THE GEOLOGICAL SOCIETY OF AMERICA ·1888·

GSA news & information

SUPPLEMENT TO GEOLOGY MAGAZINE

AUGUST 1976

Report of the Treasurer

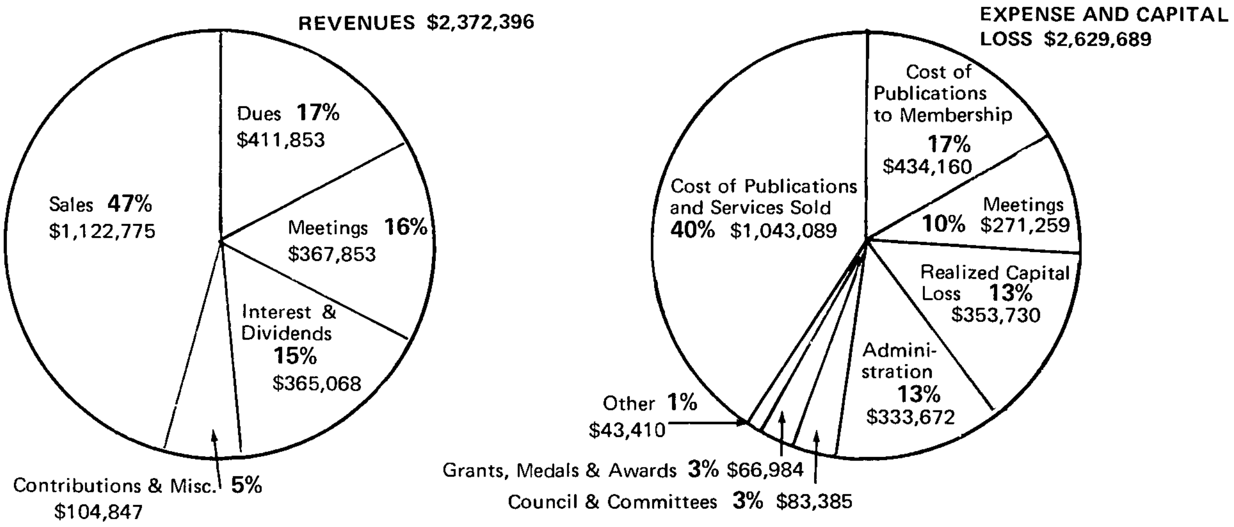
To the Council and Membership of The Geological Society of America, Inc.:

The improvement in the finances of The Geological Society of America for the fiscal and calendar year 1975 was remarkable. In 1973 our net operating deficit was $227,723; in 1974 our net operating deficit was $313,664; in 1975 our net operating gain was $44,276. This remarkable turn for the better in our finances resulted from dedicated cost-cutting by the Executive Director, Business Manager, and Headquarters Staff, and from the drastic but necessary actions taken to increase our revenue by the Executive Committee and by the Council when the extent of our plight was first realized. The Council realized that such actions as increasing publication sales prices, increasing dues, fees, and page charges, and raising convention registration costs would be unpopular with the membership and they have been. It is to the credit of the Council that they faced these unpleasant facts and still took the necessary actions for the good of the Society. Future generations of geologists have good reason to be grateful to these dedicated men and women.

The unprecedented deficits in 1973 and 1974 virtually exhausted the General Reserve Fund. Rebuilding this fund to a satisfactory level will be a major priority of the Treasurer and Committee on Investments for the next decade. We expect to increase the assets of the General Reserve Fund

(next page, please)

THE GEOLOGICAL SOCIETY OF AMERICA SOURCE AND APPLICATION OF FUNDS, 1975



NET CHANGE IN ALL FUNDS—1975 $⟨257,293⟩

Annual Report for 1975
The Geological Society of America

in 1976 by taking stock market profits in the Penrose Endowment and transferring net realized capital gains to the General Reserve Fund at the end of 1976. Nevertheless, rebuilding this fund will be a matter of years.

In 1975 we continued to sell unpromising investments and reinvest the funds received in more promising investments. This resulted in losses on sales of investments of $353,730, producing a deficiency of revenues over expenses of $257,293. We expect to reverse this in 1976.

As of December 31, 1975, GSA had total assets of $9,670,315 against total liabilities of $1,369,364 for a ratio of assets to liabilities of 7.06.

The accompanying pie diagram on source and application of funds merits study by all.

