GSA news & information

SUPPLEMENT TO GEOLOGY MAGAZINE

SPECIAL REMINDER TO GSA DIVISIONS AND SECTIONS:

Please remember that you now have a new and better medium for disseminating news of your division and (or) section and for advertising meetings, special events, symposia, and field trips. The news insert that you are now reading is for members only and reaches the entire membership once each month.

Detailed newsletters of interest to members of one division or section only cannot be carried in this news insert, but items of Society-wide interest, including brief summaries of the activities of a division or a section, are appropriate. Announcements of section meetings and the national meeting will be found in this section. This is a change from policies announced as recently as last September. Through the new procedure, the entire membership will receive the preliminary announcements of all section meetings; there will be no separate mailings of the announcements. Also, by Council action last year, each member will receive only the *Abstracts with Programs* for the national meeting and for one section meeting—the section in which the member resides—unless the individual member has requested otherwise. Do not write to headquarters for the preliminary announcements of other section meetings—they will appear in this news section.

During the first few months of 1975, this news insert will be 8 pages, but later in the year, it will expand to 16 pages and will contain the *Annual Report*, in sequented form, and other items that in the past have been printed and mailed separately at much higher cost. It is our hope that proper use of this insert will eliminate most separate mailings and that it will serve as a better means of communication for the Society. How well it works is as much up to you as to the headquarters staff. We solicit your cooperation and your suggestions.

— *John C. Frye, Executive Secretary*

Section meetings: 1975

Northeastern with the Eastern Section of the Society of Economic Paleontologists and Mineralogists, March 6–8, Hotel Syracuse, Syracuse, New York
Local Chairman, Dan Merriam, Department of Geology, Syracuse University, Syracuse, New York 13210

South-Central, March 13–14, University of Texas, Austin, Texas
Local Chairman, Robert E. Boyer, Department of Geological Sciences, The University of Texas at Austin, Austin, Texas 78712

Cordilleran with The Seismological Society of America and the Pacific Coast Section of The Paleontological Society of America, March 25–27, California State University, Los Angeles, California
Local Chairmen, Terry E. Davis and Robert J. Stull, Department of Geology, California State University, Los Angeles, California 90032

Southeastern, April 9–12, Holiday Inn at Rivermont, Memphis, Tennessee
Local Chairman, Robert W. Deininger, Department of Geology, Memphis State University, Memphis, Tennessee 38152

Rocky Mountain with the Northwest Section of the National Association of Geology Teachers, May 3–6, Rodeway Inn Convention Center, Boise, Idaho
Local Chairman, Kenneth M. Hollenbaugh, Department of Geology, Boise State University, Boise, Idaho 83725

North-Central with the Geological Association of Canada, the Mineralogical Association of Canada, the North-Central Section of The Paleontological Society, The Pander Society, and the East-Central section of the National Association of Geology Teachers, May 15–17, University of Waterloo, Ontario
Local Chairman, Robert N. Farvolden, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, Canada N2L 3GI.

Minority program contributions support scholarships

The $2,500 contributed by GSA members with their 1974 dues to support the minority program has gone to help pay for scholarships for 23 minority earth-science majors. The scholarships, ranging from $250 to $2,000 (based on need) for the 1974–1975 academic year, are administered by the American Geological Institute. The 23 recipients, selected by the Advisory Committee to the AGI Minority Participation Program (based on academic achievement and probable future success), and approved by the AGI Executive Committee, are *Carlos Bernal,* a Mexican-American geophysics junior at the Colorado School of Mines; *Fernando Blackgoat,* a Navajo geology senior at Northern Arizona University; *Louis R. Castro,* a Spanish-surnamed geophysics graduate student at Texas Technological University; *David B. Dumas,* a black geophysics graduate student at Rice University; *Fernando D. Fernandez,* a Mexican-American geology sophomore at Texas Southern University; *Manuel D. Fernandez,* a Mexican-American geology graduate student at the University of Southern California; *Johnny F. Gutierrez,* a Mexican-American geology sophomore at Texas Southern University; *Henry Haven, Jr.,* a Navajo geology junior at Fort Lewis College; *Kenneth R. Ignacio,* a Navajo geology sophomore at Fort Lewis College; *Dean A. Jones,* a black geology senior at Baldwin Wallace College; *Vashti B. Jones,* a black geology graduate student at the University of North Carolina; *Emmitt Lockard,* a black geology junior at Tennessee Technological University; *David A. Lopez,* a Spanish-surnamed geology graduate student at the University of New Mexico; *Raymond J. Lopez,* a Spanish-surnamed geology graduate student at the University of Toledo; *Stephen A. Manydeeds,* a Sioux geology senior at the University of Wisconsin; *Brent Miyazaki,* an Oriental geology senior at California State University, Northridge; *Queenie M. Mungin,* a black geology graduate student at the University of Houston; *Kim Perez,* a Mexican-Japanese-American geology junior at Western Illinois University; *Patricia Ann Fuentes Roach,* a Puerto Rican Spanish-language–geology junior at Georgia Southern University; *Edward J. Salinas,* a Mexican-American geology senior at Fort Lewis College; *Richard J. Sheppy,* a black geology graduate student at the University of Houston; *Robert E. Smith,* a black geology senior at Howard University; *Richard L. Vega,* a Spanish-surnamed geology graduate student at Texas A&M University.

