geological Survey of Canada published the Council's study of geology and geophysics in Canadian universities (paper 80-6); current studies include a status report on marine geoscience and a study of research in mineral exploration. The Council also sponsors education workshops for high-school and junior-high teachers (the EdGEO program).

Left to right: G. N. Wright, Secretary-Treasurer; N. R. Morgenstern, Executive Member; D. W. Strangway, Past President; J. O. Wheeler, President; R. A. Price, Foreign Secretary; J. Lajoie, Vice-President; note pictured is Dr. J. P. Greenhouse, Executive Director.

Postdoctoral Science Research Programs Deadline for Applications: January 15, 1982

The National Research Council announces its 1982 Research Associateship Awards Programs for research in the sciences and engineering to be conducted in 18 federal research institutions, whose laboratories are located throughout the United States. The programs provide Ph.D. scientists and engineers of unusual promise and ability with opportunities for research on problems largely of their own choosing, yet compatible with the research interests of the supporting laboratory. Initiated in 1954, the Associateship Programs have contributed to the career development of over 3,500 scientists ranging from recent Ph.D. recipients to distinguished senior scientists.

Approximately 250 new full-time associateships will be awarded on a competitive basis in 1982 for research in chemistry, engineering, and mathematics, and in the earth, environmental, physical, space, and life sciences. Most of the programs are open to both U.S. and non-U.S. nationals, and to both recent Ph.D. holders and senior investigators.

Awards are made for one year with possible extensions through a second year; senior applicants may request shorter tenures. Stipends range from $22,400 a year for recent Ph.D.s to approximately $50,000 a year for Senior Associates. Allowances are made for relocation and for limited professional travel during tenure. The host federal laboratory provides the Associate programmatic support, including facilities, support services, and necessary equipment.

Applications to the Research Council must be postmarked no later than January 15, 1982. Awards will be announced in April.

Information on specific research opportunities and federal laboratories, as well as application materials, may be obtained from the Associateship Office, JH 610-D3, 2101 Constitution Avenue, N.W., Washington, DC 20418. Telephone (202) 389-6554.

ISAP Symposium (continued from page 197)

sium is planned to discuss aspects of regional geology, tectonic evolution, geochronology, paleomagnetism, geochemistry, sedimentation, and genesis of ore deposits, related to the Archean and Early Proterozoic.

The symposium will begin with four days of thematic field trips to places in Brazil with ancient terranes associated with mineral deposits. The following areas were selected:

1. Serra dos Carajás — iron, copper, and gold deposits.
2. Goiás — greenstone belt environment.
3. Minas Gerais — Quadrilátero Ferrífero.
4. Bahia — gold in serra de Jacobina paleoplacer and in greenstone belt environment; copper and chrome deposits; high and low grade terranes.

After the field trips, the symposium will continue in Salvador with five working days of conferences, presentation of papers, and business meetings of the pertinent international Technical Commissions of the IGCP and the Lithosphere Project.

All matters pertinent to Archean and Early Proterozoic geological evolution and metallogenesis will be considered. Special sessions on geochemistry, geochronology, metallogeny, regional geology, and others are envisaged.

Letters asking for the First Circular should be addressed to Augusto J. Pedreira, ISAP Coordinator, CPRM — Rua Barros Falcão, 21, 40.000 — Salvador — Bahia — BRAZIL.

SPECIAL PREPUBLICATION OFFER

Geological Society of America Memoir 154

NAZCA PLATE:

CRUSTAL FORMATION AND ANDEAN CONVERGENCE

Edited by LaVerne D. Kulm, Jack Dymond, E. Julius Dasch, and Donald M. Hussong

Order your copy of the Nazca Plate volume now prior to publication in mid-November and get either or both of the GSA maps that supplement this Memoir at special reduced prices.

Memoir 154 is organized into five sections:

INTRODUCTION — One chapter covering the history of the Nazca Plate Project: project initiation, objectives, participants, cruise activities, and publications.

DIVERGENT BOUNDARY — Four chapters on the evolution of the oceanic crust at the spreading East Pacific Rise.

METALLIFEROUS SEDIMENTS — Eight chapters on the sedimentation on the evolving crust as it is transported across the Nazca Plate.

CONTINENTAL MARGIN AND TRENCH — Fifteen chapters covering the disruption and destruction of the subducting plate along the Peru-Chile Trench and its influence on the evolution of the Andean continental margin.

ANDEAN CONVERGENCE ZONE — Seven chapters on the effect of subduction on the volcanism, mountain building, and ore deposits of the Andes.

In *Nazca Plate: Crustal Formation and Andean Convergence*, 56 authors discuss the tectonics of the Nazca-Pacific divergent plate boundary, geochemistry of Nazca plate surface sediments, uranium and thorium isotopic investigations, formation and growth of ferromanganese oxides, economic appraisal of Nazca plate metalliferous sediments, biogeography of benthic foraminifera, estimation of depth to magnetic source using maximum entropy power spectra, a geophysical survey of the Chile Margin triple junction, volcanic gaps and the consumption of aseismic ridges in South America, convergence and mineralization, and many others. The volume is dedicated to George P. Woollard.