At the time of this writing (April, 1976) we are budgeting a small operating gain for the 1976 fiscal year in the Current Fund.

Respectfully submitted,

AUGUST GOLDSTEIN, JR., Treasurer

Report of the Committee on Investments

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

The Committee on Investments is pleased to submit its report on the investments of the Society for 1975.

On December 31, 1975, the market value of the combined investment accounts of the Society was $7,679,358 as compared with $6,816,989 on December 31, 1974, a gain of $862,370 or 12.65%. This compares with the change during 1974 from $9,101,211 to $6,816,989, a drop of $2,284,222 or 25%.[1]

The year 1975 was not a happy one for the Committee. Harry Burgess assumed the chairmanship at the beginning of the year and was very active in the early months. However, he was stricken by a serious illness in the middle of the year and regretfully asked to be relieved. President Goldsmith asked William B. Heroy, Jr., to take over in the middle of the summer, which he agreed to do, but unfortunately he was unable to attend the September meeting in New York City. The coordination and momentum of the Committee suffered somewhat. In addition, the February 1976 meeting was scheduled in conflict with the national AIME meeting, which adversely affected attendance.

The Committee is generally optimistic about the stock market for 1976 but its optimism is somewhat guarded. There is also a feeling that we should be more inclined to take profits when we have them and build up the Reserve Fund.

Council will be asked again to review the long-established policy of not delegating full discretion to our investment advisors. There is a feeling by some members that by not delegating full discretion, we hamper our ability to act as promptly as desirable in a rapidly changing market.

THE GEOLOGICAL SOCIETY OF AMERICA, INC.
SUMMARY OF INVESTMENTS BY FUNDS
DECEMBER 31, 1975

Principal amount	Security	Cost	Approximate market value
	Penrose Endowment Fund		
$ 445,000	U.S. Government & Agency Obligations	$ 446,999.75	$ 440,962.50
1,321,500	Corporate	1,305,442.50	1,072,787.85
200,000	Canadian Government	200,000.00	197,000.00
475,000	Convertible Fixed Income	470,743.75	466,075.00
27,000	Short Term Investments	27,000.00	27,000.00
	Common Stocks	3,078,453.64	3,418,074.75
Total Penrose Endowment Fund Investments		$5,528,639.64	$5,621,900.10
	Income Stabilization Furd		
$ 229,000	U.S. Government and Agercy Obligations	$ 229,755.73	$ 231,575.00
74,000	Short Term Investments	74,000.00	74,131.40
Total Income Stabilization Fund Investments		$ 303,755.73	$ 305,706.40
	General Reserve Fund		
$ 219,000	Short Term Investments	$ 219,000.00	$ 219,000.00
Total General Reserve Fund Investments		$ 219,000.00	$ 219,000.00
	Current Fund		
$ 196,000	U.S. Government & Agency Obligations	$ 194,251.61	$ 193,593.75
60,000	Corporate	60,000.00	55,800.00
292,000	Short Term Investments	292,000.00	292,000.00
	Common Stocks	6,137.00	6,727.50
Total Current Fund Investments		$ 552,388.61	$ 548,121.25
	Arthur L. Day Medal Fund		
$ 7,000	U.S. Government & Agency Obligations	$ 7,043.75	$ 6,746.25
12,000	Corporate	12,000.00	11,160.00
20,000	Convertible Fixed Income	22,750.00	13,925.00
	Common Stocks	12,006.98	4,000.00
Total Arthur L. Day Medal Fund Investments		$ 53,800.73	$ 35,831.25
	Penrose Medal Fund		
$ 5,000	U.S. Government & Agency Obligation	$ 5,012.50	$ 4,818.75
4,000	Corporate	3,990.00	3,720.00
Total Penrose Medal Fund Investments		$ 9,002.50	$ 8,538.75
	Kirk Bryan Memorial Furd		
$ 7,000	U.S. Government & Agency Obligations	$ 6,780.00	$ 6,871.25
6,000	Corporate	6,000.00	5,580.00
Total Kirk Bryan Memorial Fund Investments		$ 12,780.00	$ 12,451.25
	Retirement Reserve Fund		
$ 156,000	U.S. Government & Agency Obligations	$ 156,605.10	$ 152,977.50
316,086	Corporate	317,411.30	268,193.55
50,000	Convertible Fixed Income	52,206.25	40,687.50
39,000	Short Term Investments	39,000.00	39,000.00
	Common Stock	251,507.16	268,668.75
Total Retirement Reserve Fund Investments		$ 816,729.81	$ 769,527.30
	Major Repairs Fund		
$ 106,000	U.S. Government & Agency Obligations	$ 106,349.05	$ 105,955.00
15,000	Short Term Investments	15,000.00	15,043.80
Total Major Repairs Fund Investments		$ 121,349.05	$ 120,998.80
	Stearns Award Fund		
$ 10,000	U.S. Government & Agency Obligations	$ 10,000.00	$ 9,925.00
Total Stearns Award Fund		$ 10,000.00	$ 9,925.00