Five other member societies of the AGI and seven oil, mining, and geophysical companies contributed to the scholarship fund: *Member societies*—American Geophysical Union, Association of Engineering Geologists, National Association of Geology Teachers, Seismological Society of America, and Society of Economic Geologists. *Companies*—Amoco Production Company, EXXON USA, Kennecott Copper Corporation, Kinemetrics, Inc., Natural Gas Pipeline Company, Sun Oil Company, and Utah International, Inc.

Contributions accompanying dues payments for 1975 (or mailed separately) will go to help pay for minority scholarships for the 1975–1976 academic year. All contributions to the minority fund are deductible for income tax purposes, and every penny of each contribution goes into scholarships.

Belated reminder—Harold T. Stearns Fellowship

During 1974, the Council accepted a gift from Dr. Harold T. Stearns and approved the establishment of a Harold T. Stearns Fellowship Fund. The income from the fund will be used to award periodically a grant in support of research on one or more aspects of the geology of the circum-Pacific region. This fellowship fund is distinct from the GSA Penrose research grants and is restricted in its use to the particular region. The awardee will be selected by the Research Grants Committee. It is requested that applications for the grant during 1975 be in headquarters by February 15, 1975. At this time it is not certain that the grant will be awarded in 1975, but applications for the 1976 award will be accepted at any time during 1975.

37 Members advanced to Fellowship

The following 37 Members were elected to Fellowship by the Council at its November 1974 meeting:

Wolfgang H. Berger
James O. Berkland
Carol S. Breed
F. Eyolf Bronner
Donald G. Bryant
Keros Cartwright
Chin Chen
Malcolm M. Clark
Alfred Clebsch, Jr.
William A. Crawford
Aniruddha De
Hollis M. Dole
Larry Joe Garside
Stefan Gartner, Jr.
Richard J. Gentile
David L. Gross
Grant H. Heiken
Harold Kirkemo
Robert Y. Lamarche
Jerry A. Lineback
John A. Logan
Frederick K. Mack
Mounir T. Moussa
Thomas C. Nichols, Jr.
William R. Normark
Eugene R. Orwig, Jr.
Russel A. Peppers
Thomas H. Rogers
Joseph F. Schreiber, Jr.
Robert E. Sheridan
John W. Shomaker
Gordon R. Stephenson
George R. Tilton
Rob Van der Voo
John G. Weihaupt
Larry D. Woodfork
Margaret Woyski

Necrology

Earl T. Apfel, Syracuse, New York; *Richard Bayley,* Menlo Park, California; *Paul H. Bird,* Delmar, New York; *Arthur E. Brainerd,* Denver, Colorado; *Robert W. Bridgmen,* Wilton, Connecticut; *Paul F. Brodersen,* Ringwood, New Jersey; *Douglas R. Brown,* Anaheim, California; *Thomas P. Clendenin,* El Paso, Texas; *Elmer F. Davis,* Santa Monica, California; *Howard E. Davis, Jr.,* Midland, Texas; *Jarvis B. Hadley,* Reston, Virginia; *Glenn L. Jepson,* Princeton, New Jersey; *Jesse H. Johnson,* Crawley, Texas; *Edwin E. Lutzen,* Rolla, Missouri; *Phil F. Martyn,* Houston, Texas; *Leroy C. Maynard,* Salem, Oregon; *Walter F. Pond,* Malvern, Arizona; *Robert F. Sitler,* Kent, Ohio; *Anna I. Jonas Stose,* Ocean View, New Jersey; *Garvin L. Taylor,* Smithville, Oklahoma; *Charles C. Towle,* Lakewood, Colorado; *Everett P. Wheeler, II,* Blue Mountain Lake, New York.

Thanks and congratulations to the Miami Beach Annual Meeting Committee

The 1974 annual meeting in Miami Beach, Florida, was widely proclaimed as one of the truly successful meetings of the Society. The registration figures in themselves speak loudly: total registration was 3,616, which makes it one of our larger meetings. Of these, 2,239 were professional registrants, 859 were students, and 518 were spouses and guests. Also, approximately 250 exhibit personnel represented 85 exhibitors.

The employment interview service came into its own at the meeting with 68 prospective employers and 238 persons interviewing for prospective positions. More than 800 individual employment interviews were held at the meeting, not counting those arranged privately in hotel rooms.

The first-time experiment with poster sessions attracted favorable responses and suggestions for future improvements.