Hard bound, viii + 816 pages, 7″ x 10″, more than 400 illustrations and plates ..... Price only $18.00

ORDER THE NAZCA PLATE MEMOIR BEFORE NOVEMBER 15, 1981, AND YOU CAN ORDER EITHER OR BOTH OF THESE MAPS AT SPECIAL REDUCED PRICES

MC-26 Bathymetry of the Southeast Pacific
J. Mammerickx and S. M. Smith
In color, 43″ x 47″. Contour interval 1,000 meters, scale at equator 1:6,442,194 or 1.74 cm per degree of longitude.
Hundreds sold at ..... $ 8.00*
*Price with Memoir 154 ..... $ 4.00**

*Folded in envelope

MC-34 Part I: Bathymetry of the Peru-Chile Continental Margin and Trench
R. A. Prince, W. J. Schweller, W. T. Coulbourn, G. L. Shepherd, G. E. Ness, A. Masias.
Covering latitude 3°-40°S and longitude 65°-85°W. Nine sheets in color, approximately 18″ x 26″ each. Scale 1:1,000,000.
Part II: Chemical Composition of Nazca Plate Surface Sediments
Jack Dymond, John B. Corliss
In color, 18″ x 22″. With 2-page text.
Regular price ..... $ 16.50*
*Price with Memoir 154 ..... $ 8.25**

To get your copy of the GSA Memoir 154 and specially priced map or maps, fill out the order form below. Your copy of the Memoir, with map or maps, will be mailed to you postage paid about November 30. This offer expires November 15, 1981.

Date

Please send to: GSA member number

Name

Address

City

State/Province Zip Code

Address all orders to:
Geological Society of America
Publication Sales Department
P.O. Box 9140
Boulder, Colorado 80301

ORDER FORM

Qty.	Series and number (or other brief description)	Price each	TOTAL
	Map MC-26 folded	4.00	
	Map MC-34 folded	8.25	
	Memoir 154	18.00	
	Colorado Residents add applicable sales tax	TAX	
		TOTAL	

- Payment in U.S. funds must accompany all orders for this special offer.
- GSA members discount (see reverse side of membership card) allowed when claimed.
- Denver metro residents—add 3½% sales tax; Boulder residents—add 5½% sales tax; Colorado residents—add 3% sales tax.
- This offer good only until November 15, 1981.

PLEASE SEND YOUR RECOMMENDATIONS FOR OFFICERS AND COUNCILORS TO THE GSA COMMITTEE ON NOMINATIONS

The future of your Society—the Geological Society of America—is largely in the hands of your elected officers and councilors. Furthermore, in these present times of rapid change, rapid inflation, and rapidly evolving science, sound decisions for the Society's future must be made on a continuing basis.

It is the charge of the Committee on Nominations to consider the total membership of the Society and to submit a list of persons to Council for consideration for nomination to elective posts. The committee does not do the formal nominating or the electing. These are done by Council. The committee, however, is charged with the task of recommending several persons, each of whom they consider fully qualified, for each of the elective posts.

The committee requests your help! When sending nominations to headquarters, attention Administrative Department, please specify WHY a particular candidate would qualify to serve on Council. All nominations will be forwarded to the committee as soon as it has been appointed.

Please take this request seriously and act. The deadline for receipt of nominations at headquarters is **FEBRUARY 1, 1982.**

SEPTEMBER BULLETIN BRIEFS

Article Summary

• The nature and magnetic expression of isograds in the contact aureole of the Liberty Hill pluton, South Carolina: Summary.

J. Alexander Speer, Orogenic Studies Laboratory, Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061. (7 p., 4 figs.)

Articles Complete in the September Issue of Part I

• Introduction. Papers from symposium, "Industrial Minerals of the Upper Midwest."

Donald D. Carr, Haydn H. Murray, Indiana Geological Survey, Bloomington, Indiana 47405. (1 p.)

A symposium on "Industrial Minerals of the Upper Midwest" was held in conjunction with the 14th Annual Meeting, North-Central Section of the Geological Society of America, in Bloomington, Indiana, on April 10, 1980. Nine papers covering limestone, sand and gravel, clay, gypsum, silica sand, and beneficiation techniques for industrial minerals were presented. Six of the papers were prepared for inclusion in this volume.

It seems appropriate to hold a symposium on industrial minerals in the North-Central Section, a region where the value of industrial-minerals production exceeds that of metals production. Despite a large metals industry in Michigan, Minnesota, Missouri, and Wisconsin, the U.S. Bureau of Mines reported that the value of industrial minerals in the nine-state area of the North-Central Section in 1979 was about $3.5 billion, compared with $3.2 billion for metals. The region is well known nationally for deposits of high-purity silica sand, high-calcium limestone, high-magnesium dolomite, fluorspar, dimension stone, barite, gypsum, salt, tripoli, peat, flint clays, fire clays, various clays used for structural clay products, and absorbent clays (fuller's earth). Industrial minerals are directly related to the standard of living of a country, and the North-Central Section contributes a variety of needed industrial minerals to the economy of the region.