Respectfully submitted,

WILLIAM B. HEROY, JR., Chairman; PETER T. FLAWN; ROBERT L. FUCHS; MICHEL T. HALBOUTY; AUGUST GOLDSTEIN, JR., Treasurer; JAMES BOYD, Conferee; ROBERT E. KING, Conferee

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[1] Note: A rough calculation indicates that the total increased over $300,000 in the first quarter of 1976.

Announcements and Call for Papers for 1977 Meetings

Because the Sections will use different means for generating the $20 charge per abstract in 1977, please refer to the instruction sheet that accompanies the abstract form for the specific instructions pertaining to a particular Section.

ANNOUNCEMENTS CONCERNING THE INDIVIDUAL SECTION MEETINGS

SOUTH-CENTRAL

Holiday Inn, Downtown
El Paso, Texas
March 17–19, 1977

ABSTRACT DEADLINE: October 21, 1976

Please submit completed abstracts to
William C. Cornell, Program Committee Chairman
Department of Geological Sciences
University of Texas at El Paso
El Paso, TX 79968
(915) 747-5501

SOUTHEASTERN

Hyatt House
Winston-Salem, North Carolina
March 23–26, 1977

ABSTRACT DEADLINE: October 12, 1976

Please submit completed abstracts to
Carlton J. Leith, Local Committee Chairman
Department of Geosciences
North Carolina State University
Raleigh, NC 27607
(919) 737-2212

NORTHEASTERN

Treadway Inn
Binghamton, New York
March 31–April 2, 1977

ABSTRACT DEADLINE: November 3, 1976

Please submit completed abstracts to
James E. Sorauf, Program Committee Chairman
Department of Geological Sciences
State University of New York
Binghamton, NY 13901
(607) 798-2264

CORDILLERAN

Sacramento Convention Center
Sacramento, California
April 5–7, 1977

ABSTRACT DEADLINE: November 1, 1976

Please submit completed abstracts to
Susan C. Slaymaker, Program Committee Chairman
Department of Geology
California State University
Sacramento, CA 95819
(916) 454-6667

NORTH-CENTRAL

Southern Illinois University
Carbondale, Illinois
April 28–30, 1977

ABSTRACT DEADLINE: December 3, 1976

Please submit completed abstracts to
Dale F. Ritter, Program Committee Chairman
Department of Geology
Southern Illinois University
Carbondale, IL 62901
(618) 453-3351

ROCKY MOUNTAIN

University of Montana
Missoula, Montana
May 12–13, 1977

ABSTRACT DEADLINE: December 10, 1976

Please submit completed abstracts to
Donald W. Hyndman, Program Committee Chairman
Department of Geology
University of Montana
Missoula, MT 59801
(406) 243-2341

SPECIAL NOTE TO MEMBERS LIVING OUTSIDE CONTERMINOUS UNITED STATES

Those who live outside the conterminous United States may receive copies of the 1977 *Abstracts with Programs* for the section meetings too late to take advantage of the preregistration and housing forms.

Therefore, those who are planning to attend any of the section meetings are urged to write to the appropriate local committee officers listed above for copies of the preregistration forms, housing applications, and field trip information.

MSA Short Course on Oxide Minerals to precede GSA Annual Meeting, Nov. 5–7, 1976

The Mineralogical Society of America is sponsoring a Short Course on Mineralogy and Petrology of Rock-forming Oxide Minerals at Green Center, Colorado School of Mines, Golden, Colorado, November 5–7, 1976, immediately preceding the GSA annual meeting. Short course lecturers will be Ahmed El Goresy (Max Planck Institut für Kernphysik), Stephen E. Haggerty (University of Massachusetts), Donald H. Lindsley (State University of New York at Stony Brook), and Douglas Rumble (Geophysical Laboratory).