As always, the Annual Meeting Committee, working long and hard behind the scenes, was a key to the success of the meeting. The Society extends thanks and congratulations for a job well done. In case you have forgotten who did the work, the committee membership was as follows:

COORDINATING COMMITTEE: *F. Michael Wahl,* General Chairman; *George L. Freeland,* Co-Chairman and Housing; *Stephen S. Winters,* Technical Program; *Anthony Randazzo,* Treasurer. OPERATING COMMITTEES: *Harold R. Wanless,* Group Activities; *Nevin Hoy,* Technical Services; *George M. Griffin,* Field Trips; *Mahlon M. Ball,* Field Trips; *Carl E. Schubert,* Employment Interviews; *Robert Pierce,* Science Theater; *John W. Kofoed,* Registration; *Richard A. Davis, Jr.,* Information; *Wayne D. Bock,* Printing; *Patricia A. Bush,* Ladies' Program; *George A. Berberian,* Annual Banquet; *Louis W. Butler,* Exhibits.

Penrose Conference scheduled May 25-28

A GSA Penrose Conference on "Paleozoic Margins of Paleo-American and Eurafrican Plates" will be held May 25-28, 1975, at the University of New Brunswick at St. John. This four-day conference 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 "Pre-Mesozoic Plate Tectonics," organized by John Dewey and Henry Spall in Vail, Colorado, in January 1975, which stresses Precambrian plate tectonics. Costs for lodging, meals, and other conference-related costs is approximately $225. The conference will be succeeded by two days of optional field trips near St. John, N. B., which will cost an additional $70 total, including accommodations, meals, and transportation. For further information contact the conveners: James W. Skehan, S.J., Weston Observatory-Boston College, Weston, Massachusetts 02193, or Nicholas Rast, Department of Geology, University of New Brunswick, Fredricton, N. B., Canada. Deadline for applications is April 1, 1975.

Treatise on Invertebrate Paleontology

The next volume of the *Treatise on Invertebrate Paleontology* will be Supplement 1 to Part W, a posthumous work by the late Walter Häntzschel, who died in April 1972. Häntzschel left an almost complete card index with descriptions of genera and a largely complete list of selected illustrations. From this material, and with the active help of Mrs. Häntzschel, the manuscript for this volume was compiled in the editorial office of the *Treatise* in Lawrence, Kansas (see the *Geologist*, March 1974).

The Supplement deals with trace fossils (245 genera) and a variety of problematical fossils: Borings (65 genera), coprolites (14), microproblematica (86), and pseudofossils (77), to mention only the larger groups. The total number of generic names listed is 690. The Supplement is slightly larger than the entire first edition, Part W—269 pages, including 912 text-figures. There is a glossary of trace fossil terminology in English, French, and German, and a reference list of more than 1,800 titles.

Publication of Supplement 1 is expected this month. Supplement 2 to Part W, a revision of the conodonts, is in an advanced state of preparation.

The aim of the *Treatise*, as originally conceived and consistently pursued, is to present the most comprehensive and authoritative yet compact statement of knowledge concerning invertebrate fossil groups that can be formulated by collaboration of competent specialists working to organize what has been learned of this subject. Such work has value in providing a useful summary of the collective results of multitudinous investigations and should constitute an indispensable text and reference for all who wish to know about remains of invertebrate organisms preserved in rocks of the earth's crust. This applies to neo-zoologists as well as paleozoologists and to beginners in study of fossils as well as to thoroughly trained, long-experienced professional workers, including teachers, stratigraphical geologists, and individuals engaged in research on fossil invertebrates. The *Treatise* is divided into parts bearing index letters, each except the initial and concluding ones being defined to include designated groups of invertebrates. The chief purpose of this arrangement is to indicate their systematic sequence while allowing publication of units in whatever order each may be made ready for the press. The outline of subjects to be treated in connection with each large group of invertebrates includes description of morphological features, with special reference to hard parts; ontogeny; classification; geological distribution; evolutionary trends and phylogeny; and systematic description of genera, subgenera, and high taxonomic units.

All Fellows, Members, and Student Associates of GSA may buy one copy of each Part and Supplement (original and revised editions) at 20 percent member discount. Orders from GSA members must be personal orders placed directly with the Society in order to earn the discount.

For a list of parts in print and parts in preparation, please see the other side of this sheet.