• Geologic types of glass-sand deposits and some North American representatives.

E. Wm. Heinrich, Department of Geological Sciences, University of Michigan, Ann Arbor, Michigan 48109. (3 p.)

Although the major glass-sand deposits of the midwestern United States are of the classic blanket marine sandstone type, throughout the United States and Canada a wide variety of geological types of silica deposits is available as glass-sand sources and potential sources. These include: (I) unconsolidated sands: (A) Littoral — Cohansey Formation, New Jersey; (B) Alluvial plain — Citronelle Formation, Florida; (C) Marine dunes — Pacific Grove, California; (D) Lake dunes — Redcliff, Alberta; (E) Stream channel — Ravensdale, Washington. (II) Arkosic sands: Idaho Formation, Idaho. (III) Consolidated sandstones and orthoquartzites: (A) Marine and littoral — St. Peter Formation, Oriskany Formation, Potsdam Sandstone; (B) Alluvial — Pottsville Formation, Pennsylvania. (IV) Quartzites: Lorrain — north shore Lake Huron, Ontario; Grenville — Baie Comeau, Quebec. (V) Hydrothermal veins: Quartz Mountain, Washington; Carson City, Nevada. (VI) Tectonically crushed rocks: (A) Sandstone — Moberly Mountain, British Columbia; (B) Quartzite — St. Donat and St. Remi, Quebec. (VII) Weathering products — Oriskany Formation, Goshen, Virginia. Another, nongeological category would be waste sands—leftovers from other mining operations, such as the residual sands from the Fort McMurray, Alberta, tar sands operations.

The chief deposits of the north-central United States are the

St. Peter (Ordivician) and Sylvania (Devonian) sandstones. The St. Peter is believed to have been derived from Precambrian quartzites of the Canadian Shield (which themselves originally may have been second-generation sandstones), and the Sylvania probably was derived from St. Peter outcrops, making it a third- (or fourth-) generation sandstone.

• High-extraction magnetic filtration: A new beneficiation process for industrial minerals.

Haydn H. Murray, Department of Geology, Indiana University, Bloomington, Indiana 47405. (7 p., 9 figs., 10 tables)

Many high-quality industrial mineral deposits are being rapidly depleted, and lower-quality deposits must be beneficiated to meet the specifications required for industrial uses. In a number of instances, iron and titanium mineral impurities are the major contaminants. High-extraction magnetic filtration (HEMF) will remove magnetic and paramagnetic minerals from industrial rocks and minerals such as ball clay, bauxite, bentonite, high silica sand, kaolin, kyanite, talc, tripoli, and wollastonite. Data are presented on all of the above minerals, showing that each can be upgraded in quality by removing iron- and titanium-bearing minerals. For example, the iron content of an Arkansas bauxite was reduced from 7.92% to 0.86%, and the brightness of a white Texas bentonite was increased from 83.5% to 93.0%. HEMF can be used as a beneficiation process to increase the reserves of many industrial minerals and to produce higher-quality products. The process involves selectively filtering magnetic or paramagnetic mineral particles from a slurry, allowing the nonmagnetic mineral particles to pass through a magnetic matrix filter.

• High-calcium, high-reflectance limestone resources of Illinois.

Jonathan H. Goodwin, James W. Baxter, Illinois State Geological Survey, Natural Resources Building, 615 East Peabody Drive, Champaign, Illinois 61820. (8 p., 5 figs., 1 table)

High-calcium (>95 wt % $CaCO_3$) limestone units commonly occur in pre-Pennsylvanian rocks that crop out along the Mississippi and Ohio Rivers in the western and southern parts of Illinois. The Mississippian Glen Dean, Haney, Ste. Genevieve, St. Louis, Salem, Ullin, and Burlington Limestones; the Devonian Wapsipinicon, Grand Tower, and Backbone Limestones; the Silurian St. Clair Limestone; and the Ordovician Dunleith Limestone all contain high-calcium limestone intervals more than 10 ft (3.3 m) thick.

Aggregate is now produced from most of these units, but significant new exploration targets for quarriable stone exist in Calhoun and possibly Jersey Counties for the Dunleith Limestone, in Union County for the Backbone Limestone, and in Alexander County for the Dunleith. Possibilities for underground mining exist in Adams County for the Burlington Limestone and in Pulaski County for the Ullin. Limited high-volume markets for products from these undeveloped sources and, in some cases, transportation problems may constrain rapid commercial development of these deposits.

Reflectance measurements by the Illinois State Geological Survey on high-calcium limestone samples from most of these deposits range from 57.6% for the Wapsipinicon Limestone from Rock Island County to 88.9% for the Burlington Limestone in Adams County. Values for some of the deposits exceed 80% and therefore compare favorably with reflectance specifications for filler and coating clays.