The short course will review the mineralogy and petrology of rock-forming oxide minerals. Among the minerals to be treated are hematite, ilmenite, rutile, pseudobrookite, armalcolite, magnetite, chromite, and related solid solutions and polymorphs. Topics to be discussed include crystal chemistry, structure, and magnetic properties; phase equilibria; igneous, metamorphic, lunar, and meteoritic petrology as well as alteration parageneses. The course is designed to serve the needs of silicate mineralogists and petrologists desiring an introduction to the oxide minerals, geomagneticists interested in the mineralogical and petrological aspects of rock magnetism, professional geologists desiring an up-to-the-minute review of the subject, and graduate students seeking to broaden their educational background.

Workshops will be given on the subjects (1) ore microscopy, (2) experimental mineralogy and petrology, and (3) thermodynamic methods.

Lecture notes will be distributed to participants and subsequently will be available for sale by the Mineralogical Society of America, Suite 1000, 1909 K St., N.W., Washington, D.C. 20006.

Applications for this limited enrollment course will be accepted upon payment in full of the registration fee, which is $80 for MSA members, $100 for nonmembers, and $50 for full-time students enrolled in degree-granting institutions.

The registration fee includes short course notes and two catered lunches. Nonmembers may designate part of their registration fee for membership in MSA. The fee is refundable up to October 1, 1976.

APPLICATION FORM FOR SHORT COURSE ON OXIDE MINERALS

NAME ______________________________

POSITION ______________________________

AFFILIATION ______________________________

ADDRESS ______________________________

______________________________ ZIP ____________

Member of MSA Yes ☐ No ☐

Student Yes ☐ No ☐

Enclose your check for the entire registration fee and make it payable to "MSA Short Course." Mail this form to Douglas Rumble, MSA Short Course, Geophysical Laboratory, 2801 Upton Street, N.W., Washington, D.C. 20008.

August BULLETIN briefs

Brief summaries of articles in the August 1976 GSA Bulletin *are provided on the following pages to aid members who chose the lower dues option to select* Bulletin *separates of their choice. The Document Number of each article is repeated on the coupon and mailing label in this section.*

☐ 60801—Geochemistry of the Cape Verde Islands and Fernando de Noroñha. *Bernard M. Gunn, Department of Geology, Université de Montréal, Montréal, Quebec, Canada, and Norman D. Watkins, Graduate School of Oceanography, University of Rhode Island, Kingston, Rhode Island 02881* (12 p., 13 figs., 5 tbls.)

Two hundred chemical analyses made of igneous rocks from seven of the Cape Verde Islands and from Fernando de Noroñha show that these Atlantic islands are predominantly composed of plagioclase-free limburgite grading into plagioclase-bearing basanite. Minor amounts of nepheline latite, nepheline monzonite, and nepheline syenite occur as intrusive stocks together with flows and plugs of phonolite. The high average Sr, Ti, P, total Na + K, and normative Ne contents distinguish the series from the ankaramite–alkali basalt-trachyte suites found in most oceanic volcanic islands.

Nepheline latite and nepheline syenite rocks of the Cape Verde Islands and Fernando de Noroñha could have formed by the subtraction of a highly mafic olivine-bearing kaersutitic clinopyroxenite from a limburgitic magma. Comparison with published results from other oceanic islands and the sea floor shows that the Cape Verde Islands and Fernando de Noroñha are the most alkalic parts of the oceanic crust. A plot of Sr versus TiO_2 for oceanic and sea-floor islands clearly delineates the extreme character of these island groups. This representation of magma type is proposed as being of greater value than the conventional alkali versus silica diagram for oceanic island comparisons.

☐ 60802—Paleohydrologic analysis of a late Carboniferous fluvial system, southern Morocco. *G. V. Padgett and Robert Ehrlich, Department of Geology, University of South*

(continued on p. 485)

BULLETIN briefs . . .

(continued from p. 476)

Carolina, Columbia, South Carolina 29208 (present address, Padgett, Exploration Division, Consolidation Coal Company, Bluefield, West Virginia 24605) (4 p., 6 figs., 1 tbl.)

Differential weathering of paleosurfaces in upper Carboniferous sandstone of southern Morocco has exposed arcuate ridges and swales that record point-bar accretionary events. From the point-bar ridges and swales, paleohydraulic and paleogeographic data have been gathered that define an array of late Carboniferous rivers with moderate discharges calculated to be from 130 to 565 m^3/sec. The broad sinuous channels flowed toward the east-southeast; the distance from the source terrain to the sea was about 100 km. Channel slope was approximately 0.16 m/km.