TREATISE ON INVERTEBRATE PALEONTOLOGY

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PARTS IN PRINT

		RETAIL PRICE
C	PROTISTA 2 (Foraminifera, etc.) [in 2 volumes], 1964: xxxii + 900 p., 5,311 fig. in 655 groups	$37.00
D	PROTISTA 3 (radiolarians, tintinnines), 1954: xii + 195 p., 1,050 fig. in 92 groups	$12.50
E	ARCHAEOCYATHA (revised), Volume 1, 1972: xxx + 158 p., 871 fig. in 107 groups	$16.00
E	PORIFERA (revised), Volume 2	*to be published*
F	COELENTERATA, 1956: xvii + 498 p., 2,700 fig. in 358 groups	$23.50
G	BRYOZOA	*
H	BRACHIOPODA [in 2 volumes], 1965: xxxii + 927 p., 5,198 fig. in 746 groups	$37.50
I	MOLLUSCA 1 (Mollusca general features, Scaphopoda, Amphineura, Monoplacophora, Gastropoda general features, Archaeogastropoda, Caenogastropoda, Opisthobranchia), 1960: xxiii + 351 p., 1,732 fig. in 216 groups	$19.75
K	MOLLUSCA 3 (Cephalopoda general features, Endoceratoidea, Actinoceratoidea, Nautiloidea, Bactritoidea), 1964: xxviii + 519 p., 2,382 fig. in 361 groups	$23.75
L	MOLLUSCA 4 (Ammonoidea), 1957: xxii + 490 p., 3,800 fig. in 588 groups	$22.50
N	MOLLUSCA 6 (Bivalvia), Volumes 1 and 2, 1969: xxxviii + 952 p., 6,198 fig. in 610 groups	$38.25
N	MOLLUSCA 6 (Bivalvia), Volume 3 (Oysters), 1971: iv + 272 p., 742 fig. in 153 groups	$19.50
O	ARTHROPODA 1 (Arthropoda general features, Protarthropoda, Euarthropoda general features, Trilobitomorpha), 1959: xix + 560 p., 2,880 fig. in 145 groups	$23.50
P	ARTHROPODA 2 (Chelicerata, Pycnogonida, Palaeoisopus), 1955: xvii + 181 p., 565 fig. in 123 groups	$14.00
Q	ARTHROPODA 3 (Ostracoda), 1961: xxiii + 442 p., 3,476 fig. in 334 groups	$22.75
R	ARTHROPODA 4 (Crustacea except Ostracoda; Myriapoda, Hexapoda), Volumes 1 and 2, 1969: xxxvi + 652 p., 1,762 fig. in 397 groups	$26.00
R	ARTHROPODA 4 (Hexapoda), Volume 3	*to be published*
S	ECHINODERMATA 1 (Echinodermata general features, homalozoans, crinozoans except Crinoidea) [in 2 volumes], 1968: xxx + 650 p., 2,868 fig. in 400 groups	$26.00
U	ECHINODERMATA 3 (Asterozoans, echinozoans) [in 2 volumes], 1966: xxx + 695 p., 3,485 fig. in 517 groups	$27.50
V	GRAPTOLITHINA (revised), 1970: xxxii + 163 p., 481 line drawings, 2 tables	$12.75
W	MISCELLANEA (Conodonts, conoidal shells of uncertain affinities, worms, trace fossils, Problematica), 1962: xxv + 259 p., 1,058 fig. in 153 groups	$14.00
W	MISCELLANEA, Supplement 1 (trace fossils and Problematica, second edition [revised and enlarged])	*to be published February 1975*

**Out of print. Revised edition in process. Publication of first volume anticipated late in 1975; other volumes will follow at irregular intervals.*

PARTS IN PREPARATION

Part A	INTRODUCTION
Part B	PROTISTA 1 (Chrysomonadida, Coccolithophorida, Charophyta, Diatomacea, etc.)
Part J	MOLLUSCA 2 (Gastropoda, Streptoneura exclusive of Archaeogastropoda, Euthyneura)
Part M	MOLLUSCA 5 (Coleoidea)
Part R	ARTHROPODA 4 (Hexapoda), Volume 3
Part T	ECHINODERMATA 2 (Crinoidea)
Part X	ADDENDA, INDEX
Part E	(revision) Porifera, Volume 2
Part F	(supplement) Coelenterata (Anthoxoa Rogosa)
Part G	(revision) Bryozoa
Part L	(revision) Ammonoidea

February BULLETIN briefs

Brief summaries of articles in the February 1974 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 on the last page of this section.*

☐ 50201—Experimental Study of Unconfined Flow of Solnhofen Limestone at 500°C to 600°C. *E. H. Rutter, Geology Department, Imperial College, London SW 7; S. M. Schmid, Australian National University, Research School of Earth Sciences, P.O. Box 4, Canberra, Australia.* (8 p., 9 figs., 2 tbls.)

Results of 25 uniaxial creep, stress-relaxation, and constant strain-rate tests in the temperature range 500°C to 600°C on cylinders of Solnhofen limestone are reported. Permanent strains of as much as 20 percent were often produced. Standard experimental procedures for metallurgical creep tests were used. The results of different experimental techniques employed on unconfined rock were found to be consistent and were comparable with data from high-temperature triaxial tests on the same rock. The strength of this rock, extrapolated to geological strain rates, was found to be high compared with stress levels expected in nature.