• Chemical composition, stratigraphy, and depositional environments of the Black River Group (Middle Ordovician), southwestern Ohio.

David A Stith, Ohio Geological Survey, Fountain Square, Building B, Columbus, Ohio 43224. (5 p., 3 figs., 1 table)

The chemical composition and stratigraphy of the Black River Group in southwestern Ohio were studied. Chemical analyses were done on two cores of the Black River from Adams and Brown Counties, Ohio. These studies show that substantial reserves of high-carbonate rock (96% to 98+% $CaCO_3$ plus $MgCO_3$) are present in the Black River at depths of less than 800 ft, in proximity to Cincinnati and the Ohio River.

Stratigraphic studies show that the Black River Group has eight marker beds in its middle and upper portions and three distinct lithologic units in its lower portion; these marker beds and units are present throughout southwestern Ohio. The Black River Group correlates well with the High Bridge Group of Kentucky. Depositional environments of the Black River are similar to those of the High Bridge and to present-day tidal flats in the Bahamas.

• Evaluation of high-purity limestones and dolostones in northern Michigan.

Allen M. Johnson, Institute of Mineral Research, Michigan Technological University, Houghton, Michigan 49931; Harry O. Sorensen, Michigan Geological Survey Division, Department of Natural Resources, Stevens T. Mason Building, Lansing, Michigan 48909. (7 p., 4 figs., 1 table)

While limestones as a class are abundant and widely distributed, high-purity stone meeting rigid chemical and physical specifications for industrial use is limited in occurrence. Economic deposits, those which can be profitably mined and marketed, are even less abundant, for in addition to stone of commercial grade being present in sufficient quantity, the deposits must be accessible and extractable. Shipping costs for this bulky and relatively low-value product are an additional concern. If deposits are not located near markets, cheap transportation must be available.

In Michigan, geology and geography have fortuitously combined to meet these criteria. Large limestone resources lie within easy access of Great Lakes shipping. As a result, Michigan produces large quantities of industrial limestone for metallurgical, chemical, cement, aggregate, and agricultural uses.

In recent years, limestone and limestone products have accounted for about one-seventh of the value of Michigan's yearly mineral production, which presently is valued between 2 and 2.5 billion dollars. It is obvious that limestone is an important raw material and contributes significantly to the economy of Michigan. This realization, coupled with the fact that available knowledge was not adequate to define high-purity reserves, provided strong justification for developing more information on this important resource.

Since 1974, the Geological Survey Division of the Michigan Department of Natural Resources and the Institute of Mineral Research of Michigan Technological University have been working cooperatively on the evaluation of high-purity limestone and dolostone resources in Michigan. Three carbonate units are being investigated, two of Silurian age and one of Devonian.

The Silurian occurrences include the high-calcium Fiborn Member of the Hendricks Formation, Burnt Bluff Group, and the Engadine Group, a high-purity dolostone.

The evaluation program involves reconnaissance geologic mapping, selection of drill sites, core drilling, core logging and processing, and chemical analysis. Our purpose was not to "block-out" quarries or mines, but rather to define promising areas which could be investigated more closely by follow-up work as the need arose.

• Search for high-calcium limestone in Silurian reefs of northern Indiana.

Curtis H. Ault, Donald D. Carr, Indiana Geological Survey, Bloomington, Indiana 47405. (7 p., 5 figs., 2 tables)

During Silurian time, the Indiana part of the Wabash Platform was a shallow-water area between the proto-Illinois and proto-Michigan Basins and a site of growth of hundreds, or perhaps thousands, of reefs. Today, most reefs of northern Indiana are dolomite, but some are dolomitic limestone, and a few are limestone of high purity in deposits that can be mined by open-pit methods.

Four of the five generations of reefs of Silurian age in the Great Lakes area have been recognized in northern Indiana. All known oldest-generation reefs in Indiana (second-generation in the Great Lakes area) are dolomitic. A reef in Carroll County containing commercial amounts of high-calcium limestone is the next oldest (third generation), with roots in basal Louisville limestone, and a limestone reef of similar size in Grant County is of a younger (fourth) generation, with its roots in upper Louisville limestone and dolomite. Numerous slightly younger reefs with mostly mixed dolomitic-calcitic compositions are also of this generation, but all known examples are too small to be commercially important. One small limestone reef has been found in the youngest (fifth) generation, with roots in limestone of the Kokomo Limestone Member of the Salina Formation.

All known limestone reefs are restricted to an area of six counties in north-central Indiana, although no apparent depositional environment as revealed from study of surrounding inter-reef rocks has been found to account for any restriction. Dolomitization is more likely related to the textures and lithologies of the individual reefs.

• Timing and mode of emplacement of the Roberts Mountains allochthon, Antler orogeny.