☐ 60803—Cretaceous and Cenozoic faulting in eastern North America. *James E. York and Jack E. Oliver, Department of Geological Sciences, Cornell University, Ithaca, New York 14853* (10 p., 6 figs., 1 tbl.)

Cretaceous and Cenozoic faults in eastern North America provide evidence of modest intraplate tectonic activity in this region. Thrust and gravity faults are found; strike-slip movement is not demonstrable but could have occurred in some cases. Fault movements are dated by offset Cretaceous, Tertiary, and Quaternary sediments, Cretaceous kimberlite, and Pleistocene glacial stria. Cretaceous and Cenozoic displacements range from about 1 mm to several tens of metres. The faults are found in the central Mississippi River valley, the southeastern and northeastern United States, and eastern Canada. Correlations among historic seismicity, fault plane solutions, and the Cretaceous and Cenozoic faulting in the central Mississippi River valley and the southeastern United States suggest a close causal relationship. The quality of the correlation between historic seismicity and Cretaceous and Cenozoic faulting in the northeastern United States and eastern Canada varies considerably from area to area; hence the relation there between Cretaceous and Cenozoic faulting and contemporary seismotectonics is uncertain.

Sharp offsets in loosely consolidated sediments, the presence of slickensides and fault gouge, and the involvement of Precambrian or Paleozoic bed rock provide the best evidence that faulting was associated with tectonic earthquakes. The displacement of near-surface deposits implies that surface faulting has occurred, although it has not been documented for modern earthquakes in eastern North America. At least some of the displacements occurred along pre-existing faults. The number and amounts of Cretaceous and Cenozoic movements on each fault have not been determined, but on one fault a displacement of 0.6 m during a short time span suggests that an earthquake of about magnitude 6 was associated with the displacement. The largest Cretaceous and Cenozoic displacements must represent more than one movement.

The presence of thrust and gravity faults and the inconsistent trends of the faults imply that stresses that vary spatially and (or) temporally, rather than a single stress field acting steadily throughout the entire North American plate, are responsible for causing this intraplate tectonic activity.

☐ 60804—Episodic erosion and deposition in the Tongue of the Ocean (Bahamas). *W. Schlager, Comparative Sedimentology Laboratory, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Fisher Island Station, Miami Beach, Florida 33139; R. L. Hooke, Department of Geology and Geophysics, University of Minnesota, Minneapolis, Minnesota, 55455; N. P. James, Department of Geology, Memorial University of Newfoundland, St. John's, Newfoundland, A1C 5S7, Canada* (4 p., 5 figs.)

During four dives in the Tongue of the Ocean in the deep submersible *Alvin*, we observed extensive evidence for erosion, including cliffs several tens of metres high of horizontally bedded pelagic chalk, crescentic scour marks around boulders in channel bottoms, and bands of freshly exposed rock at the bases of cliffs that were otherwise stained dark brown by manganese oxide. In the central part of the Tongue of the Ocean, the change from a depositional to an erosional regime must have occurred only recently, as the axial valley is cutting headward into bedded chalks of mid-Pleistocene age. Such changes may have occurred several times in the history of the Tongue of the Ocean, and the steep walls may be the result of an interplay between upbuilding of the platforms and erosion of the troughs.

☐ 60805—Plate tectonic model for the evolution of the eastern Bering Sea Basin. *Alan K. Cooper, David W. Scholl, and Michael S. Marlow, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, California 94025* (8 p., 4 figs., 1 tbl.)

The eastern Bering Sea Basin, composed of the Aleutian and Bowers Basins, is flanked to the north by Mesozoic foldbelts that probably represent zones of plate subduction in Mesozoic time. Present plate subduction occurs 400 to 1,000 km farther south, at the Aleutian Trench. North-south magnetic lineations that formed at an oceanic spreading ridge, probably in Mesozoic time (117 to 132 m.y. ago), have been identified in the Aleutian Basin. The orientation and age of those anomalies can be explained by reconstructing Kula-Farallon Pacific plate motions during late Mesozoic–early Tertiary time.