☐ 50202–Mineralogy and Chemistry of the Patapsco Formation, Maryland, Related to the Ground-Water Geochemistry and Flow System: A Contribution to the Origin of Red Beds. *P. R. Schluger, Amerada Minerals Corporation of Canada, Ltd., 540 5th Ave. S.W., Calgary, Alberta, T2P OM3, Canada; H. E. Roberson, Department of Geological Sciences, State University of New York at Binghamton, Binghamton, New York 13901.* (6 p., 9 figs., 1 tbl.)

Sediments of the Patapsco Formation were studied to determine if color changes, clay mineralogy, and iron content are related to the present ground-water geochemistry and the present ground-water flow system. The red color of the sediments becomes darker in the direction of the ground-water flow, particularly in local discharge areas. This color change is related to the amount and kind of iron oxides in the sediments. Hematite and goethite coexist in most of the red and mottled samples; hematite is more abundant than goethite in red sediments but is rarely found in drab sediments. Large amounts of amorphous or poorly ordered iron oxyhydroxides in these sediments indicate that much of the iron has been introduced by diagenetic processes. Lower iron oxide values prevail toward the center of the outcrop belt, and higher values prevail in the recharge area. Detrital kaolinite and illite are the most abundant clay minerals. Vermiculite and mixed-layer illite-smectite are almost always found in red-colored sediments and are probably products of post-depositional diagenesis.

The mineralogic and chemical variations correlate regionally with the observed ground-water flow pattern and with observed changes in Eh and dissolved iron content of the ground water. These results suggest that fluctuations in the ground-water flow system in conjunction with Eh and pH conditions caused precipitation of iron hydroxides that, on aging, have crystallized as goethite and (or) hematite.

☐ 50203–Late Ordovician–Early Silurian Conodont Biostratigraphy, Inyo Mountains, California. *Richard H. Miller, Department of Geology, California State University, Northridge, California 91324.* (4 p., 2 figs., 1 tbl.)

Conodonts from two measured sections of the slightly metamorphosed Ely Springs Dolomite in the central Inyo Mountains of California indicate that the Ordovician-Silurian systemic boundary occurs at the middle of the formation and not at the top as previously reported. The lower member of the formation contains conodonts characteristic of Late Ordovician (Cincinnatian) age; the middle and upper members contain conodonts characteristic of Early Silurian (Llandoverian) age. This is one of the first indications of a diverse conodont fauna within this stratigraphic interval in the southwestern Great Basin.

☐ 50204—Mineral Reactions in Zeolitic Triassic Tuff, Hokonui Hills, New Zealand. *J. R. Boles, D. S. Coombs, Department of Geology, University of Otago, Dunedin, New Zealand.* (11 p., 11 figs., 4 tbls.)

Textural evidence and other considerations indicate the following paragenetic sequence of reactions in marine Triassic tuff beds which are scattered through a 4.8 to 5.8 km thickness of the Murihiku Supergroup, Hokonui Hills, Southland, New Zealand: (1) glass → montmorillonite ± illite, (2) glass → heulandite + chlorite and celadonite, (3) heulandite → laumontite, or prehnite, or calcite, or analcime, or albite.

Heulandite with high Si/Al ratios is associated with calcium-poor pyroclastic feldspars, whereas heulandite with low Si/Al ratios is associated with calcium-rich pyroclastic plagioclases. These data indicate that the Si/Al ratio of heulandite was controlled by the Si/Al ratio of the glass precursor.

The breakdown of heulandite to Na-aluminosilicates (analcime or albite) or to Ca-aluminosilicates (laumontite or prehnite) over a wide stratigraphic interval suggests that such factors as activity of various ions in stratal waters may have played a more significant role than depth of burial in controlling the distribution of these authigenic and very low grade metamorphic phases in the Hokonui Hills.

☐ 50205—Geochemical Analysis of Stream Sediments as a Tool for Environmental Monitoring: A Pigyard Case Study. *George R. Alther, Department of Geology, Brock University, St. Catharines, Ontario, Canada.* (3 p., 8 figs., 2 tbls.)

A geochemical analysis of 11 chemical elements in stream sediments in the vicinity of a pig farm shows that geochemical exploration methods can be used for regional environmental monitoring of organic pollution. In a 5-sq-mi (12.95 km^2) area in southern Ontario, contaminated stream sediments showed definite increases in Mg, Ca, Na, K, and Zn. Changes in Cu content were inconclusive; Pb, Co, Ni, Fe, and Mn showed background averages.

The study showed that stream sediments are affected by large-scale agricultural operations within a short period of time. It is conclusive that ground water will be affected as contamination continues.

February BULLETIN briefs

□ 50206—Petrology of Rattlesnake Mountain Sill, Big Bend National Park, Texas. *Max F. Carman, Jr., Geology Department, University of Houston, Houston, Texas 77004; Maryellen Cameron, Board of Earth Sciences, University of California, Santa Cruz, California 95064; Bernard Gunn, Geology Department, Université de Montreal, Montreal 101, Quebec, Canada; Kenneth L. Cameron, Board of Earth Sciences, University of California, Santa Cruz, California 95064; John C. Butler, Geology Department, University of Houston, Houston, Texas 77004*. (17 p., 22 figs., 6 tbls.)