J. G. Johnson, Anne Pendergast, Department of Geology, Oregon State University, Corvallis, Oregon 97331. (11 p., 4 figs., 1 table)

This Antler model involves incipient subduction of continental crust and miogeoclinal strata beneath an accretionary wedge composed primarily of oceanic sedimentary rocks and lesser outer shelf strata (underthrusting and sediment obduction). Three phases of associated tectonism are: (1) first emplacement phase, in which only oceanic crust is subducted, evidenced primarily by foreland epeirogeny; (2) second emplacement phase, in which incipient subduction of continental crust occurs and a flysch trough is formed; (3) post-emplacement phase of isostatic uplift of continental margin and allochthon, accompanied by molasse sedimentation. The first two phases, associated with compressive movements of the Antler orogeny of Nevada, occurred between mid-Frasnian and mid-Osagean time. This interval equals about 23 m.y., based on C. A. Sandberg's estimates of the duration of conodont zones.

Overlap of the surface trace of the Roberts Mountains thrust by the Kinderhookian Webb Formation preceded final emplacement of the allochthon. Ordovician, Devonian, and Kinderhookian units in the allochthon, as mapped in the Carlin-Pinyon Range area by Smith and Ketner, overlie the oldest Antler flysch (Kinderhookian age) and are interpreted to have been encased within the Antler clastic wedge during Osagean time.

• Geologic studies of the Columbia Plateau: Part I. Late Cenozoic evolution of the southeast part of the Columbia River Basalt Province.

V. E. Camp, c/o Directorate General of Mineral Resources, P.O. Box 5219, Jeddah, Saudi Arabia; P. R. Hooper, Department of Geology, Washington State University, Pullman, Washington 99164. (10 p., 7 figs.)

Creation and evolution of the Columbia River Basalt Province occurred in late Cenozoic time, during an 11-m.y. interval in which most of the volcanism was centered in the east and southeast part of the province. Tectonism contemporaneous with volcanism resulted in: (1) progressive rise of the eastern margin of the Columbia Plateau and creation of a westerly dipping regional paleoslope; (2) development of uplifted plateau surfaces (Nez Perce plateau and Joseph plains) isolated from further (younger) volcanism; (3) initiation of the Lewiston, Troy, and Stites structural basins; and (4) initiation of the Blue Mountains uplift of southeast Washington and northeast Oregon. Although deformation was continuous throughout the eruptive episode, it is most evident during its later, waning stages. Deformation continued after cessation of volcanism about 6.0 m.y. B.P. A combination of epeirogeny and a stress regime, having a horizontal NNW-SSE axis of maximum compression and a horizontal WSW-ENE axis of minimum compression (tension), imposed on basalt overlying an older structural grain can account for most structural elements in the southeast part of the province.

• Geologic studies of the Columbia Plateau: Part II. Upper Miocene basalt distribution, reflecting source locations, tectonism, and drainage history in the Clearwater embayment, Idaho.

V. E. Camp, c/o Directorate General of Mineral Resources, P.O. Box 5219, Jeddah, Saudi Arabia. (10 p., 6 figs., 2 tables)

The Clearwater embayment of western Idaho represents the easternmost encroachment of Columbia River Basalt against the western side of the Rocky Mountains. Several new units of the Columbia River Basalt Group have been identified in the embayment, and the distribution of these, and other previously recognized flows, reflects (1) the location of vents, feeder dikes, and source areas from which the flows were erupted; (2) tectonic events during the eruptive episode; and (3) the development of erosional channels that were filled subsequently by successive flows.

The Lewiston and Stites basins were filled by Wanapum and Saddle Mountains flows erupted in the North Fork of the Clearwater River area. Flows poured into the Stites basin from surrounding plateau surfaces, but they spread into the Lewiston basin after advancing down ancestral Clearwater River canyons. As an ancestral Clearwater River would lose its canyon to an

invading flow, water would spill onto the low-lying areas of the Lewiston basin and deposit sediment. This event was repeated several times and resulted in a sequence of alternating flows and intercalated sediment in the Lewiston basin.

• Allometry and cirque evolution.

Greg A. Olyphant, Department of Geography, Indiana University, Bloomington, Indiana 47405. (7 p., 4 figs., 4 tables)

A deductive analysis of the processes responsible for cirque formation leads to a model that describes cirque development through time. In this model, cirque volumes increase as the third power of time, although observed variations in cirque size also reflect preglacial erosion, as well as the average rate of surface recession/lowering.

The deductive findings are extended via analysis of 23 cirques from a part of the Sangre de Cristo Mountains, south-central Colorado. The assumption that glacier-occupance times are proportionately adjusted to topoclimatic situations leads to the conclusion that average rates of cirque erosion exhibit at least a fourfold (possibly as much as an order of magnitude) range within a given massif. The notion that cirque-development rates depend on bed-rock resistance is supported by a statistically significant inverse relationship between estimated erosion coefficients and average bed-rock joint spacing.

Allometric analysis of a 15-cirque subsample (the cirques were chosen because they exhibit similar erosion susceptibility) lends credence to the hypothesis that headwall recession has been more rapid than cirque-floor lowering within the study area. However, allometric enlargement cannot by itself account for observed values for the ratio cirque length: cirque depth. The results imply that preglacial topography strongly influences observed variability in glacial morphometry.