In Mesozoic time, subduction of the Kula plate occurred north of the Aleutian Trench near the present location of the Bering Sea continental margin. At about 70 m.y. B.P. (Late Cretaceous), the zone of subduction shifted south to the present location of the Aleutian Trench, thereby trapping a fragment of oceanic plate imprinted with north-south magnetic lineations within the eastern Bering Sea Basin. A stable basin framework has prevailed behind the Aleutian arc since early Tertiary time.

☐ 60806—Two classes of transform faults. *William N. Gilliland and Gary P. Meyer, Department of Geology, Rutgers University, Newark, New Jersey 07102* (4 p., 3 figs.)

A theoretical model and experimental work with cooling wax, as well as a consideration of some faults that were originally cited as transform faults, have suggested that two classes of transform faults exist. They are termed "*boundary transform fault*" and "*ridge transform fault.*" They differ in the degree and manner in which they delineate plate boundaries and probably also in age relative to a given plate.

☐ 60807—Quaternary geology of La Orchila Island, central Venezuelan offshore, Caribbean Sea. *Carlos Schubert, Centro de Ecologia, Instituto Venezolano de Investigaciones Científicas, Apartado 1827, Caracas 101, Venezuela; Sam Valastro, Jr., Radiocarbon Laboratory, University of Texas, Austin, Texas 78757* (12 p., 8 figs., 6 tbls.)

Erosional features that indicate former sea-level stands on La Orchila Island are wave-cut notches in metamorphic basement rocks, a wave-cut notch just above a low marine terrace, and a relict mangrove swamp. The main limestone terrace consists of a coarse-grained facies (coral and shell rubble) and a fine-grained facies (calcareous and siliceous sand). Other deposits include eolianite (stabilized and cemented calcareous dunes) and salt flats. Beachrock is now forming along the southern and eastern coasts; wave erosion is prominent along the northern and northeastern coasts.

Radiocarbon dates for coral, shell, and beachrock from the terrace range between approximately 8,000 and 41,000 yr B.P. X-ray diffraction and petrographic data indicate alteration and recrystallization of the original aragonite, at least in part, thus rendering the radiocarbon ages too young. Two Th^{230}/U^{238} dates on coral gave an approximate age of 131,000 yr. Thus, the terrace is most probably of Sangamon age.

The wave-cut notches were probably cut as the island emerged in early Quaternary(?) time. During the Sangamon interglacial stage, coral and shell rubble deposited by storms was cemented into beach rock along the edges of the island. Planation by waves took place during the highest (late Sangamon) sea-level stand. The terrace was exposed during the Wisconsin Glaciation; postglacial sea-level rise did not reach the terrace level because of island uplift.

☐ 60808—Hydrothermal crystallization of silica gel. *John H. Oehler, Commonwealth Scientific and Industrial Research Organization, Division of Mineralogy, Baas Becking Geobiological Laboratory, Box 378, Canberra City, A.C.T. 2601, Australia* (10 p., 9 figs., 1 tbl.)

Under hydrothermal conditions (3 kb, 100° to 300°C, 25 to 5,200 hr), freshly solidified silica gel crystallized to quartz, predominantly in the form of chalcedonic spherulites. No intermediate crystalline phases in the transition from amorphous silica to quartz were detected. Chalcedony that made up the synthetic spherulites was either length-slow, length-fast, or both, depending on the experimental conditions. These findings contrast with the hypothesis that chalcedony derived from silica gel should be length-fast. In experiments in which blue-green algae had been embedded in the silica gel, spherulite nucleation occurred preferentially on surfaces of particulate organic matter, and the chalcedony generally was length-slow. A summary of spherulitic crystallization mechanisms is presented, and emphasis is placed on impurity and viscosity requirements. Considering these requirements and the experimental results, a viscous colloidal origin is postulated for cherts and other siliceous sedimentary rocks that contain abundant silica microspheres. The seemingly biological attributes of quartz microspheres in Precambrian iron formation cherts can be explained by strictly inorganic processes related to spherulitic crystallization of colloidal precursors.

☐ 60809—Landslide inventory in northern Calabria, southern Italy. *A. Carrara and L. Merenda, Consiglio Nazionale delle Ricerche, Instituto di Ricerca per la Protezione Idrogeologica, 87030 Castiglione Scalo, Cosenza, Italy* (10 p., 9 figs.)

In Calabria, the toe of the Italian boot, landsliding and slope instability, produced by soft rocks, rapid tectonic uplift, earthquakes, and seasonally heavy precipitation, constitute a major geologic hazard. For this reason a detailed inventory of landslide and accelerated erosion events has been initiated in northern Calabria. To carry out this project, a methodology for the collection and mapping of slope instability phenomena has been established.