The Rattlesnake Mountain intrusion is an early Tertiary analcime-bearing monzonite sill about 80 m thick that was injected at shallow depth and underwent differentiation in place. It contains sheets, lamellae, cylindroidal masses, and ocelli of syenite that show systematic distribution within the monzonite.

Crystal fractionation played a dominant role in generating syenitic rest liquids that could be aggregated into the structures found in the sill; rifting of a partially solid crystal mesh explains the formation of lamellae and many sheets, but the cylindroidal masses and ocelli are more enigmatic. The rocks of Rattlesnake Mountain sill, as well as others of Big Bend, show distinct chemical similarities to alkalic oceanic suites such as those of the Azores. There appear to be two differentiation trends related, perhaps, to undersaturated and saturated basaltic lava flows known in the area and possibly also affected by depth at which differentiation occurred.

□ 50207—Rate of Sulfuric-Acid Production in Yellowstone National Park. *T. D. Brock, J. L. Mosser, Department of Bacteriology, University of Wisconsin, Madison, Wisconsin 53706*. (5 p., 2 figs., 4 tbls.)

Production of sulfuric acid in vapor-dominated hydrothermal systems is primarily a bacterial process. The rate of production of sulfuric acid was measured in springs in several acid-altered areas in Yellowstone National Park. Most of these springs lack surface water flow, but water enters and leaves these springs at approximately constant rates via underground seepage. The rate of water exchange in these steady-state systems was measured by enriching the springs with sodium chloride and measuring the rate at which the chloride ion was diluted. In all cases, the added chloride was diluted at an exponential rate, and half-times for dilution were calculated. The rate at which sulfuric acid was being produced was calculated from a knowledge of dilution rate and volume of the springs and from measurement of the sulfuric acid concentrations of the waters. In several small springs, flow rate was measured more directly by draining the springs and measuring the rate at which water returned.

These studies showed that water in acid springs enters as cold acid ground water, which is steam heated within the source pool. It was possible to estimate how much of the sulfuric acid in a given spring could have been produced in situ, and how much entered by underground seepage. In springs with pool volumes of 2,000 liters or less, most of the sulfuric acid was produced outside the spring, probably by bacteria present in the nearby acid-altered soil. In springs with pool volumes around 10^6 liters, most of the sulfuric acid was produced in situ by resident bacterial populations. The techniques used may have wider utility in biogeochemical investigations.

□ 50208—Coastal Breakup in the Alaskan Arctic. *A. D. Short, Wm. J. Wiseman, Jr., Coastal Studies Institute, Louisiana State University, Baton Rouge, Louisiana 70803*. (4 p., 6 figs.)

Spring river flooding, generated by earlier inland melt, accompanies arrival of temperatures above 0°C on the coast. The extent of flooding over the nearshore ice is related to total flood discharge and coastal morphology. Along wave-controlled barrier-island coasts, flooding and bed load are confined to lagoons, whereas on fluvial-dominated coasts, floodwater and sediment spread across lobate delta fronts and offshore shoals. During this time, marine influence is minimal as a result of protection afforded by sea ice cover. Sea ice melt continues through summer, and the final coastal sea ice breakup and ice dispersion depend on offshore Ekman transport, breakup of the offshore pack ice, and local bathymetry. The coastal ice breaks up 4 to 8 weeks after initiation of melt. Melt of ice and snow within the beach generates beach collapse and resultant unique arctic beach features, whereas flow of tundra snowmelt across the beach produces micro-fans and micro-deltas.

□ 50209—Implications for the Fossil Record of Modern Carbonate Bank Corals. *B. M. Abbott, Department of Earth Sciences, The Open University, Buckinghamshire, England*. (2 p.)

Growth forms, analogous with those developed by Silurian colonial organisms, are constructed by modern scleractinian corals living in south Florida carbonate banks. The fauna of the Silurian bioherms is thought to have formed under broadly similar conditions and not as a patch or barrier reef as suggested by earlier workers. First approximations as to the extent of the ancient sediments' lithification can be made on the evidence of the coral growth form present.

□ 50210—Extension of the Cordilleran Miogeosynclinal Belt to the San Andreas Fault, Southern California. *John H. Stewart, U.S. Geological Survey, Menlo Park, California 94025; Forrest G. Poole, U.S. Geological Survey, Denver, Colorado 80225*. (8 p., 6 figs.)

Correlations of marine sedimentary rocks in the San Bernardino Mountains and western Mojave Desert area with known uppermost Precambrian and some Paleozoic rocks of the southern Great Basin suggest that a nearly complete succession of Cordilleran miogeosynclinal rocks extends into southern California.