• Geology of the Ketcherside Mountain area, southeastern Missouri, and the source of Grassy Mountain ignimbrite.

J. Ronald Sides, Department of Geology, University of Texas at Arlington, Arlington, Texas 76019. (8 p., 4 figs., 2 tables)

The St. Francois Mountains igneous complex is a shallow batholith about 1,500 m.y. old which has intruded a roof formed by its own volcanic ejecta. It is similar to other shallow-roofed batholiths such as the Boulder batholith. However, it has been tilted and beveled by erosion so that the roof is available for study at a wide range of stratigraphic levels. The volcanic roof is composed mostly of ash-flow tuff sheets, implying that caldera-collapse eruptions were the major mechanism of formation of the roof. Only two calderas have been proposed in the St. Francois Mountains thus far, the Taum Sauk caldera and the Butler Hill caldera.

The southern ring fault of the Taum Sauk caldera is located in the Ketcherside Mountain area of southeastern Missouri. The fault is nearly vertical, strikes about N50°E, and is intruded by a small body of porphyritic granite with vertical flow foliation. Rocks in the down-dropped block are broken by high-angle faults as much as 3 km from the ring fault, but extracaldera units are little deformed. Associated with the ring fault are bedded tuffs and volcaniclastic sedimentary units, some of which are mineralized. These data support the hypothesis that the Taum Sauk caldera is a trap-door caldera with major faulting along the eastern and southern walls. There is little evidence of faulting along the western wall.

The Butler Hill caldera occurs in the eastern St. Francois Mountains and is centered approximately on the Butler Hill Granite. The caldera, one of the earliest features to develop, has been obscured by later structural modification, but the major collapse ash-flow tuff of the caldera, the Grassy Mountain ignimbrite, is well exposed. Analysis of flow directions of the ignimbrite indicates a source for the unit in the eastern St. Francois Mountains, as predicted by the Butler Hill caldera model.

• An analysis of drumlin form in the northeastern and north-central United States: Discussions and reply. (3 p.)

Discussion: *J. Menzies, Department of Geography, Brock University, St. Catharines, Ontario, Canada L2S 3A1.*
Discussion: *Ian J. Smalley, Soil Bureau, Department of Scientific and Industrial Research, Lower Hutt, New Zealand.*
Reply: *Hugh H. Mills, Department of Earth Sciences, Tennessee Technological University, Cookeville, Tennessee 38501.*

OCTOBER BULLETIN BRIEFS

Article Summary

• Geology and petrology of Quaternary volcanic rocks, Garibaldi Lake area, southwestern British Columbia: Summary.

Nathan L. Green, Department of Geological Sciences, University of British Columbia, Vancouver, British Columbia, Canada. (6 p., 2 figs., 2 tables)

Articles Complete in the October Issue of Part I

• Imbricate low-angle faulting in uppermost Franciscan rocks, South Yolla Bolly area, northern California.

Dan M. Worrall, The University of Texas at Austin, Austin, Texas 78512 (present address: Shell Development Company, Bellaire Research Center, P.O. Box 481, Houston, Texas 77001). (27 p., 25 figs., 1 table)

The South Yolla Bolly area of northern California contains the intersection of the Franciscan complex, the Klamath Mountains, and the Great Valley sequence. Four distinct lithic units, among them the South Fork Mountain Schist, as well as several subunits, have been discerned in the Franciscan rocks of this area. These units are composed mostly of coherent or semi-coherent

layered sedimentary and mafic igneous rocks and their metamorphic equivalents rather than melange, and are arranged in largely upright, parallel imbricate fault slices.

Four major low-angle faults have been clearly recognized. Paleontologic data indicate that at least one fault places older material over younger. Lithic units exhibit various degrees of differences in metamorphic mineral assemblages, textural grade, and amount of internal deformation across the faults, with more intensely deformed and metamorphosed material occupying successively higher structural positions. These contrasts indicate that some of these faults served as surfaces by which deformed rocks were emplaced differentially upward during and/or after metamorphism.

Original bedding and compositional layering in all of the coherent units generally parallel the thrust faults. Two fault-bounded units are each composed of a coherent sequence of basalt at the base overlain by bedded chert, and further overlain by mudstone and graywacke or their metamorphic equivalents. The faults which underlie these two sequences seem to have originated as decollements localized at or near a sedimentary rock–mafic-crust interface, perhaps as discrete underthrust slices. The distinct contrasts in original rock composition among these units plus the aforementioned characteristics seem to indicate that these faults had an early history in the accretionary prism apart from their later use as convenient surfaces for differential upward emplacement of metamorphosed material.

• Thrust emplacement of the Schoonover sequence, northern Independence Mountains, Nevada.