The method is based on the use of a standardized form for the collection of field data. The data form and related map symbols reflect the purpose of the project, which is the collection of information that is as quantitative and objective as possible on a large number of slope instability phenomena by surveyors with varying degrees of field and laboratory experience.

The morphometric and typologic data gathered in this way constitute a convenient basis for statistical analysis of factors related to the slope stability and for the preparation of landslide susceptibility maps. The maps also can be used readily for soil conservation measures.

This inventory method has been tested in two sample areas and is at present being applied to an area of about 1,000 km².

☐ 60810—Growth and early diagenetic changes in artificial gypsum crystals grown within bentonite muds and gels. *Robert D. Cody, Department of Earth Science, Iowa State University, Ames, Iowa 50010* (6 p., 8 figs.)

Experiments designed to simulate muddy environments failed to nucleate anhydrite or cause replacement of initially formed gypsum crystals by anhydrite during five months at temperatures to 80°C and with pore solutions containing as much as 20 percent sodium chloride. Gypsum and bassanite (at higher temperatures and salinities) were the only species produced. In addition, gypsum crystals experimentally grown for several months in Wyoming bentonite gels and pastes and in the presence of dissolved monovalent salts underwent major habit changes. The habit produced by these early diagenetic changes is characteristic of many natural crystals found in saline sediments and probably is diagnostic of evaporite sedimentation.

☐ 60811—Quantitative evaluation of nivation in the Colorado Front Range. *Colin E. Thorn, Department of Geography, University of Maryland, College Park, Maryland 20742* (10 p., 8 figs., 10 tbls.)

A quantitative evaluation of nivation in a mid-latitude alpine environment has been derived from an intensive study of two snow patches on Niwot Ridge, in the Colorado Front Range. Four research hypotheses were tested: nivation intensifies (1) mechanical weathering, (2) mechanical transport, (3) chemical weathering, and (4) chemical transport.

Nivation does not increase the number of freeze-thaw cycles (mechanical weathering); rather, snow patches redistribute the pattern of occurrence of freeze-thaw cycles by preventing wintertime cycles and increasing springtime cycle totals. Intensification of mechanical weathering can only result from increased cycle effectiveness. In contrast to a snowfree site, nivation increases the mechanical transport of sand, silt, and clay by an order of magnitude. Sheetwash and rill flow dominate mechanical transport. The snowpack itself is protective, sediment removal being focused downslope of the retreating snow margin. Chemical weathering is increased by a factor of two to four by a snow patch. Variations in weathering rinds indicate that chemical weathering is produced by concentration of meltwater and (or) snowpack free water.

Within a nivation hollow, chemical and mechanical degradation are approximately equal. On Niwot Ridge, degradation increased from 0.0001 mm/yr on a snowfree site to 0.0074 mm/yr within a nivation hollow. Slope profile through a nivation hollow corresponds to slope forms derived theoretically from the continuity equation. Snow-patch enlargement leads to downslope lengthening of the nivation hollow, whereas regular, complete meltout promotes incision of the hollow headwall into the hillside.

☐ 60812—Heat flow in Lake Tahoe, California-Nevada, and the Sierra Nevada–Basin and Range transition. *T. L. Henyey and T. C. Lee, Department of Geology Sciences, University of Southern California, Los Angeles, California 90007 (present address, Lee, Department of Earth Sciences, University of California, Riverside, Riverside, California 92502)* (9 p., 8 figs., 4 tbls.)

Heat-flow measurements made in Lake Tahoe, California-Nevada, demonstrate that the transition from subnormal heat flow in the Sierra Nevada to above-normal heat flow in the Basin and Range province occurs west of the assumed physiographic boundary between these two areas, contrary to earlier belief. In addition, these data, together with data of other workers, clearly reveal the sharpness of this transition, which suggests that the causative thermal sources and (or) sinks must be restricted to depths not greater than the uppermost mantle. The way in which heat-flow data constrain the current hypotheses of crustal structure and evolution of the Sierra Nevada–Basin and Range provinces is illustrated with a tectonic model that employs a post-Cretaceous shallow-dipping subduction zone beneath the Sierra Nevada and an active upper mantle diapir under the Bain and Range province during late Cenozoic time.