Pre-Mesozoic rocks in the San Bernardino Mountains consist of (1) gneiss and schist of Precambrian age (probably older than 1,200 m.y.); (2) the Saragossa Quartzite, here considered to be latest Precambrian and Early Cambrian in age; and (3) the Furnace Limestone, the upper part of which is locally dated by megafossils as Mississippian and possibly Pennsylvanian or Permian but considered here to contain strata ranging in age from Early Cambrian to

Permian(?). The Saragossa Quartzite contains distinct units that can be lithologically correlated confidently with parts of the uppermost Precambrian and Lower Cambrian sequence containing the Johnnie, Stirling, Wood Canyon, and Zabriskie Formations of the eastern Mojave Desert and the southern Great Basin.

Some rock units on Quartzite Mountain in the western Mojave Desert are lithologically correlated with the uppermost Precambrian and Cambrian Wood Canyon, Zabriskie, Carrara, and Bonanza King Formations of the eastern Mojave Desert and southern Great Basin.

The Cordilleran miogeosynclinal belt is truncated by the San Andreas fault in southern California; a displaced segment may occur in the Salinian block 450 km to the northwest. Cordilleran miogeosynclinal rocks also occur in northwestern Mexico, east of the San Andreas fault, indicating a major change in trend of the geosyncline between the Great Basin and Mexico.

□ 50211—Geophysical Study of the Venezuelan Borderland. *Eli A. Silver, U.S. Geological Survey, Menlo Park, California 94025; James E. Case, U.S. Geological Survey, Corpus Christi, Texas 78911; H. J. MacGillavry, Geologisch Instituut, Universiteit Amsterdam, The Netherlands*. (14 p., 12 figs.)

The Venezuelan Borderland is composed of several large depositional basins, a linear chain of islands, and a broad outer ridge. It is cut by a nearshore zone of east-trending faults. Geophysical profiles show that the basins have different structural styles, but these features and the large faults and ridges are related to each other and to the Caribbean Coast Range by a complex history of relative movement between the Caribbean and South American plates since Late Cretaceous time.

The east-trending Curaçao Ridge is a thick pile of deformed low-density strata ($Vc \leq 4.1$ km/sec) that apparently formed by compression of Venezuela Basin strata on its north side and by deposition and compression of strata in Los Roques Trough on the south. The basement rock of the Netherlands Antilles is composed of diabase, pillow basalt, and marine sediment that are weakly metamorphosed and cut by quartz dioritic intrusive rocks. Gravity models suggest a root beneath the islands 32 km thick and a crust beneath the Bonaire Trough 18 km thick.

□ 50212—Constitution of the Lower Continental Crust Based on Experimental Studies of Seismic Velocities in Granulite. *Nikolas I. Christensen, Department of Geological Sciences and Graduate Program in Geophysics, University of Washington, Seattle, Washington 98195; David M. Fountain, Department of Geological Sciences, University of Washington, Seattle, Washington 98195.* (10 p., 7 figs., 4 tbls.)

Rocks of the granulite facies have been proposed as major constituents of the lower continental crust. To evaluate this possibility, compressional and shear wave velocities have been determined to pressures of 10 kb for 10 granulite samples, thus enabling comparisons of seismic data for the lower crust with the velocities and elastic properties of granulite rocks. The samples selected for this study range in composition from granitic to basaltic, with bulk densities of 2.68 to 3.09 g/cm^3. At 6 kb, compressional (V_p) and shear (V_s) wave velocities range from 6.39 to 7.49 km/sec and from 3.36 to 4.25 km/sec, respectively. Velocities in granulites vary systematically with variations in mineralogical constitution. Both V_p and V_s increase with increasing pyroxene, amphibole, and garnet. Velocities increase with an increasing ratio of pyroxene to amphibole in hornblende-granulite subfacies rocks of approximately equivalent chemical compositions. Decreasing quartz content in granulite rocks produces an increase in V_p and an accompanying decrease in V_s, thereby significantly changing Poisson's ratio. The range of velocities measured for the granulite samples is similar to the range of seismic velocities reported for the lower continental crust; thus, the hypothesis that granulite rocks are major lower crustal constituents is further strengthened. Furthermore, lower crustal composition is extremely variable, and therefore valid discussions of composition must be limited to specific regions where seismic velocities are well known. The use of seismic velocities in estimating lower crustal composition is illustrated for the Canadian Shield in Ontario and Manitoba.

□ 50213—Paleomagnetic and Geochronologic Data Bearing on the Structural Evolution of the Northeastern Margin of the Front Range, Colorado. *R. Hoblitt, E. Larson, Department of Geological Sciences, University of Colorado, Boulder, Colorado 80302.* (6 p., 4 figs., 5 tbls.)