Elizabeth L. Miller, James Bateson, David Dinter, James R. Dyer, and Dwight Harbaugh, Department of Geology, Stanford University, Stanford, California 94305; D. L. Jones, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, California 94325. (8 p., 3 figs., 1 table)

Preliminary paleontologic data from the northern Independence Mountains, Nevada, suggest that at least part of the Schoonover sequence is time equivalent to the lithologically and structurally similar upper Paleozoic Havallah sequence. The base of the Schoonover is a major thrust fault that juxtaposes paleogeographically distant but, in part, time-equivalent rocks. Along the west side of the range, the Schoonover sequence structurally overlies Late Mississippian nonmarine to shallow-marine rocks that unconformably overlie deformed Ordovician strata of the Roberts Mountains allochthon. This nonmarine to shallow-marine sequence is correlative to overlap assemblage sequences elsewhere in Nevada. Along the east side of the range, the Schoonover is thrust over shallow-marine to slope-facies Permian rocks that unconformably overlie deformed lower Paleozoic miogeoclinal rocks as well as the Roberts Mountains allochthon.

The allochthonous Schoonover sequence is a heterogeneous assemblage of deformed deep-water sedimentary rocks and greenstone units. Isoclinally folded chert in the structurally lower half of the Schoonover yields ages based on radiolaria that range from earliest Mississippian to possibly latest Devonian at the very base of the sequence to as young as Early Pennsylvanian in structurally higher parts of the sequence. Clastic rocks within the lower part of the sequence contain debris derived from erosion of Roberts Mountains allochthon-type rocks. Rare volcaniclastic and volcanogenic units in the Schoonover indicate an andesitic-dacitic source. The structurally higher part of the allochthon contains a thick succession of silty-limestone turbidite deposits that represent yet a third, carbonate source terrane for the Schoonover sequence.

Structural data indicate southeast-directed thrusting of the Schoonover sequence. Thrusting postdates deposition of Late Permian rocks and is inferred to predate intrusion of Late Jurassic plutons present to the north of the map area. Similarity of structural style and constraints on the timing of thrusting in the Independence Mountains strongly suggest that the Schoonover sequence may represent the northeasternmost exposures of the Golconda allochthon.

The age of at least some of the pelagic sediments in the Schoonover sequence may overlap the age of the youngest rocks known in the Roberts Mountains allochthon as well as the age of the Antler Orogeny. This suggests that the Schoonover sequence was deposited, at least in part, in a location that was paleogeographically distant from the edge of the Nevadan portion of the North American shelf during the Antler Orogeny. No volcanism occurred on the continental shelf during the emplacement of the Roberts Mountains allochthon; therefore, the presence of tuffaceous turbidites within the Schoonover also suggests deposition far away from the continental margin. On the other hand, the composition of coarse clastic rocks within the Schoonover is compatible with their derivation from the eroding Roberts Mountains allochthon, suggesting proximity to the North American shelf. If sedimentary rocks from dual sources (volcanic arc and Roberts Mountains allochthon) are indeed interbedded in the Schoonover, rather than tectonically interleaved, then this might argue in favor of deposition of the Schoonover-Havallah sequences in a back-arc basin setting.

• COCORP seismic profiling of the Appalachian orogen beneath the Coastal Plain of Georgia.

Frederick A. Cook, Larry D. Brown, Sidney Kaufman, Jack E. Oliver, and Todd A. Petersen, Department of Geological Sciences, Cornell University, Ithaca, New York 14853. (11 p., 8 figs.)

A southeastward extension onto the Coastal Plain of an earlier COCORP traverse, which confirmed large-scale, thin-skinned thrusting of crystalline rocks of the southern Appalachians, has provided some of the most spectacular reflections yet seen in crustal seismic data. Most of the reflectors can be interpreted as either fault surfaces or as metamorphosed strata of late Precambrian–early Paleozoic age. They are consistent with the hypothesis that a major detachment extends eastward beneath this part of the orogen, although other interpretations with a more complex pattern of detachments or sutures are also possible. Large-scale overthrusting provides a mechanism for incorporating sedimentary rocks into the lower crust and may help to explain many of the layered features on crustal seismic data. Reflections from deep beneath the Coastal Plain indicate that the structural configuration of the rocks is complex and that the remains of a collision zone are being observed. Several east-dipping horizons, which bear strong similarities to thrust faults in Valley and Ridge sedimentary rocks, are seen in the basement at shallow and mid-crustal levels beneath the Coastal Plain. The Augusta fault, for example, displays a reflection which extends at a low angle some 80 km or more southeast of its surface position. In conjunction with surface geologic information, these new data demonstrate that late Paleozoic compressive deformation was pervasive and resulted in lateral movements in the upper crust extending from

the Valley and Ridge to the crystalline rocks beneath the Coastal Plain—a distance of 400 km or more. A large antiform, cresting at about 2.3 sec, or about 6 km below the surface, and other structures beneath the Coastal Plain of Georgia deserve further consideration for petroleum exploration, although metamorphism may have eliminated petroleum from these rocks. Refracted arrivals and fault geometries indicate two Triassic rift basins beneath Coastal Plain sedimentary rocks, one of which has apparently not been recognized previously.