☐ 60813—Age of the Cardenas Lavas, Grand Canyon, Arizona. *Edwin H. McKee, U.S. Geological Survey, Menlo Park, California 94025; Donald C. Noble, Mackay School of Mines, University of Nevada, Reno, Nevada 89109* (3 p., 3 figs., 2 tbls.)

Six whole-rock specimens of basalt from the Cardenas Lavas of the younger Precambrian Unkar Group yield a Rb-Sr isochron of 1.09 ± 0.07 b.y. This age is believed to approximate the time of extrusion of the lava. Potassium-argon age determinations of the lava are considerably younger and may reflect either diffusive loss of ^{40}Ar or a period of heating about 800 m.y. ago.

☐ 60814—Geology of the Fresnillo area, Zacatecas, Mexico. *Zoltan de Cserna, Instituto de Geologia, Universidad Nacional Autonoma de México, México, D.F. (mailing address, Apartado Postal 69-736, México 21, D.F., México)* (9 p., 8 figs., 1 tbl.)

The Fresnillo area, in the state of Zacatecas in north-central Mexico, comprises a gently rolling terrain near the western edge of the Mexican Central Plateau. It is underlain by 1,800 m of Lower Cretaceous marine beds that are subdivided into four lithostratigraphic units; this sequence is mostly clastic in the lower part and becomes progressively more limy upward. Lower Cretaceous strata rest unconformably on deformed Upper Triassic andesitic pillow lava

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and greenstone, considered to be allochthonous, and are covered by Upper Cretaceous flysch-type sedimentary rock. Folded Mesozoic strata are overlain unconformably by lower Tertiary continental clastic and associated volcanic rocks, remnants of middle Tertiary rhyolitic pyroclastic flows, and upper Tertiary basalt flows. Quaternary deposits consist of alluvium in valleys and caliche on hillslopes.

Early Tertiary deformation produced open north-northwest–trending folds that were intruded at two localities by small stocks of granodiorite and quartz monzonite. This was followed by block faulting, erosion, rhyolitic volcanism, further erosion, and finally basaltic volcanism. Caliche developed over wide areas in late Tertiary time, and subsequent erosion resulted in the accumulation of alluvium in valleys.

Mining operations at Fresnillo started in 1553 and to date have produced more than 12 tons of gold, 775 tons of silver, and about 1,000,000 tons of combined lead and zinc. Ore bodies are folded mantos, fissure veins, and related stockworks. Ore minerals are pyrite, sphalerite (marmatite), galena, chalcopyrite with some pyrrhotite, arsenopyrite, pyrargyrite, tetrahedrite, polybasite, matildite, and pavonite. Gangue minerals are quartz, calcite, scheelite, siderite, and graphite.

☐ 60815—New analyses of Eocene basalt from the Olympic Peninsula, Washington: Discussion and reply.

Discussion: *William Glassley, Department of Geological Sciences, University of Washington, Seattle, Washington 98195* (*present address, Department of Oceanography, University of Washington, Seattle, Washington 98195*).

Reply: *N. A. Lyttle and D. B. Clarke, Department of Geology, Dalhousie University, Halifax, Nova Scotia, Canada B3H 3J5.*

☐ 60816—Pliocene uplift of the Grand Canyon region—Time of drainage adjustment: Discussion. *Douglas W. Shakel, Department of Geosciences, University of Arizona, Tucson, Arizona 85721* (3 p., 3 figs.)

☐ 60817—Medals and awards for 1975.

Presentation of the Penrose Medal to Francis J. Pettijohn. *Citation by A. W. Bally* (*delivered by Charles L. Drake*). *Response by F. J. Pettijohn.*

Presentation of the Arthur L. Day Medal to Allan Cox. *Citation by R. G. Coleman. Response by Allan Cox.*

Presentation of the Kirk Bryan Award to James B. Benedict. *Citation by William C. Bradley. Response by James B. Benedict.*

Presentation of the O. E. Meinzer Award to John D. Bredehoeft and George F. Pinder. *Citation by R. Allan Freeze. Responses by J. D. Bredehoeft and G. F. Pinder.*

Presentation of the E. B. Burwell, Jr., Memorial Award to Erhard M. Winkler. *Citation by Kurt E. Lowe. Response by Erhard M. Winkler.*

Presentation of the Gilbert H. Cady Award to Jack A. Simon. *Citations by Irving A. Breger and Gilbert E. Smith. Response by Jack A. Simon.*

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