Radiometrically dated hypabyssal tabular intrusive masses in the northern part of the Front Range, Colorado, were emplaced about 63 m.y. ago. Comparison of the remanent magnetic directions of these igneous bodies with their unrotated magnetic reference directions indicates that the intrusive rocks and the enclosing Paleozoic and Mesozoic sedimentary rocks have undergone variable amounts of rotation, depending on their geographic location. The host beds of the Ralston intrusive near Golden were rotated to their present attitude after the emplacement of the intrusive, whereas the enclosing sedimentary rocks at three sites near Boulder were rotated in part prior to and in part after intrusion. The host beds of the sill near Left Hand Canyon were probably rotated prior to intrusion. It is likely that rotations are due to the vertical and (or) eastward translation of the Precambrian crystalline rocks adjacent to the monocline.

□ 50214—Evolution of Silurian Brachiopod Communities along the Southeastern Coast of Acadia. *Rodney Watkins, Department of Geology and Mineralogy, University of Oxford, Oxford OX1 3PR, England; A. J. Boucot, Department of Geology, Oregon State University, Corvallis, Oregon 97331.* (12 p., 14 figs., 5 tbls.)

Silurian rocks along the Atlantic coast from Massachusetts to Nova Scotia contain a diversity of level-bottom marine communities dominated by articulate brachiopods. Stratigraphic changes in these communities are classified as *community evolution* when there is a preponderance of con-

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tinuous lineages between older and younger communities and *community succession* when there is not. In Nova Scotia, community succession within the nearshore environment was caused by faunal invasion between lower and upper Llandovery time, community successions accompanied offshore conditions during Wenlock time, and community evolution occurred within relatively constant nearshore conditions from late Wenlock through Pridoli time. Earliest nearshore communities of Nova Scotia were dominated by single species of pedunculate brachiopods, whereas later nearshore communities included greater diversity of both pedunculate and free-lying brachiopods. Late Silurian nearshore communities from Massachusetts to New Brunswick retained the pattern of single-species dominance, but species were of different stocks than those of Early Silurian time and included free-lying as well as pedunculate forms.

☐ 50215—Observations on Hillslope Erosion in Tower Karst Topography of Belize. *Roy C. McDonald, Department of Geography, Louisiana State University, Baton Rouge, Louisiana 70803.* (2 p., 3 figs.)

Differential erosion in karst topography of Belize forms closed basins around karst towers. Ephemeral lakes that collect in the basins are active in removing talus and undermining hillslope support by corrosion. Channel incision establishes more rapid drainage of the basins that surround towers, resulting in less active hillslope erosion.

Tower karst topography of coastal Belize is in the process of changing from a landscape characterized by rapid talus removal and undermining to a landscape characterized by slow talus removal and little slope undermining. As the drainage continues to improve around karst towers, steep tower hillslopes become more obscured at their bases by the accumulation of talus.

☐ 50216—Quantitative Classification and Chemical Comparison of Common Volcanic Rocks. *B. N. Church, British Columbia Department of Mines and Petroleum Resources, Victoria, British Columbia V8V 2M2, Canada.* (7 p., 14 figs., 1 tbl.)

A simple quantitative method of classification and chemical comparison of the main volcanic rock species has been devised using the three-axis orthogonal plot $Na_2O + K_2O$ versus $FeO + Fe_2O_3 + \frac{1}{2}(MgO + CaO)$ versus Al_2O_3/SiO_2, in weight percent. The method combines a new index of basicity with some of the important aspects of variation diagrams proposed by Tilley and Murata. The resulting generalized treatment of major oxide data, which stresses the gross differences in rock composition, has the important advantages of de-emphasizing some of the possible effects of analytical error and requiring a minimum of manipulation and processing of data.

Graphs of analyses readily discriminate between magma types and trends and reaffirm classical volcanic rock nomenclature. Good correlation is established with the arc fusion determinative procedure of Mathews, thereby increasing the scope and general utility of the method.

☐ 50217—Characteristics of the Pennsylvanian Lower-Middle Haymond Delta-Front Sandstones, Marathon Basin, West Texas: Discussion and Reply.

Discussion: *Earle F. McBride, Department of Geological Sciences, University of Texas at Austin, Austin, Texas 78712.*

Reply: *Romeo M. Flores, Department of Geology, Sul Ross State University, Alpine, Texas 79830.*

☐ 50218—World-Wide Correlation of Mesozoic Magnetic Anomalies and Its Implications: Discussion and Reply.

Discussion: *William A. Berggren, Department of Geology and Geophysics, Woods Hole Oceanographic Institute, Woods Hole, Massachusetts 02543; Dan P. McKenzie, Department of Geodesy and Geophysics, Cambridge University, Cambridge, England; John G. Sclater, Department of Earth and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139; Jan E. van Hinte, Exxon Production Research Co., P. O. Box 2189, Houston, Texas 77001.*

Reply: *Roger L. Larson, Walter C. Pitman III, Lamont-Doherty Geological Observatory of Columbia University, Palisades, New York 10964.*

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