• The Eagle Pass detachment, southeastern Arizona: Product of mid-Miocene listric(?) normal faulting in the southern Basin and Range.

George H. Davis and James J. Hardy, Jr., Department of Geosciences, The University of Arizona, Tucson, Arizona 85721. (14 p., 14 figs., 1 table)

Mid-Miocene low-angle normal faulting is an integral part of the regional tectonic strain of the southern Basin and Range. The distinguishing characteristic is the presence of "detachments"—allochthons of moderately to steeply dipping hanging-wall rocks resting in very low angle fault contact on structurally deeper, generally older, footwall rocks. Rotation of detachment strata was accomplished by imbricate listric(?) normal faulting and coordinated tear faulting. Regional structural domains, each thousands of kilometres in area, contain detachments marked by uniform sense of detachment-strata rotation.

The Eagle Pass detachment, 70 km northeast of Tucson, Arizona, reveals informative structural details of parts of the system. Steeply southwest-dipping mid-Miocene volcanic and sedimentary rocks, several thousands of metres in thickness, rest in very low angle (10° ±) fault contact on Precambrian granitic basement. Detachment strata were faulted into position by NE-directed translation, accompanied by rotation of strata to steep SW dips. The detachment fault which underlies the 25 km² detachment has the form of a large northeast-trending mullion trough with relief of at least 500 m. Along the keel of the detachment, Precambrian quartz monzonite was transformed into a hydrothermally altered selvage of microbreccia. The steep (± 80°) northwest margin of the mullion trough served as a tear fault along which quartz monzonite was crushed, volcanics were dragged, and fanglomerate was locally sheared into flattened-pebble conglomerate.

Detachments like that at Eagle Pass resemble slump blocks on a grand scale. They are elements of a regional system of extensional deformation which coincides with the belt of Cordilleran metamorphic core complexes. Mid-Miocene detachment faulting postdates the formation of exposed mylonitic tectonites of core complex affinity, but the direction of translation of the detachments is parallel to penetrative lineation in nearby and/or underlying tectonite. Moreover, in southeastern Arizona examples, the sense of translation of detachments matches the sense of simple-shear movements disclosed by tectonite fabrics. We speculate that large crustal displacements achieved during extension-induced formation of tectonite produced a geometric and/or dynamic condition which strongly influenced subsequent detachment faulting. Consequently, with renewed(?) or continued(?) extension in mid-Miocene time, deep upper-crustal slumping was triggered, and detachment rocks were translated along listric(?) normal faults in the direction and sense of the earlier displacements which had accommodated the formation of tectonite.

• Tertiary extension north of the Las Vegas Valley shear zone, Sheep and Desert Ranges, Clark County, Nevada.

Peter L. Guth, Department of Earth and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139 (present address: B Company, 34th Engineer Battalion [Combat] [Heavy], Fort Riley, Kansas 66442. (9 p., 5 figs., 1 table)

Detailed mapping reveals the presence of high-angle extensional faults and low-angle gravity slides on the west side of the Sheep Range. Three major high-angle faulting events each account for 20° of eastward rotation and accommodate extension between the Las Vegas Range and the Desert Range. Low-angle faults represent surficial slides in response to topography produced by extension on the high-angle faults. Faulting took place during the Miocene, synchronously with deposition of the Horse Spring Formation and with displacement in the Las Vegas Valley shear zone. The extension in the Sheep Range took place without volcanism, intrusion, or metamorphism of the Paleozoic sedimentary rocks.

Offset thrust faults suggest that the area west of the Sheep Range extended almost 100% during the Miocene, while the corresponding area south of the Las Vegas Valley shear zone did not extend significantly. The shear zone bounded the extending terrane on the south, acting as a transform fault. This extension west of the Sheep Range may in part balance that mapped by Anderson (1971) in the Eldorado Mountains. The Las Vegas Valley shear zone and the Lake Mead fault system may have acted together to compensate for areas of localized extension between the Colorado Plateau and the vicinity of the Specter Range.

• Medals and Awards for 1980.

Presentation of the Penrose Medal to Hollis Dow Hedberg. *Citation by John C. Maxwell. Response by Hollis Dow Hedberg.*

Presentation of the Arthur L. Day Medal to Harry G. Thode. *Citation by Samuel Epstein. Response by H. G. Thode.*

Presentation of the Kirk Bryan Award to James A. Clark, William E. Farrell, and W. Richard Peltier.

Citation by William C. Bradley. Response by James A. Clark. Response by William E. Farrell. Response by W. Richard Peltier.

Presentation of the Oscar E. Meinzer Award to Richard Lewis Cooley.

Citation by Roger G. Wolff. Response by Richard L. Cooley.

Presentation of the E. B. Burwell, Jr., Memorial Award to Kerry Edward Sieh.

Citation by Allen W. Hatheway. Response by Kerry Edward Sieh.

INSIDE---

THE GEOLOGICAL SOCIETY OF AMERICA
P.O. Box 9140 • 3300 Penrose Place
Boulder, Colorado 80301

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